STUDIES OF BENIGN PROSTATIC ENLARGEMENT.

Volume 1. Symptomatology and Clinical Course with Special Reference to Expectant Treatment.

Volume 2. Late Results of Perurethral Prostatic Resection.

by

T.L.Chapman, M.B., Ch.B., F.R.C.S.(Eng.).,F.R.F.P.S.G.

A Thesis submitted for the Degree of Ch.M. of the University of Glasgow.

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 – 1346

VOLUME I.

Contents

Introduction.

Surgical operations are frequently performed where symptoms have produced no extreme discomfort or inconvenience. This is clearly justifiable where danger to life and health can be foretold with certainty, as in many forms of malignant disease, but is less so when the course of the disease is in some doubt. In prostatic obstruction the clinical course shows wide variations and the patient's expectation of life is often short for reasons unrelated to the prostate. Expectant treatment of the mild degrees of prostatic obstruction is a subject of growing importance. The lay public is more and more aware of the dangers of the advanced stages and patients frequently present themselves for a surgical opinion when only mild symptoms are present. Also many attractive new operative methods, each with its own advantages, have been introduced in recent years. The patient's terror of operation has been reduced and the temptation to the over-enthusiastic surgeon has been increased.

It is well known that enlargement of the prostate exists in many individuals without symptoms or ill effects. Boyd (1943) states that only 8 per cent of those whose prostates are enlarged experience symptoms. Prostatic enlargement should, therefore, be regarded like the arcus senilis/

senilis of the cornea and the greying and thinning of the hair as an anatomical feature of old age which occurs sufficiently commonly that it may be regarded as a variety of the normal. Only when obstruction to the flow of urine is produced does it become a disease.

The cause of benign prostatic enlargement is not known. It is generally supposed to be due to an imbalance of hormones associated with the phase of involution of the male generative organs. It is agreed, by most, that the process is not neoplastic. There is, therefore, no reason to suppose that a prostate which has begun to enlarge must necessarily continue to do so.

The mechanism by which obstruction is produced by the enlarged prostate is also a matter of doubt. Clearly this is not due to narrowing of the urethra, as large instruments can be passed in the great majority of cases. Several theories have been advanced but none of them gives a satisfactory explanation of all cases. On one point, however, there is general agreement. The form of the prostate is the important factor. There is no relationship between size and degree of obstruction.

These facts, (1) that the prostate which has begun to enlarge does not necessarily continue to do so, and (2) that continued enlargement does not necessarily produce increased obstruction, have certain important clinical implications. It/

It is reasonable to suppose that an intermediate group exists between the individual whose enlarged prostate is without effect on health and happiness and the patient who passes through the classical stages of obstruction and who will die of renal failure if he does not receive surgical treatment. It is quite certain that there are many patients in this intermediate group and although they may suffer minor inconvenience, their health is in no immediate danger. It is less certain how many of them remain in this state. The decision between operative and conservative treatment depends on the recognition of this type of patient and on the assessment of the prognosis.

Opinion in the Specialist Literature of Urology:

Expectant treatment is given a place by all writers who have made a special study of the subject. The obvious indication is where a mild degree of prostatic obstruction occurs in the presence of an advanced stage of some other disease. Opinion is less uniform in the case of the robust man who shows mild prostatic symptoms - the so-called "early prostate". Few, if any, of the specialist writers would advise absolutely against a trial of conservative measures in such cases but there are shades of opinion about the indications for this treatment/

treatment and about the ultimate prospect of avoiding operation.

The advice given to such patients has the object of reducing the danger of congestion in the pelvic organs. Exercise short of fatigue is advised but horse-riding, cycling and long periods in a sitting posture are considered unwise. Chills are dangerous and special warning is given against wet feet. The bowels must be kept free and liqueurs, black coffee, strong beer and spiced foods are contra-indicated. The patient must never resist the desire to micturate and must not place himself in a social position where such a difficulty might arise. According to Marion sexual impulses should be discouraged but when occurring naturally should be satisfied. Other measures are suggested by some - urethral dilatation, urethral instillations, prostatic massage, X-Ray Therapy, hormone treatment and the Steinach operations.

The enlarged prostate endangers life by obstructing the outflow of urine from the bladder. If the bladder empties incompletely, urine is passed down the ureter against an increased pressure. This results in a reduction in kidney function. In addition stagnant urine predisposes strongly to infection and stone formation. The estimation of the urine left in the bladder after micturition/

micturition is thus a valuable indication of prognosis and most writers consider this estimation of importance in the selection of cases suitable for expectant treatment.

Thomson-Walker, Young and Marion have held positions of great authority in the British, American and French schools of Urology. Their views may be considered as representative of their schools.

Thomson-Walker (1927) considered that non-operative treatment might be used in cases where no marked degree of obstruction had developed. His indications for operation were:- (1) Frequent micturition causing loss of sleep and inability to take part in social life. (2) Obstruction causing residual urine of more than 1 oz. Recurrent attacks of acute retention of urine with or without residual urine. (3) Haemorrhage (rarely). (4) Sepsis. (5) Recurrent stone formation.

In the opinion of Hugh H. Young (1926) palliative treatment should be used "in early cases, where the symptoms are not aggravated, the urine sterile, the residual urine small (less than 100 c.c.), vesical capacity fairly good (say 300 c.c.) and the bladder wall showing no great trabeculation, cellule or diverticulum formation, the kidney function good and no evidence of cardio-renal disease." Marion (1940) advised non-operative treatment where symptoms were not severe and where residual urine was of negligible amount./

amount. His indications for operation were:- (1) All patients requiring to use a catheter. (2) Progressive symptoms especially increasing residual urine. (3) Complications - attacks of acute retention, calculi, epididymitis, haematuria. (4) Mass suspicious of carcinoma.

These leaders of three national schools do not differ greatly in their indications for conservative treatment and they agree in giving an extremely guarded prognosis. It is clear that they expect the great majority of these patients to require operative treatment later unless they die soon of some other disease.

On the whole the British writers are more conservative than the Americans. Barrington (1923) advised against surgical treatment when the residual urine was clear and less than 400 c.c. A smaller quantity was considered significant in the presence of infection or if the patient was a comparatively young man. Kenneth Walker (1933) also considers age an important factor in assessing the importance of residual urine. Operation is advised with a quantity of two ounces at the age of sixty but with five ounces at the age of seventy and with ten ounces over the age of seventy-five. Sepsis alone is an indication for operation. Ogier Ward (1943) considers a consistent residuum of five ounces an indication for operation but allows/

allows more in old age and less in the presence of infection. Multiple sacculation and trabeculation are strong indications for operation. Frequency of micturition is not itself an indication unless of a very marked degree. Millin (1947) has recently questioned the great importance which is attributed to residual urine. The decision depends, in his opinion, on whether or not there is "very positive evidence of established obstruction" His chief guide is vesical trabeculation.

Many of the Americans use transurethral resection for a degree of obstruction too mild to be an indication for open operation. Herman (1938) considers that this type of operation has largely replaced the non-operative procedures recommended for early cases. He does not advise its use, however, if there is no residual urine. Slight trabeculation is an indication for observation but not for immediate treatment. Eisandrath and Rolnick (1938) also believe that transurethral resection has a place in the treatment of the mild degrees of prostatic obstruction. They have found, however, that many such cases are relieved by the passage at intervals of a large sound with the instillation of a mild silver preparation. Their indications for conservative treatment are night frequency, if only once or twice, only slight difficulty and a residual urine of one to three ounces. The urine must be clear/

clear and the blood chemistry, function tests and general condition satisfactory. Lowsley and Kirwin (1944) advise palliative treatment in patients with slight enlargement, slight or intermittent urinary symptoms and little or no residual urine. The size of the prostate is not frequently mentioned in the selection of cases for expectant treatment. Lowsley and Kirwin agree with the general view that size is not related to the degree of obstruction but, no doubt, consider that the prognosis is less favourable in the larger glands. The non-operative measures recommended are prostatic massage, urethral dilatation and irrigation, hot rectal irrigations and hot Sitz baths. They believe that hormone and X-Ray treatment relieve symptoms in some cases. Hinman (1935) gives a warning against unnecessary prostatic resection. He advises conservative treatment where there is little frequency, night micturition of once or twice, a residuum of 25 - 100 c.c. and normal function. Residual urine may vary and Hinman advises against making a decision on a single estimation. He also stresses the importance of trabeculation and sacculation as indications of permanent obstruction. Prostatic massage has given prompt relief where oedema and infection were present. The indications for palliative treatment given by Keyes and Ferguson (1936) are the absence of symptoms and a residual urine of less than/

than 50 c.c. They regard acute retention more seriously in the more elderly patient as the bladder muscle is much less likely to recover its tone. They favour X-Ray therapy for obstruction of mild degree. It is known that enormous hypertrophies do not occur in cases of stricture with prolonged prostatitis. The aim of X-Ray therapy is to produce an artificial sclerosis sufficient to inhibit hypertrophy but not sufficient to obstruct urination.

The assessment of prognosis in this condition is not easy as the course is very variable. The effects of the enlarged prostate as described in the special literature may be grouped as follows:-

1. Prostatic enlargement without symptoms or ill-effects. This is a large group considered by most writers to include 50 - 75 per cent of all enlarged prostates (Sir Henry Thompson. Marion (1940), Herman (1938), Hinman (1935).)

2. Progressively increasing obstruction. This is also a large group and includes a large number of the patients referred to surgical out-patient departments. Three periods were described by Guyon (1888) - the periods of congestion, of incomplete retention without distension and of incomplete retention with distension. The course is rarely quite regular but progress through these three periods will occur in these cases if surgical treatment is not/

not carried out.

3. Sudden Onset of Acute Retention. This is a common type. An attack of acute retention is frequently the first symptom to cause the patient to seek advice. Keyes and Ferguson (1936) say that this occurs in almost half of all prostatic cases referred to hospital.

4. Silent Prostatic Obstruction. This type is not common but is very dangerous. There is a gradual distension of the bladder without marked urinary symptoms. The patient complains first of all of loss of weight and energy and of gastro intestinal symptoms.

5. Non-progressive cases. These are included in many descriptions of this disease. The symptoms in such cases are usually mild or temporary. Kenneth Walker (1933) says that "many patients showing enlargement enjoy long intervals during which no change appears to take place in their condition." Hinman (1935) describes patients whose temporary trouble has been relieved by palliative means and who remain for many years without residual urine or dysuria. Marion (1940) states that there are some who,after having had great difficulty in micturition,improve as age advances. Keyes and Ferguson (1936) mention patients who survive for many years without surgical treatment and die of intercurrent disease. Such cases, however, are usually regarded as exceptional examples of remission in the course of/

of the disease. This view is held strongly by Keyes and Ferguson (1936) who say "The expectation of life without operation of the prostatic, from first symptom to complete retention of urine, is six years for the man of fifty, four for the man between fifty and sixty and two for the man over sixty". Herman (1938), on the other hand considers prostatic hyperplasia a progressive condition "in a relatively small percentage of cases." He divides all enlarged prostates into two groups. One group comprising one third where symptoms are progressive and the other comprising two thirds where symptoms are relatively insignificant and not progressive. All of these writers advise expectant treatment in some cases. It follows that in their opinion cases exist where the obstruction is either non-progressive or so slowly progressive that health and comfort are not endangered.

General Medical Opinion.

The teaching of the medical schools is the basis of opinion on medical and surgical questions throughout the country. A study of the appropriate sections in seven standard textbooks published since 1940 suggests that the teaching of the present subject is not uniform.

Four of the seven do not mention expectant, palliative or conservative treatment except in the discussion of catheter/

catheter life, hormone treatment and the Steinach operations. The classical stages passing from early to advanced obstruction are described in a manner suggesting an inexorable process which will be arrested only by operation. Romanis and Mitchiner (1941) teach that the ideal treatment is to remove the obstruction and consider this to be contra-indicated only when the patient is not in sufficiently good general condition. Operation is definitely recommended for cases with a short history and a small amount of residual urine. Souttar (1940) describes enlargement of the prostate as an essentially progressive condition. A statement about the high incidence in the male population, however, suggests that it is not always sufficiently rapidly progressive to be important. Wakeley and Hunter (1940) describe the condition as a "chronic persistent overgrowth of the organ" and discuss the varying vascularity which produces changes in the symptoms from time to time. Catheter life combined with regularity and moderation in habits has allowed the patient to live in comparative comfort perhaps for years, the progress of the affection being entirely checked in some instances. They believe that it is possible by using the Steinach II operation in early prostatic cases for the development of the full syndrome to be averted. No opinion is given, however, about whether this might occur as a variety of the/

the natural course of the disease or as the result simply of a regular moderate life. Hamilton Bailey and McNeill Love (1946) mention the high incidence of prostatic enlargement and point out that "in only 15 per cent of those affected are symptoms sufficiently aggravating to impel the patient to seek advice." From this, however, and the other three textbooks which have been mentioned, the average student will form the impression that the patient who seeks advice and who is found to have an enlarged prostate, should have a surgical operation.

The other three textbooks recommend expectant treatment in the minor degrees of obstruction. Illingworth (1942) states that by palliative measures "much can be done to relieve symptoms and prevent or delay the untoward results of prostatic enlargement." Handfield Jones and Porritt (1945) give as indications for expectant treatment "(1) patients who have an early or slight enlargement, (2) a residual urine of less than 4 oz. (3) a sterile urine, (4) a normal renal efficiency and (5) a frequency not sufficiently severe to impair their general condition by lack of sleep." It is advised that these cases can safely be watched. Examination at intervals of three months with assessment of residual urine, renal efficiency and general condition is recommended. Pannett (1944) in his indications for operation expresses similar views and he, also/

also, recommends examination every three months.

Objects of Investigation.

A review of the literature suggests that further study of this subject would be of value. If a moderate proportion of selected cases do not require operative treatment, this is a matter of great practical importance which should be recognised by all teachers and taught to their students. Many of these students will have the duty of advising patients about this condition and some may acquire the necessary skill and adequate hospital facilities to perform a prostatectomy without having made a study of the special literature. On the other hand if, in the enormous majority of cases, expectant treatment merely postpones operation for a short time its importance is very doubtful.

The vital point is whether, among the patients who seek medical advice, there are many definitely non-progressive cases. If so, can they be recognised? What is the significance in this connection of the various symptoms, of the patient's age, of the size and consistence of the prostate, of residual urine, of vesical trabeculation and sacculation? These questions could only be answered conclusively by following a very large number of patients to the end of their lives. The investigation to be described in this paper is a contribution to this study.

Numerous/

Numerous measures have been suggested to arrest the progress of this disease and it is probable that an effective endocrine treatment will be found for this purpose. In order to evaluate such methods, precise information is required about the normal course of the disease.

Material of Present Investigation.

With these objects information has been collected about the progress of all cases of benign prostatic enlargement treated expectantly by the writer since the end of 1938. This includes all patients referred to the Urological Clinic of the Victoria Infirmary and all private patients of the same group. It does not include patients admitted to the Wards in a very advanced stage of disease where treatment would have been advised but for the moribund or almost moribund state. Where enlargement was slight both on rectal and endoscopic examination the case has not been included. Also small firm areas have been felt in some prostates which suggested the possibility of early malignant change. These were given the benefit of endocrine therapy and consequently were not included. Cystoscopic and urethroscopic examinations have not been performed when the diagnosis could be established by other means. Following the advice of Macalpine (1936) and others these methods were reserved chiefly for cases where haematuria had occurred or where/

where the enlargement felt per rectum was not definite. Endoscopic diagnosis of prostatic enlargement has been based on the obscuring of the trigone, the presence of clefts between the lobes, abnormal form of the urethral lumen and elongation of the urethra above the verumontanum. Some American writers describe these cases in four grades of enlargement as seen endoscopically. This has not been attempted but gross differences in size and in the relative involvement of the lobes have been recorded. The degree of enlargement as felt per rectum has also been graded by some writers. For example Barnes (1943) classifies his cases by the estimated encroachment of the rectal lumen as follows:-

Grade 1. Protrusion of 0 - 1 cm.

Grade 2. Protrusion of 1 - 2 cm.

Grade 3. Protrusion of 2 - 3 cm.

Grade 4. Protrusion of over 3 cm.

It has been found convenient in the present series to use numbers in tabulating the size of the prostates. Gross enlargement is indicated as 4, considerable enlargement as 3, moderate enlargement as 2, slight enlargement as 1 and no enlargement as 0. It is probable that these are approximately the same as Barnes' grades. 124 cases are included in this series and each case has been given a serial number. The evidence of enlargement and the chief complaint are shown in Table No. 1. Slight degrees of trabeculation

were present in almost all the cases. Where trabeculation was very prominent and well marked this has been recorded.

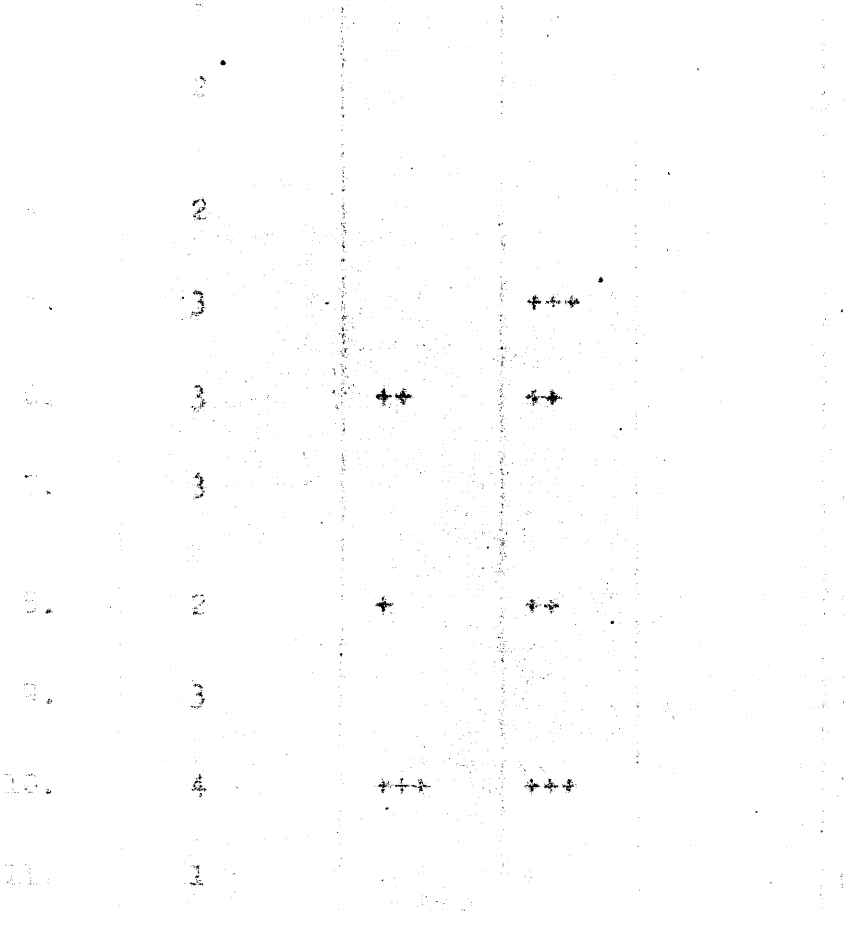

Table No.1.

EVIDENCE OF ENLARGEMENT.

Serial Number.	Rectal Examination. Degree of enlargement.	Endoscopic Examination. Lateral Lobes.	Middle Lobe.	Trabeculation.	Chief Complaint.
1.	3				Attack of acute retention.
2.	2				Frequent micturition.
3.	2				Attack of acute retention.
4.	2				Difficult micturition.
5.	3		+++		Frequent micturition.
6.	3	++	++		Frequent micturition.
7.	3				Attacks of acute retention.
8.	2	+	++		Haematuria.
9.	3				Attack of acute retention.
10.	4	+++	+++		Haematuria.
11.	1				Hesitant micturition.
12.	2	+++	+++		Haematuria and frequent micturition.
13./					

Table No.1. (Cont).

EVIDENCE OF ENLARGEMENT.

Serial Number.	Rectal Examination. Degree of enlargement.	Endoscopic Examination. Lateral Lobes.	Middle Lobe.	Trabeculation.	Chief Complaint.
13.	3				Frequent micturition.
14.	4	++	++		Urgent micturition and haematuria.
15.	2				Frequent micturition.
16.	4	++	+++	+++	Haematuria.
17.	2				Frequent micturition.
18.	4				Frequent micturition.
19.	2	++	++		Haematuria.
20.	2				Urgency of micturition.
21.	2				Hesitant, frequent micturition.
22.	1	+	++		Frequent micturition.
23.	2	+	++	+++	Frequent, difficult micturition.
24.	3				Frequent micturition.
25.	4				Frequent, difficult micturition.
26./					

Table No.1. (Cont).

EVIDENCE OF ENLARGEMENT.

Serial Number.	Rectal Examination. Degree of enlargement.	Endoscopic Examination. Lateral Lobes.	Middle Lobe.	Trabeculation.	Chief Complaint.
26.	4		+++		Haematuria.
27.	2	++	++		Frequent micturition.
28.	2	+	++		Haematuria.
29.	2				Hesitant, difficult micturition.
30.	3				Hesitant, frequent micturition.
31.	2				Hesitant, frequent micturition.
32.	2				Frequent micturition.
33.	3				Hesitant micturition.
34.	2				Frequent micturition.
35.	1		+++	+++	Difficult micturition.
36.	2		++	+++	Bouts of frequent micturition.
37.	2		+		Frequent, difficult micturition.
38.	2	++	++		Haematuria.
39.	2				Bouts of frequent micturition.
40.	2	+	++		Haematuria.
41./					

Table No.1. (Cont).

EVIDENCE OF ENLARGEMENT.

Serial Number.	Rectal Examination. Degree of enlargement.	Endoscopic Examination. Lateral Lobes.	Middle Lobe.	Trabeculation.	Chief Complaint.
41.	2	++	++	+++	Frequent micturition.
42.	2	++	++		Difficult micturition and haematuria.
43.	2	++	++	+++	Frequent micturition.
44.	2	++	++	+++	Difficult micturition.
45.	3				Hesitant, frequent micturition.
46.	3				Hesitant micturition.
47.	2	+++	+++		Frequent micturition.
48.	3				Frequent micturition.
49.	1				Frequent micturition.
50.	2	++	++	+++	Frequent micturition.
51.	2				Frequent micturition.
52.	1	++	++		Frequent, difficult micturition.
53.	3				Difficult micturition.
54.	2				Frequent micturition.
55.	3				Frequent micturition.

56/

Table No.1. (Cont).

EVIDENCE OF ENLARGEMENT.

Serial Number.	Rectal Examination. Degree of Enlargement.	Endoscopic Examination. Lateral Lobes.	Middle Lobe.	Trabeculation.	Chief Complaint.
56.	2				Frequent micturition.
57.	2				Attack of acute retention.
58.	3	++	++	+++	Haematuria.
59.	2				Frequent micturition.
60.	2				Frequent micturition.
61.	3	++	++		Frequent micturition.
62.	1	++	++	+++	Frequent micturition and haematuria.
63.	2				Frequent painful micturition.
64.	1	++	++		Frequent micturition.
65.	2				Frequent micturition.
66.	2				Frequent difficult micturition.
67.	3				Frequent, difficult micturition.
68.	2	++	++		Frequent micturition.
69.	2	+	++		Haematuria.
70./					

EVIDENCE OF ENLARGEMENT.

Serial Number.	Rectal Examination. Degree of Enlargement.	Endoscopic Examination. Lateral Lobes.	Middle Lobe.	Trabeculation.	Chief Complaint.
70.	2	++	++		Bouts of frequent micturition.
71.	2	+	++		Frequent micturition.
72.	2		++		Hesitant, frequent micturition.
73.	2	++	++		Attack of acute retention.
74.	2		++		Attack of acute retention.
75.	0		+++		Frequent micturition.
76.	2				Frequent micturition.
77.	2				Bouts of frequent micturition.
78.	2	++	++		Haematuria.
79.	1	++	++	+++	Haematuria.
80.	2				Frequent Micturition.
81.	3	+++	+++		Haematuria and frequent micturition.
82.	3				Difficult micturition.
83.	2				Frequent micturition.
84./					

EVIDENCE OF ENLARGEMENT.

Serial Number.	Rectal Examination. Degree of Enlargement.	Endoscopic Examination. Lateral Lobes.	Middle Lobe.	Trabeculation.	Chief Complaint.
84.	3				Frequent, difficult micturition.
85.	3				Bouts of frequent micturition.
86.	0		+++	+++	Haematuria.
87.	2				Painful micturition.
88.	2				Frequent micturition.
89.	1				Difficult micturition.
90.	2	+	++		Lumbar pain.
91.	2	++	++		Hesitant, difficult micturition.
92.	2	++	++		Haematuria.
93.	2				Frequent micturition.
94.	2				Frequent micturition.
95.	3				Bouts of frequent micturition.
96.	2				Frequent micturition.
97.	1	++	++		Frequent micturition.
98.	3				Frequent micturition.
99./					

EVIDENCE OF ENLARGEMENT

Serial Number.	Rectal Examination. Degree of Enlargement.	Endoscopic Examination. Lateral Lobes.	Middle Lobe.	Trabeculation.	Chief Complaint.
99.	3				Urgent micturition.
100.	2				Difficult micturition.
101.	3				Hesitant, difficult micturition.
102.	1	+	++		Bouts of frequent micturition.
103.	2				Frequent micturition.
104.	2				Frequent micturition.
105.	2				Attacks of acute retention.
106.	3				Hesitant, difficult micturition.
107.	0	+	++		Frequent micturition.
108.	0		+++	+++	Haematuria and frequent micturition.
109.	2				Bouts of frequent micturition.
110.	2				Frequent micturition.
111.	0		++		Frequent micturition.
112.	2				Frequent painful micturition.
113./					

EVIDENCE OF ENLARGEMENT.

Serial Number.	Rectal Examination. Degree of Enlargement.	Endoscopic Examination. Lateral Lobes.	Middle Lobe.	Trabeculation.	Chief Complaint.
113.	3				Lumbar pain.
114.	3				Frequent micturition.
115.	2	++	++	+++	Frequent micturition.
116.	4				Frequent micturition.
117.	2				Hesitant, difficult micturition.
118.	3	++	++		Haematuria.
119.	2	++	++		Bouts of frequent micturition.
120.	3				Frequent micturition.
121.	3				Bouts of frequent micturition.
122.	1		+		Haematuria.
123.	2	++	++		Haematuria.
124.	2				Bouts of frequent micturition.

The selection of cases for expectant treatment was orthodox. The volume of the residual urine was considered the most important single factor. With four ounces or more operation was usually advised. Less was considered important in young subjects or in the presence of infection. Cases with more than four ounces were occasionally treated expectantly in old age or when other facts indicated a short expectation of life. A second and sometimes a third estimation of residual urine was made when the volume was not in keeping with the other facts of the case or when there was doubt about the accuracy of the first estimation. The estimation and significance of residual urine will be discussed more fully later.

The difficulty in micturition described or demonstrated by the patient was considered important and when this was extreme expectant treatment was not advised even if there was no residual urine.

Attacks of acute retention of urine were usually considered an indication for operation even when a complete return to normal had occurred. In a few cases expectant treatment was advised owing to high operative risk. In two cases the patient's extreme reluctance to undergo operative treatment was allowed to influence the decision.

The presence of multiple sacculation or of diverticula was considered an indication for operation but trabeculation in/

in itself was not. The great majority of these cases showed at least a slight degree of trabeculation.

The advice given to these patients was also orthodox. They were warned about the dangers of chills, alcoholic excess and the failure to obey the urge to empty the bladder. They were told that their urinary mechanism was abnormal. They were encouraged to believe that this would never cause them any serious trouble but were advised strongly to report any increase in urinary symptoms or any evidence of failing health. An attempt was made to assess the psychological reaction of the patient and to vary the advice so as to avoid morbid introspection on the one hand and dangerous complacency on the other. Urethral dilatation, prostatic massage, hormone treatment, X-Ray treatment and the Steinach operations were not used in these cases. Return visits were arranged according to the need of the individual patient but no routine system was adopted. Practitioners were frequently asked to send patients to the clinic after an interval of three months and if the condition was doubtful the visit was repeated on a few occasions. Patients were sometimes reluctant to return to the clinic when their symptoms were improved or unchanged but with a few exceptions they were very ready to report any increase in symptoms.

The Follow Up System.

The/

The records of these patients were filed separately. Information obtained at return visits, from the patients' doctors or in some cases from the patients'friends was collected carefully. Postal questionnaires were sent to patients who had not been seen for a time and about whom doubt was felt. In addition the entire group of patients were sent questionnaires in December, 1944, April, 1946 and November, 1947. The following questions were asked:-

"Have you any difficulty in passing water?
Has this difficulty, if any, become greater or less recently?
Is the flow slow to start?
How long can you hold your water during the day?
Are you disturbed at night to pass water?
If so, how many times in one night?
Have you seen any blood in the water?
Is your general health good?
Have you required to have any surgical treatment to relieve symptoms of this kind?
Have you required to have your water withdrawn by an instrument?
If so, how often?"

This form was accompanied by a letter in which a special request was made to patients who might have had treatment from another surgeon. It was pointed out that there was no need whatever to mention the name of the surgeon or hospital but they were urged to say whether a surgical operation had been performed. When question forms were returned by the Post Office an Almoner visited the district and usually succeeded in discovering the new address. When no reply was received the Almoner also visited and in most cases a reply was obtained. In the series of 131 cases only seven were/

were untraced. This high proportion of cases followed was due to the enthusiasm of the Almoner's Department and to the fact that the great majority of the patients were resident in Southern Glasgow, sufficiently close to the hospital for visiting.

When the answers to the questions showed an increase in symptoms another examination was arranged. During the months of January, February and March, 1948 invitations were sent in groups to all the survivors to attend for examination. Seventy two patients accepted this invitation.

When information was received of a patient's death letters were sent to his relatives and to his doctor asking about the cause of death and whether there had been any increase in urinary symptoms.

Table No. 2. shows the date of first attendance in each case, the patient's age at that time and the duration of the follow up. The date of the most recent information or of the termination of the follow up is also recorded in each case.

Table No. 2.

DURATION OF FOLLOW UP.

Serial Number.	Age at first visit.	Date of first visit.	Date of death, operation or most recent communication.	Duration of follow up. Years.	Months.
1.	58	1.11.'38.	Died (Cardiac failure) October, 1947.	8	11
2.	78	4. 3.'39.	Died (Senile changes) 17th January, 1940.	-	10
3.	76	-. 5.'39.	Died (pneumonia) July, 1946.	7	2
4.	65	-. 8.'39.	Reply. December,1947.	8	4
5.	70	22.11.'39.	Visit. 14th January, 1948.	8	2
6.	64	19.12.'39.	Visit. 14th January, 1948.	8	1
7.	70	6. 1.'40.	Operation March,1943.	3	2
8.	65	16. 1.'40.	Visit. 14th January, 1948.	8	-
9.	73	20. 1.'40.	Died (Cardiac failure) 19th December, 1940.	-	10
10.	66	15. 6.'40.	Visit. 14th January, 1948.	7	7
11.	56	20. 7.'40.	Operation, 21st October, 1941.	1	3
12.	65	27. 7.'40.	Visit. 14th January, 1948.	7	6
13.	68	14. 8.'40.	Visit. 14th January, 1948.	7	5
14.	61	31. 8.'40.	Visit. 14th January, 1948.	7	5
15.	64	12.10.'40.	Visit. December 1947.	7	1
16./					

DURATION OF FOLLOW UP.

Serial Number.	Age at first visit.	Date of first visit.	Date of death, operation or most recent communication.	Duration of follow up. Years.	Months.
16.	67	19.11.'40.	Operation. August, 1947.	6	9
17.	91	8. 2.'41.	Died (uræmia) June, 1942.	1	4
18.	66	26. 3.'41.	Died (carcinoma of stomach. December, 1947.	6	8
19.	57	14. 4.'41.	Reply. November, 1947.	6	7
20.	51	24. 4.'41.	Died (heart attack) September, 1944.	3	5
21.	68	11. 5.'41.	Operation. 12th August, 1942.	1	3
22.	54	9. 5.'41.	Visit. 14th January, 1948.	6	8
23.	59	26. 5.'41.	Operation. 18th June, 1943.	2	1
24.	70	4. 8.'41.	Died (Cardio-vascular disease. 21st Jan. 1944.	2	6
25.	62	2. 9.'41.	Reply. January, 1948.	6	4
26.	56	21.10.'41.	Operation advised February, 1948.	6	4
27.	50	10.11.'41.	Visit. 14th January, 1948.	6	2
28.	57	3. 1.'42.	Reply. November, 1947.	5	10
29.	71	9. 6.'42.	Reply. November, 1947.	5	5
30.	69	16.11.'42.	Visit. December, 1947.	5	-
31./					

Table No. 2. (cont).

DURATION OF FOLLOW UP.

Serial Number.	Age at first visit.	Date of first visit.	Date of death, operation or most recent communication.	Duration of follow up. Years.	Months.
31.	67	21.12.'42.	Visit. 21st January, 1948.	5	1
32.	69	11. 5.'43.	Reply. November, 1947.	4	6
33.	62	16. 6.'43.	Visit. 24th January, 1948.	4	7
34.	67	23. 8.'43.	Reply. November, 1947.	4	3
35.	56.	19.10.'43.	Visit. 23rd February, 1948.	4	4
36.	49	20.10.'43.	Visit. 21st January, 1948.	4	3
37.	47	8.11.'43.	Reply. November, 1947.	4	-
38.	55	10.11.'43.	Operation. September, 1945.	1	10
39.	68	10.11.'43.	Visit. 21st January, 1948.	4	2
40.	67	22.11.'43.	Reply. November, 1947.	4	-
41.	51	1.12.'43.	Visit. 21st January, 1948.	4	1
42.	52	1.12.'43.	Visit. 21st January, 1948.	4	1
43.	36	21.12.'43.	Visit. 21st January, 1948.	4	1
44.	55	6. 1.'44.	Operation advised February, 1948.	4	1
45.	60	19. 1.'44.	Visit. 4th February, 1948.	4	1
46./					

DURATION OF FOLLOW UP.

Serial Number.	Age at first visit.	Date of first visit.	Date of death, operation or most recent communication.	Duration of follow up. Years.	Months.
46.	58	19. 1.'44.	Visit. 4th February, 1948.	4	1
47.	70	16. 2.'44.	Reply. November,1947.	3	9
48.	68	16. 2.'44.	Visit. 4th February, 1948.	4	-
49.	58	23. 2.'44.	Died (cerebral haemorrhage) March, 1946.	2	1
50.	55	29. 3.'44.	Visit. 4th February, 1948.	3	11
51.	77	21. 4.'44.	Visit. 19th February, 1948.	3	10
52.	67	17. 4.'44.	Operation. January, 1947.	2	9
53.	76	19. 4.'44.	Visit. 4th February, 1948.	3	10
54.	58	7. 6.'44.	Operation.		
55.	72	9. 6.'44.	Reply. November, 1947.	3	5
56.	54	14. 6.'44.	Visit. 4th February, 1948.	3	8
57.	57	16. 6.'44.	Visit. 4th February, 1948.	3	8
58.	60	21. 6.'44.	Visit. 4th February, 1948.	3	8
59.	59	11. 8.'44.	Reply. November,1947.	3	3
60.	65	15. 9.'44.	Visit. 4th February, 1948.	3	5
61./					

Table No. 2. (cont.)

DURATION OF FOLLOW UP.

Serial Number.	Age at first visit.	Date of first visit.	Date of death, operation or most recent communication.	Duration of follow up. Years.	Months.
61.	59	-. 9.'44.	Reply. November, 1947.	3	2
62.	63	18.10.'44.	Visit. 11th February, 1948.	3	4
63.	72	25.10.'44.	Reply. November, 1947.	3	1
64.	59	25.10.'44.	Reply. November, 1947.	3	1
65.	62	30.10.'44.	Visit. 28th January, 1948.	3	3
66.	83	5.11.'44.	Visit. 24th January, 1948.	3	2
67.	60	8.11.'44.	Operation. 9th February, 1948.	3	2
68.	61	29.11.'44.	Died (pyloric stenosis)	-	-
69.	72	1.12.'44.	Died (tumour of testis) April, 1945.	-	4
70.	72	6.12.'44.	Reply. November, 1947.	2	11
71.	60	14.12.'44.	Visit. 28th January, 1948.	3	1
72.	69	14.12.'44.	Visit. 28th January, 1948.	3	1
73.	50	22.12.'44.	Visit. 28th January, 1948.	3	1
74.	57	7. 2.'45.	Visit. 28th January, 1948.	2	11
75.	63	7. 2.'45.	Visit. 28th January, 1948.	2	11
76./					

Table No. 2. (Cont).

DURATION OF FOLLOW UP.

Serial Number.	Age at first visit.	Date of first visit.	Date of death, operation or most recent communication.	Duration of follow up. Years.	Months.
76.	67	15. 3.'45.	Died (carcinoma of lung).	-	2
77.	51	21. 3.'45.	Visit. 3rd March, 1948.	3	-
78.	63	6.4. '45.	Died (coronary thrombosis) June, 1946.	1	2
79.	78	10. 4.'45.	Reply. November, 1947.	2	7
80.	61	18. 5.'45.	Died (tumour of lung) 27th October, 1947.	2	5
81.	66	12. 6.'45.	Visit. 29th January, 1948.	2	7
82.	55	6. 6.'45.	Operation advised May, 1947.	1	11
83.	59	13. 7.'45.	Visit. 4th February, 1948.	2	7
84.	70	18. 7.'45.	Reply. November,1947.	2	4
85.	60	27. 7.'45.	Visit. 11th February, 1948.	2	7
86.	52	27. 7.'45.	Visit. 11th February, 1948.	2	7
87.	66	3. 8.'45.	Visit. 11th February, 1948.	2	6
88.	68	10. 8.'45.	Reply. November,1947.	2	3
89.	55	29. 8.'45.	Reply. November,1947.	2	3
90.	60	19. 9.'45.	Reply. November,1947.	2	2
91./					

Table No. 2. (Cont.)

DURATION OF FOLLOW UP.

Serial Number.	Age at first visit.	Date of first visit.	Date of death, operation or most recent communication.	Duration of follow up. Years.	Months.
91.	56	26. 9.'45.	Visit. 11th February, 1948.	2	5
92.	58	6.10.'45.	Died (Cerebral haemorrhage) 11th March, 1947.	1	4
93.	65	16. 1.'46.	Reply. November,1947.	1	10
94.	53	30. 1.'46.	Visit. 18th February, 1948.	2	1
95.	66	15. 2.'46.	Reply. November,1947.	1	9
96.	65	20. 2.'46.	Visit. 18th February, 1948.	2	-
97.	69	12. 3.'46.	Visit. 18th February, 1948.	1	11
98.	76	13. 3.'46.	Visit. 18th February, 1948.	1	11
99.	70	2. 4.'46.	Visit. 25th February, 1948.	1	10
100.	64	1. 5.'46.	Reply. November,1947.	1	6
101.	70	5. 7.'46.	Visit. 18th February, 1948.	1	4
102.	66	30. 8.'46.	Operation. March,1948.	1	7
103.	71	3. 9.'46.	Reply. November,1947.	1	2
104.	72	4. 9.'46.	Visit. 23rd February, 1948.	1	5
105.	60	-. 9.'46.	Operation advised March, 1948.	1	6
106.					

Table No. 2. (cont).

DURATION OF FOLLOW UP.

Serial Number.	Age at first visit.	Date of first visit.	Date of death, operation or most recent communication.	Duration of follow up. Years.	Months.
106.	68	26.10.'46.	Reply. November,1947.	1	1
107.	65	27.10.'46.	Visit. 4th February, 1948.	1	3
108.	64	11.12.'46.	Reply. November,1947.	-	11
109.	63	3. 1.'47.	Visit. 27th February, 1948.	1	1
110.	72	29. 1.'47.	Visit. 25th February, 1948.	1	1
111.	59	26. 2.'47.	Visit. 3rd March, 1948.	1	1
112.	61	12. 3.'47.	Visit. 25th February, 1948.	-	11
113.	54	26. 3.'47.	Reply. November,1947.	-	8
114.	73	9. 4.'47.	Visit. 3rd March,1948.	-	11
115.	71	16. 4.'47.	Visit.24th February, 1948.	-	10
116.	57	7. 5.'47.	Visit. 25th February, 1948.	-	9
117.	50	28. 5.'47.	Visit. 25th February, 1948.	-	9
118.	61	10. 6.'47.	Visit. 3rd March,1948.	-	9
119.	58	18. 6.'47.	Visit. 25th February, 1948.	-	8
120.	87	25. 6.'47.	Visit. 25th February, 1948.	-	8
121./					

DURATION OF FOLLOW UP.

Serial Number.	Age at first visit.	Date of first visit.	Date of death, operation or most recent communication.	Duration of follow up. Years.	Months.
121.	71	7. 7.'47.	Reply. 3rd March, 1948.	-	8
122.	54	8. 8.'47.	Reply. 3rd March, 1948.	-	7
123.	62	15. 8.'47.	Visit. 3rd March, 1948.	-	7
124.	73	29. 8.'47.	Visit. 3rd March, 1948.	-	7

Untraced Cases.

The seven untraced cases are not included in Tables 1 and 2. The information about these cases is incomplete and is summarised below:-

(i) In December, 1940 (aged 57) the chief complaint was of night micturition (one to two times). The prostate was moderately enlarged. The replies in December, 1944 and April, 1946 showed that some frequency had developed by day and that urgency of micturition was troublesome. In April, 1945 the frequency by night was the same as at the first visit. There was no difficulty in micturition. He is not at his old address and no information can be obtained about him.

(ii) In August, 1942 (aged 62) advice was sought about frequent and difficult micturition. Cystoscopic examination showed moderate enlargement of middle and lateral lobes of the prostate. In April, 1945 the patient reported having passed two small stones. No evidence of other stones was found. Frequency of micturition was still present but difficulty was less. He has been traced to several addresses but his present one is not known.

(iii) In April, 1944 (aged 63) this patient complained of slight difficulty and hesitancy in micturition. He was sometimes disturbed twice in the night and the residual urine was half an ounce. Replies to the questionnaires in December/

December, 1944 and April, 1946 showed that the difficulty and hesitancy in micturition were less but the frequency was unchanged. He has now gone to live in another town and it has not been possible to discover his exact address.

(iv) In May, 1944 (aged 79) the complaint was of bouts of frequent and difficult micturition. Owing to senile mental deterioration no replies have been attempted to recent questionnaires. His own doctor reports attacks of urinary infection but no gross evidence of obstruction.

(v) In June, 1945 (aged 74) this patient complained of difficulty and hesitancy in micturition at some times and urgency at other times. Frequency of micturition was not troublesome during the day but he was disturbed three to four times at night. He was extremely breathless on slight exertion. He is known to have died about a year later but the cause of death and the course of the urinary symptoms are not known.

(vi) In March, 1946 (aged 57) this patient complained of bouts of frequent micturition and some hesitancy. The force of the flow was considered normal. The prostate was slightly enlarged on rectal examination. Cystoscopy showed a moderate enlargement of middle and lateral lobes. The residual urine was about three ounces. This patient is at present spending a six months holiday in Canada.

(vii) In April, 1946 (aged 59) this patient complained of frequent/

frequent, urgent micturition with some burning pain. There was some hesitancy and the flow was variable. The urine contained blood and pus, and culture showed a pure growth of B. coli. The symptoms responded well to Sulphonamide treatment. A few weeks later cystoscopic examination showed a moderate enlargement of middle and lateral lobes of the prostate but no other abnormality. There was no residual urine. His present address is not known.

Deaths during the period of the follow-up.

Fifteen patients have died. It is necessary to determine, as far as possible, whether the prostatic condition was wholly or in part responsible for death in any of these cases. The course of the disease and the cause of death are considered.

Case No.1. In November, 1938 at the age of 58 years this patient had an attack of acute retention. He made a complete recovery and a week later there was no residual urine. He had had a recent severe coronary attack and operation was not advised. The prostate was considerably enlarged, homogeneous and soft. In October, 1943 he had extreme difficulty in micturition while confined to bed after a cataract operation but made a complete recovery on returning to normal conditions. In December, 1944 he stated that he could hold his urine for six hours during the day and was not/

not disturbed at night. There was no difficulty and only slight hesitancy. Similar replies were received in April, 1946. He died as the result of another coronary attack in October, 1947. No change had taken place in his urinary symptoms.

Case No. 2. In March, 1939 at the age of 78 years there was a complaint of moderate difficulty in micturition and of being disturbed twice each night. He died in January, 1940 as a result of general senile changes and without any change in his urinary symptoms.

Case No. 3. In May, 1939 at the age of 76 years and in poor general condition this patient had an attack of acute retention. The prostate was moderately enlarged and soft. He made a complete recovery. In December, 1944 he could hold his urine for two hours during the day and was disturbed three times at night. There was no difficulty or hesitancy in micturition. In April, 1946 the day interval had extended to four hours and he was not disturbed at night. There was still no difficulty or hesitancy in micturition. This normal state continued. He died of pneumonia in July, 1946.

Case No.9. In January, 1940 at the age of 73 years there was a brief attack of retention. The prostate was of considerable size and soft in consistence. He died of cardiac failure in December, 1940 without recurrence of urinary/

urinary difficulty.

Case No.17. In February, 1941 at the age of 91 years this patient sought advice about frequent micturition, sometimes five times per night,and occasional incontinence. He was still fairly active but difficulty in micturition was slight and operation was not advised. No residual urine estimation was performed. The frequency and incontinence continued and he died in June, 1942 in a comatose state diagnosed as uraemia by his doctor.

Case No.18. In March, 1941 at the age of 66 years this patient complained of frequent micturition (two or three times per night). There were intervals of three hours during the day. Some hesitancy but no real difficulty in micturition was experienced. There was a recent history of coronary thrombosis, and breathlessness occurred on exertion. The prostate was grossly enlarged and the residual urine measured four ounces. The frequency of micturition gradually diminished. In December, 1944 he reported that he was usually disturbed once each night, though sometimes twice. In April 1946 he said that he only required to rise once. The day intervals extended to four hours (December, 1944) and five hours (April, 1946). No difficulty in micturition occurred at any time. He died of carcinoma of stomach in December, 1947. The diagnosis was made by barium examination and test meal.

Case/

Case No.20. In April, 1941 (aged 51) this patient had urgency of micturition and occasional slight incontinence. He was disturbed once in the night. The prostate was moderately enlarged and no residual urine was found. No increase in urinary symptoms occurred and he died of a "heart attack" while attempting to climb Goat Fell in September, 1944.

Case No.24. In August, 1941 at the age of 70 years the chief complaint was of frequent urgent micturition. The day interval was two hours and he was disturbed two or three times each night. There was no difficulty in micturition. A considerable firm enlargement of the prostate was found. No increase in urinary symptoms took place and he died two and a half years later of cardio-vascular degeneration.

Case No.49. In February, 1944 aged 58 years this patient gave a history of rising from two to five times each night. The prostate was only slightly enlarged and was very firm. The residual urine measured half an ounce. The night frequency became less during the following months and he reported in December, 1944 that he only required to rise once. No difficulty in micturition occurred at any time. The urinary symptoms showed no further change and he died suddenly of cerebral haemorrhage in March, 1946.

Case No.68. In November, 1944 (aged 61) this patient complained/

complained of frequent, urgent micturition (four to five times per night and at intervals of one and a half hours during the day). Cystoscopy showed a moderate enlargement of middle and both lateral lobes. No increase occurred in urinary symptoms and he died about a year later of a pyloric ulcer believed to have been malignant.

Case No. 69. In December, 1944 aged 72 years this patient complained of frequent micturition (three times per night) and of urgency, hesitancy and occasional slight incontinence. The prostate was moderately enlarged on rectal examination and cystoscopy showed a considerable middle lobe. He died in April, 1945 without change in urinary symptoms. His death appeared to be caused by a tumour of the testis with abdominal metastases. This is not a common disease at 72 years and it is possible that the scrotal swelling was due to inflammatory changes in the epididymis and testis and may, therefore, have been related to his prostatic condition.

Case No.76. In March, 1945 aged 67 years this patient complained of frequent micturition specially at night, when he was disturbed from two to seven times. There was slight incontinence but no hesitancy or difficulty. The prostate showed a moderate enlargement and the residual urine measured half an ounce. He died in May, 1945 of carcinoma of lung,without change in his urinary symptoms.

Case/

Case No.78. In April, 1945 aged 63 years this patient complained of hesitant, urgent micturition, occasional terminal haematuria and day and night frequency of variable degree. On rectal examination a moderate, rather firm, enlargement was found. Cystoscopy showed enlargement of middle and both lateral lobes. Residual urine was of negligible amount. In April, 1946 he reported a slight improvement in urinary symptoms. He died suddenly of coronary thrombosis in June, 1947.

Case No.80. In May, 1945 at the age of 61 years the chief complaint was night frequency of three or four times. There was also some urgency of micturition. There was no complaint of hesitancy or difficulty in micturition though the stream varied sometimes in force. There was a moderate degree of enlargement of the prostate and the residual urine was less than one ounce. He was examined again in October, 1945 when no change in symptoms was noted and the residual urine was still less than one ounce. He died of a tumour of the lung in October, 1947 having had no increase in urinary symptoms.

Case No. 92. In November, 1945 at the age of 58 years this patient complained of frequent micturition, every two hours by day and twice each night. Haematuria occurred on one occasion. The prostate was moderately enlarged and cystoscopy showed that the middle and both lateral lobes were/

were involved. In April, 1946 he reported no marked change in symptoms. The intervals between acts of micturition during the day were longer. No difficulty in micturition was noted at any time. In August, 1946 he had a cerebral haemorrhage from which he made a good recovery. A fatal cerebral haemorrhage occurred in March, 1947. There was no increase in urinary symptoms.

In the case of the old man of 91 (No.17.) it is probable that prostatic obstruction was at least partially responsible for his death although the evidence available was not conclusive. In the other fourteen cases it is unlikely that the duration of life was affected by this condition. This is almost certainly true of the cases where neoplasms were shown to be present in other parts of the body (Nos.18, 76 and 80). It is less certain in some of the other cases. The kidneys may be affected in urinary obstruction without obvious increase in symptoms. In a series of 1215 post mortem examinations of male subjects Randall (1931) found 222 examples of benign hypertrophy of the prostate and of these 191 (86 per cent) showed definite evidence of renal disease. This figure is less startling, however, when it is known that 888 cases without pathological change in the prostate showed evidence of renal disease in 73.5 per cent. It is also worthy of note that hydroureter only occurred in 12 of the 222 cases of prostatic enlargement (5.4 percent). Nevertheless/

Nevertheless in the series discussed in the present paper the possibility of unsuspected renal disease must be considered. Such a condition might play a part in the production of cerebral haemorrhage (Nos. 49 and 92). The gastric symptoms in Case No.68 might have been due to uraemia, and reduced resistance to infection or the effects of retained products of metabolism might explain other cases.

It was decided, therefore, to compare these figures with the normal expectation of life. The figures after the questionnaire of November, 1947 were submitted to Dr. R. A. Robb, Lecturer in Statistics in the University of Glasgow. A request was made for a comparison between the rate of survival in these cases and the expected rate of survival of men, of the same ages, followed during the same periods, living in Scotland.

For the purposes of this comparison it was necessary to discard the odd months since a patient was first examined, dividing them into groups followed for a certain number of years. Those followed for less than one year were excluded. The patients were also divided into ten year age groups. Comparison was made with the mortality in Scotland given in the life tables Vol. 78 supplement. A life table was prepared for each age group in which age distribution and follow up were exactly the same as in the observed group but substituting the standard probabilities of surviving for the/

the observed probabilities.Dr. Robb (1948) found "no significant difference between observed and standard probability of surviving. This group of patients has a probability of survival equal to that of a population whose age distribution and length of follow up is exactly that of the observed group." It may be assumed, therefore, that the presence of prostatic enlargement has not affected the duration of the lives of these patients.

Progressive Cases.

In fifteen cases treated expectantly, operation was considered necessary later. It is obvious that this group should have special consideration. An attempt is made to distinguish between those patients who were from the beginning "border line" cases and those who showed evidence of increasing obstruction.

Case No. 7. In January, 1940 at the age of 70 years this patient sought advice about two attacks of acute retention which had occurred but from which he had made a good recovery. The prostate was considerably enlarged but the residual urine was less than an ounce. He passed urine easily and with a good flow. He was extremely reluctant to agree to operative treatment and it was decided to treat him expectantly. He was given the usual advice and asked specially to report if another attack of acute retention occurred./

occurred. He did not report again until March, 1943. Numerous attacks of acute retention had occurred in the interval and operation was advised. Even at the first visit this patient's history did not justify expectant treatment according to the usual indications in this series.

Case No. 11. In July, 1940 at the age of 56 years this patient complained of hesitancy and difficulty in micturition. He held his urine for four hours during the day and was not disturbed at night. He reported again in October, 1941 with increased difficulty, well marked frequency of micturition and a moderate quantity of residual urine. Operation was advised.

Case No.16. In November, 1940 at the age of 67 years this patient was referred for the investigation of haematuria. He had no hesitancy or difficulty in micturition, held his urine for four hours during the day but was sometimes disturbed twice in the night. The prostate was grossly enlarged and residual urine was negligible in amount. Replies to questionnaires showed no change except the development of occasional slight hesitancy. He reported again in July, 1947. Recent marriage had interfered with all efforts to avoid prostatic congestion. "The aged, if ambitious prostatic benedict, is in urinary peril" (Herman (1938)). Numerous haemorrhages had occurred and he showed definite evidence of anaemia. No marked increase in frequency had occurred/

occurred and there was no difficulty in micturition. Operation was advised on account of haemorrhage.

Case No. 21. In May, 1941 at the age of 66 years the chief complaint was frequency of micturition (two hour intervals during the day and two occasions each night). The prostate was only slightly enlarged but was very firm. The residual urine estimation was six ounces. The patient was very nervous and it was doubtful whether this estimation was a true one. As the general condition was excellent and the symptoms mild, it was decided to venture a period of expectant treatment. He was seen at intervals and no marked change in symptoms occurred. In July, 1944 the urine showed evidence of infection and operative treatment was advised.

Case No. 23. In May, 1941 at the age of 59 years this patient complained of frequent micturition (intervals of one and a half hours by day, once per night), haematuria, slight hesitancy and difficulty in micturition. The prostate was considerably enlarged. The residual urine was negligible in amount. Cystoscopy showed a considerably enlarged middle lobe. In June, 1943 he consulted another surgeon and had an operation performed on the prostate. The clinical condition at that time is not known.

Case No. 26. In October, 1941 at the age of 56 years this patient was referred for the investigation of haematuria. There was slight hesitancy in micturition but no difficulty. The/

The frequency of micturition was within normal limits - intervals of three to four hours during the day, not usually disturbed at night. On rectal examination a gross enlargement of the prostate was found. Cystoscopy showed a large congested middle lobe. The residual urine was less than one ounce. Replies to the questionnaires December, 1944, April, 1946 and November, 1947 showed almost identical symptoms. Examination in January, 1948, however, showed an increase in residual urine to three and a half ounces. A few weeks later an attack of acute retention occurred and operation was advised.

Case No. 38. In October, 1943 at the age of 55 years this patient was referred for investigation of haematuria. The frequency of micturition was very variable but at times was six times per night. There was slight hesitancy and difficulty in micturition. The prostate was moderately enlarged on rectal examination. Cystoscopy showed enlargement in middle and both lateral lobes with considerable congestion. The residual urine was less than one ounce. His reply in December, 1944 showed no marked change. The symptoms were still extremely variable. In September, 1945 he stated that the difficulty in micturition was increasing. Residual urine estimation showed three ounces. Operation was advised.

Case No. 44. In January, 1944 at the age of 55 years this patient sought advice about a slight diminution in the force of/

of the urinary flow with a tendency to dribble at the end of the act. There was no marked frequency of micturition during the day and he was disturbed once or twice during the night. The prostate was moderately enlarged on rectal examination and cystoscopy showed considerable enlargement of the middle lobe with some enlargement also of the lateral lobes. The residual urine was negligible. His replies in December, 1944 and April, 1946 showed no marked change in symptoms. In June, 1946 the difficulty and frequency appeared to be less. During 1947 difficulty in micturition increased and in February, 1948 the residual urine reached a level of eight ounces. Operation was advised.

Case No. 52. In April, 1944 at the age of 67 years this patient complained of hesitant and difficult micturition. He held his urine for three hours during the day and was disturbed three times each night. He also suffered from severe chronic bronchitis, the slightest effort producing extreme breathlessness and exhaustion. The prostate was only slightly enlarged and the residual urine was negligible. The history of difficult micturition was a very definite one and in most cases would have been considered an adequate indication for operation. However, in view of his poor general condition and the absence of residual urine it was decided to advise a period of conservative treatment. For a time this appeared to be fully justified. The frequency

of/

of micturition was variable but on the whole showed no increase. The hesitancy in micturition continued but it became definitely easier to empty the bladder for a time. In the winter of 1945, however, the difficulty in micturition increased again and operation was advised in January, 1946.

Case No. 54. In June, 1944 at the age of 58 years the complaint was frequent micturition (three or four times each night and sometimes at intervals of one hour during the day). There was no hesitancy or difficulty in micturition. The prostate was moderately enlarged and very firm. Residual urine was negligible. It was thought that the frequent micturition might be due to a transient phase of congestion and the patient was advised to report again in two months. He did not do so and in reply to the questionnaire of December, 1944 stated that he had been treated successfully by another surgeon.

Case No. 58. In June, 1944 at the age of 60 years this patient was referred for the investigation of haematuria. He had some hesitancy and difficulty in micturition. He held his urine for two to three hours during the day and was disturbed once or twice each night. Rectal examination showed considerable enlargement and cystoscopy showed that the middle and both lateral lobes were affected. The residual urine was about four ounces. The symptoms have not/

not shown any marked change since June, 1944. A residual urine estimation in November, 1947 showed the presence of six and a half ounces. He was reluctant to agree to operation but wished to remain under observation. In February, 1948 the residual urine was eight ounces. He has not yet agreed to have operative treatment.

Case No. 67. In November, 1944 at the age of 60 years this patient complained of frequent micturition, (three times each night and day intervals of about two hours). There was some difficulty and hesitancy in micturition. Rectal examination showed a considerable soft enlargement of the prostate. There was no residual urine. The intensity of the symptoms increased slightly during the next few years but the patient was reluctant to return and was only induced to answer the questionnaires with difficulty. In August, 1947 there was a considerable increase in frequency with occasional incontinence. He did not return to the Clinic until January, 1948 when the bladder was palpably distended. He consented to have operative treatment.

Case No. 82. In June, 1945 at the age of 55 this patient complained of hesitant, difficult micturition. He was disturbed once or twice each night and held his urine only one and a half hours during the day. The prostate was considerably enlarged as felt per rectum and the residual urine was one ounce. He was seen regularly at intervals of three months and a very gradual increase in residual urine occurred/

occurred. The level of four ounces was reached in June, 1946 and operation was advised.

Case No. 102. In August, 1946 at the age of 66 years this patient complained of haematuria and some difficulty in micturition. There was usually no marked frequency of micturition but occasional bouts of extreme frequency occurred. The prostate was only slightly enlarged on rectal examination but cystoscopy showed definite enlargement of middle and both lateral lobes. Residual urine was negligible. All symptoms improved and the difficulty in micturition almost disappeared. There was some failure of general health during 1947 and when he reported in February, 1948 there was a considerable quantity of residual urine. He was not aware of any difficulty in micturition, he was not disturbed at night and there were intervals of three or four hours during the day. Operation was advised.

Case No. 105. In September, 1946 at the age of 60 this patient had an attack of acute retention of urine. Previously no difficulty in micturition had been noticed, the intervals were of normal duration by day and he was not disturbed at night. A second attack of acute retention occurred in December, 1946. It was known that a serious cardiac condition had been present for a considerable time. A diagnosis of bundle branch block had been made many years before and a poor prognosis given. This diagnosis had been confirmed/

confirmed several times. Between attacks of acute retention there was no residual urine and as the operative risk appeared to be high, conservative treatment was advised. In February, 1948 three attacks of acute retention occurred. There was still no gross evidence of residual urine or infection but it seemed likely that these complications would ensue if the obstruction remained. Operation was advised.

Several risks of expectant treatment are seen in these cases. This aspect of the subject will be considered later (p. 106). First of all, the cases will be considered simply as examples of the course of prostatic obstruction. The evidence of progressively increasing obstruction was more definite in some cases than in others. In four cases (Nos. 7, 21, 52 and 105) the clinical findings indicated a degree of obstruction for which operation was usually advised. For the reasons stated in the summaries of the case histories expectant treatment was given a trial. It was hoped that a careful moderate life would produce a decrease in congestion and consequently in the tendency to obstruction. However, the signs and symptoms persisted in these cases and operation was advised although the disease was no more advanced than at the first examination. These four cases are neither good examples of a progressively increasing obstruction nor are they fair test cases of the indications/

indications for expectant treatment employed in this series. Case No. 16 was treated surgically on account of haemorrhage. There was no evidence of increasing obstruction. In two cases (Nos. 23 and 54) the patient was treated by another surgeon and details are not known of the indications for operation. It may be assumed that evidence of increasing obstruction was found. A third case (No.82) was treated by another surgeon but operation had already been advised and the indications are known. In eight cases (Nos. 11,26, 38, 44, 58, 67, 82 and 102) there was definite evidence of increasing obstruction - increased residual urine, increased difficulty in micturition or both.

The clinical features of prostatic enlargement will be considered separately and comparisons made between the group of prostatic patients treated expectantly throughout, the fifteen patients for whom operation was recommended later, the ten patients where progressively increasing obstruction was demonstrated or may be assumed and the eight patients where there was definite evidence of progressively increasing obstruction. Some comparisons are also made between the series of 124 patients treated expectantly and a series of 500 patients seen during approximately the same period and for whom operative treatment was advised after the first examination.

Difficulty in Micturition.

Difficulty in micturition is the most significant symptom of prostatic obstruction. If sufficiently severe it is usually regarded as an indication for operation even in the absence of residual urine. This practice has been followed in the present series. Difficulty in micturition is distinguished from hesitancy which is merely difficulty in commencing the act. Many patients, after a moderate hesitancy, produce a strong flow which empties the bladder quickly and completely. Difficult micturition is described in several ways by prostatic patients. Commonly they have noticed weakness and lack of projectile force in the flow of urine. This is especially marked at the end of the act when the flow frequently becomes a dribble. The prolonged effort required to empty the bladder is also frequently described. When the bladder has lost its tone the patient may be satisfied that he has emptied his bladder when a large quantity of urine remains. Such patients may not complain of difficulty in micturition. This is a feature of the type of case described as "silent prostatism" of which an example was given in the last section (Case No. 102).

In the series of cases treated expectantly 61 complained of some difficulty in micturition when first examined, 63 had experienced no difficulty. Table No.3. shows the proportion of these cases which were found in the groups with evidence/

evidence of progressive obstruction.

Table No. 3.

Incidence of Difficulty in Micturition.

	Difficulty	No Difficulty	Incidence expressed as a %.
Total series. 124 patients.	61	63	49%
Treated expectantly at first, later by operation 15 patients.	12	3	80%
Progressive obstruction - definite evidence or assumed. 10 patients.	8	2	80%
Definite evidence of progressive obstruction. 8 patients.	7	1	87%

Of 63 patients who had no difficulty in micturition at the first examination only three have required to be treated by operation. In one of these, No.16, the operation was performed for haemorrhage and no evidence of obstruction had been observed during over six and a half years. In one, No .54, the reason for operation is not known. In the third, No.26, the development of obstruction was a very slow process. In the course of over six years the residual urine increased from one to three and a half ounces. The decision to operate was made on account of an attack of acute retention of urine which followed a long period of voluntary retention.

It/

It is clear that the absence of any history of difficult micturition is a very important point in the selection of cases for expectant treatment and is a strong indication of favourable prognosis. In this group the form of the prostate must be of a type which does not obstruct the urinary outflow and this form may be retained even when the prostate has grown to a considerable size. Examples of very large prostates with little or no obstruction are commonly described, and the theories of the mechanism of prostatic obstruction attempt to explain this fact. According to Swift Joly's theory (Swift Joly 1924) the lobes of the prostate produce obstruction when they fit closely together and project into the bladder. The intravesical pressure then acts chiefly on the outer aspects of the lobes pressing them together and keeping the channel closed. Prostatic patients commonly complain that their difficulty is increased by straining. When the lobes form a wide open crater leading into the urethra this mechanism will not be effective. Also when the lobes do not fit closely together and deep clefts exist between them obstruction is not produced. Joly found a greater tendency for the clefts to be open in large rather than in small prostates. Young (1936) points out the importance of the trigone in opening the vesical neck. This action must be greatly impeded by median enlargement of the prostate. The absence of enlargement in this part of/

of the prostate is Young's explanation for many cases where the gland is very large and the difficulty is slight or absent. Joly's theory seems to be the more probable explanation in the present series of cases. Many examples of middle lobe enlargement occur without difficulty in micturition. For example, Case No.5 has a gross enlargement of the middle lobe and has been followed up for over eight years. He has not experienced difficulty in micturition at any time and his residual urine in January, 1948 was two ounces.

It is interesting to consider how many patients make no complaint of difficulty in micturition and for other reasons are advised to have operative treatment. In a series of 500 patients recommended for operation by the writer 44 stated that they had no difficulty in micturition. The great majority of these were very advanced cases with gross distension of the bladder. Owing to loss of tone in the bladder muscle these patients believed the bladder to be empty when a considerable quantity of urine remained. Many of them had a urinary stream which would not have satisfied a normal fit man but other symptoms such as frequency or urgency of micturition were so prominent that they thought little of a gradual decrease in the projectile power of the bladder. Many gave a history of difficulty in the past; others were very vague about the earlier phases of their disease./

On the whole this group is easily diagnosed as prostatic obstruction and very easily distinguished from the patient whose enlarged prostate is not obstructive. In four cases there was no complaint of difficulty, and micturition occurred at intervals only slightly shorter than normal. These are examples of "silent prostatism". 4 out of 500 cases referred for operation, 4 out of over 600 prostatic cases attending a urological clinic is not a high incidence. This clinical type is, however, a dangerous one. In two of the four cases the distension of the bladder was obvious; in the other two it was only suspected and the diagnosis of chronic retention had to be confirmed by catheter. This type will be considered again in discussing the risks of expectant treatment.

Of the 61 patients who complained of some difficulty in micturition at the first examination twelve have been advised to have operative treatment later. Two patients (Nos. 17 and 120) may reasonably be excluded from the discussion. At the first visit they were aged 91 and 87 and they were not in extreme urinary discomfort. Residual urine estimations were not made as operative treatment seemed to be unjustifiable on general grounds. Of the remaining 47 patients there is no doubt that some will require operative treatment in the future. Is expectant treatment justifiable in this group at all? It must be remembered that/

that a prostatic patient frequently seeks advice at the height of an attack of congestion. This frequently settles in a short time and he ceases to have difficulty in micturition. This was the course in 37 of the 47 patients in this group. No recurrence of difficult micturition has occurred in these 37 patients. Four of them have been followed for over seven years and fourteen for over four years. They all empty their bladders well. It is reasonable to suppose that many of them will continue to do so until their lives are terminated by some other disease. In four of these cases this has already happened. In 10 cases some degree of difficulty has persisted. This is not of an extreme degree and they still empty their bladders. Their prognosis with regard to avoiding operation is probably less favourable.

Hesitancy in Micturition.

In the initiation of the act of micturition the bladder neck is opened chiefly by a flattening of its lower segment. This is a different mechanism from the contraction of the detrusor which empties the bladder. It is not surprising, therefore, that hesitancy of micturition and difficult micturition are not invariably associated with one another. In the present series of 124 cases, 53 patients complained of hesitancy and difficulty, 50 complained of neither

symptom, 13 had hesitancy but no difficulty, 8 had difficulty but no hesitancy. In the group of 13 with hesitancy only, there was one progressive case. In the group of 8 with difficulty only, three were progressive. In the whole series 66 complained of hesitancy and 58 did not do so. In Table No.4 the incidence of this symptom is shown in the groups selected according to the evidence of progressive obstruction.

Table No. 4.

Incidence of Hesitancy of Micturition.

	Hesitancy	No hesitancy	Incidence expressed as a %.
Total Series. 124 patients.	66	58	53%
Treated expectantly at first. Operation advised later. (15 patients)	10	5	66%
Progressive obstruction known or assumed. (10 patients)	7	3	70%
Definite evidence of progressive obstruction. (8 patients)	6	2	75%

There was a considerably higher incidence of hesitant micturition at the first examination in those patients who later showed progressive obstruction. The difference, however, is much less marked than in the case of difficulty in/

in micturition. Hesitancy of micturition though not without significance is a less valuable guide in the selection of patients for expectant treatment and in the assessment of their prognosis.

Frequency of Micturition.

The term "frequency" is used in different senses. Some use it in the sense of the everyday word "frequent" meaning "numerous, abundant, often occurring". Others give the term the more exact meaning used by physicists, that is, "the number of repetitions in given time". The point is not of great practical importance as the meaning is usually clear. Where the users of the everyday term say "frequency" thoseof the mathematical term must say "increased frequency". Reference to the Oxford Dictionary produces greater confusion. The word "micturition" itself is defined as a "morbidly frequent desire to make water" and the modern medical meaning of the word is given as an improper use. (Marshall (1947)) In the present discussion frequency is used in the everyday sense.

Frequency of micturition in prostatic enlargement is not due to the same cause in all cases. Where there is residual urine the cause is obvious. If the bladder still contains urine after the act of micturition a shorter period of secretion will be required to reach the state of distension/

distension which produces the desire to pass water. This effect may be masked to some extent by a gradual increase in the bladder capacity. In rare cases the intervals between micturition remain normal. Young records such a case where the residual urine was 2100 c.c. Case No. 102 (p.57) was somewhat similar. Frequent micturition in the absence of residual urine may be explained in various ways and the same explanation may not apply to all cases. It is not surprising that a mass of tissue in the region of the bladder neck upsets the delicate mechanism of the act of micturition. Local congestion may produce irritability in the trigone. A middle lobe may produce the same type of irritation as a stone or foreign body. The enlargement may occur in such a position that the bladder neck is dilated but the way into the posterior urethra is not blocked. The walls of the urethra may not be accurately opposed to one another and may meet only at the most prominent parts of the prostatic lobes. Thus urine may pass into the sensitive posterior urethra producing irritability and frequency. It is also possible that hypertrophy of the detrusor in some cases has reduced the bladder capacity.

Table No.5 shows the incidence of frequent micturition in one group of patients most of whom had a considerable amount of residual urine and in another where residual urine/

urine was negligible.

Table No. 5.

Incidence of Frequent Micturition in Groups recommended for operative and expectant treatment.

	In 500 cases recommended for operation.		In 124 cases treated expectantly.	
	No. of cases.	Percentage.	No. of cases.	Percentage.
Extreme night frequency. (4 times or more).	252	50%	31	25%
No marked night frequency. (Once or not at all).	46	9%	40	32%
Extreme day frequency. (Every 1½ hrs. or less)	189	38%	28	23%
No marked day frequency. (Every 3 hours or more).	111	22%	41	33%

On the whole an extreme degree of frequency is commoner in the more obstructive cases and normal intervals are less common.

In Tables No. 6 and No. 7 the group treated expectantly is considered with reference to the evidence of progressive obstruction.

Table No. 6./

Table No. 6.

Incidence of an Extreme Degree of night frequency of micturition.

	Extreme night frequency.	No extreme night frequency.	Incidence expressed as %.
Total series. (124 cases).	31	93	25%
Treated expectantly at first, operation advised later. (15 patients).	3	12	20%
Progressive obstruction known or assumed. (10 patients).	3	7	30%
Definite evidence of progressive obstruction. (8 patients).	2	6	25%

Table No. 7.

Incidence of an Extreme Degree of Day frequency of micturition.

	Extreme day frequency.	No extreme day frequency.	Incidence expressed as %.
Total Series (124 cases).	28	96	22.5%
Treated expectantly at first. Operation advised later. (15 patients).	4	11	27%
Progressive obstruction known or assumed. (10 patients).	3	7	30%
Definite evidence of progressive obstruction. (8 patients).	2	6	25%

There is no marked difference in the incidence of extremely frequent micturition in the four groups. In the selection of cases for expectant treatment and in the assessment of their prognosis the degree of frequency is of no value whatever.

Ogier Ward (1946) has advised against operating for frequency of micturition alone. A few others have given this warning but it is not often mentioned in the literature of the subject. In 69 cases in the present series frequency of micturition was the chief or only complaint. Two of these (Nos. 17 and 120) may be excluded from the discussion for reasons given previously. Of the remaining 67 cases 7 patients (Nos. 2, 10, 24, 49, 68, 76 and 80) have died of causes unrelated to the urinary tract and without any increase in symptoms. Three have been treated by operation (Nos. 21, 54 and 102). In only one of these (No. 102) was there definite evidence of increasing obstruction. The duration of the follow up in the remaining 57 cases was as follows:- over 8 years, 2 cases: 7-8 years, 3 cases: 6-7 years, 2 cases: 5-6 years, 1 case: 4-5 years, 8 cases: 3-4 years, 15 cases: 2-3 years, 8 cases: 1-2 years, 10 cases: 7 months-1 year, 8 cases. In 37 cases there has been a recent estimation of residual urine. In six of these the amount was between 3 and $3\frac{1}{2}$ ounces; in four it was about 2 ounces; in twenty-seven it was less than 2 ounces. The danger/

danger of progressively increasing obstruction appears to be small in this type of case.

Frequency of micturition may be of such a degree that normal social life is impossible and exhaustion may be caused by loss of sleep. In such cases operative treatment may be justified. It is well to remember, however, that the patient has, in all probability, sought advice during a phase of congestion of the prostate when symptoms are at their maximum. In 52 of the 124 cases discussed here the frequency of micturition decreased definitely in the course of the follow up. Also frequency of micturition does not always disappear after prostatectomy. Riches and Muir (1933) investigating a series of cases treated by a group of surgeons found frequency of more than twice per night in 12 of a series of 68 previous prostatectomies. This unsatisfactory sequel is, no doubt, less common since the introduction of modern chemotherapy but it would still be unwise to promise to cure a patient of frequent micturition by prostatectomy especially in the absence of residual urine.

Haematuria.

Haematuria may occur in cases of prostatic enlargement as the result of the passage of instruments or of the sudden evacuation of a distended bladder. In these cases the cause is evident. Another pathological condition such as papilloma/

papilloma or calculus may be present in the same patient. On account of this danger cystoscopy is never omitted in the case of prostatic enlargement with haematuria. Spontaneous bleeding may also occur and is said (Marion (1940, Walker (1933)) to be more common in the period of incomplete retention. This has not been the experience of the present writer. In 124 cases where residual urine was absent or of small amount 25 cases of haematuria occurred (20 per cent) while in 500 cases in most of which the residual urine was considerable 82 cases of haematuria were found (16.4 per cent). Haematuria is not usually severe and only in rare cases is it sufficient to suggest the necessity for operation to prevent further loss of blood. This was the chief indication in 2 of the 500 cases which have been discussed.

Table No. 8 shows the incidence of haematuria in the group selected according to the evidence of increasing obstruction.

Table No. 8.
Incidence of Haematuria.

	Haematuria	No Haematuria	Incidence expressed as %.
Total Series. (124 cases)	25	99	20%
Treated expectantly at first, operation later.(15 cases)	5	10	33%
Progressive obstruction known or assumed(10 cases)	4	6	40%
Definite evidence of progressive obstruction. (8 cases)	3	5	37.5%

No/

No doubt the prostate which is most liable to attacks of extreme congestion is the one most likely to produce haematuria. Even in the absence of rapid growth these prostates are most likely to cause recurrent periods of increased symptoms. Table No. 8 shows a considerably greater occurrence of haematuria among the cases which later proved to be progressive than in the whole series. However in many cases haematuria must be considered as a vascular accident depending more on the state of the patients vessels than on the degree of prostatic obstruction. It would not be wise, therefore, to regard haematuria as a strong indication for operative treatment except in those rare cases where blood loss is sufficient in itself to justify intervention. Nevertheless its occurrence in cases treated expectantly shows a somewhat less favourable prognosis than in the average case.

The Size of the Gland.

The potentiality of a prostate to endanger its owner depends on its shape. Its size has no relationship with the degree of obstruction which it will produce. (Numerous writers including Swift Joly (1924), Marion (1940), Kenneth Walker (1933), Young and Lewis (1936), Lowsley and Kirwin (1944), Hinman (1935), Adamson (1947), Keyes and Ferguson (1936)). This was evident in the present series where 38 patients/

patients had grossly or considerably enlarged prostates with obstruction of slight degree, not sufficient to cause residual urine or great difficulty in micturition. However, it is reasonable to suppose that the prognosis in the case of a very large gland is less favourable. A gland of moderate size has space in which to grow and may increase without changing its form. A grossly enlarged gland which continues to grow will be subjected to the pressure of surrounding tissues and is more likely to change its shape. One can imagine interstices between lobes being closed in by pressure. Table No. 9 shows how the larger glands were distributed in the groups which have been discussed previously.

Table No. 9.

Size.

	Considerable and gross enlargement.	Moderate and slight enlargement.	Incidence of larger prostates as %.
Total Series. (124 cases).	38	86	31%
Treated expectantly at first, operation later. (15 cases).	6	9	40%
Progressive obstruction known or assumed. (10 cases).	4	6	40%
Definite evidence of progressive obstruction. (8 cases).	4	4	50%

It/

It appears that the prognosis is less favourable with the larger glands. However, the difference is not sufficient to be an important factor in selecting patients for expectant treatment. Only half of the definitely progressive cases had glands of large size and thirty two cases of considerable or gross enlargement have shown no evidence of increasing obstruction during the period of the follow up. Two of the largest prostates in the series occurred in patients No. 10 and No. 14. Both have been followed for a period of about seven and a half years. Their symptoms remain mild and recent residual urine estimations showed one ounce in one case and less than one ounce in the other.

The Age of the Patient.

"Age is the only factor in the causation of prostatic enlargement of which we can be certain" (Kenneth Walker (1933)). In the majority of cases symptoms are observed first of all about the age of 60 years, and this is a strong reason for the modern belief that prostatic enlargement is a disorder of the process of involution. Moore (1936) has studied the normal involution of the prostate. He states "It would appear that the involution proceeds with greater rapidity during the fifth and sixth decades and that after 60 years the changes are less striking and the velocity greatly/

greatly decreased." "On the whole, old age as determined by the morphology of the prostate, may be considered definite at 60 years." Moore (1943) has also studied the morphology of benign hypertrophy of prostate. He found like Randall (1931) and others that there is a progressive increase in incidence until after the age of 80 years. This must be correlated, however, with the proportion of individuals at different ages who develop obstruction. Moore concluded that "Benign hypertrophy of the prostate occurs with increasing frequency after 40 years of age but the cases with clinical symptoms of urinary obstruction reach a maximum incidence at 65 years of age. This would indicate that the etiological agent is present during presenility and senility but is most active during presenility."

In 124 cases treated expectantly by the writer the average age was 63.4 years while in the series of 500 treated by operation the average age was 67.6 years. Table No. 10 shows the series of 124 cases grouped according to age.

Table No. 10.

Age Groups.

Under 40.	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	Over 90.
1 case.	5 cases	43 cases	53 cases	19 cases	2 cases	1 case

If Moore's theory is correct the evidence of progressive obstruction will be much greater in the presenile group (under/

(under 60 years) than in the senile group (over 60 years). Table No. 11 shows the proportion of cases over and under 60 years in the groups with evidence of increasing obstruction.

Table No. 11.

Age in Groups showing Progressive Obstruction.

	60 years and under 60 years	61 years and over 61 years	Percentage under 61 years
Total Series (124 cases).	49	75	39%
Treated expectantly at first, operation advised later. (15 cases).	10	5	66%
Progressive obstruction known or assumed. (10 cases).	9	1	90%
Definite evidence of progressive obstruction. (8 cases).	7	1	87%

These figures support Moore's views very strongly. It is interesting to consider the ages of another group of patients. In considering difficulty in micturition it was found that 47 who had complained of some difficulty at the first visit had been treated expectantly throughout. In 37 of these cases the difficulty decreased soon after the first visit and has not returned. In 10 cases the difficulty has persisted/

persisted. Table No. 12 shows these groups subdivided according to age.

Table No. 12.

Transient and Persistent Difficulty in micturition - Age Groups.

	60 years and under 60 years	61 years and over 61 years	Percentage under 61 years
Difficulty transient. (37 cases).	13	24	35%
Difficulty persistent. (10 cases).	7	3	70%

It is evident that the age of the patient is a significant factor in the selection of patients for expectant treatment and in the assessment of their prognosis.

Trabeculation of the Bladder.

The muscular coat of the bladder is described in three layers. The innermost one consists in the body of the bladder of "relatively rare, separate, longitudinal or oblique strands." (Maximov and Bloom (1936)). When the outflow of urine is impeded and the bladder muscle hypertrophies, the strands of muscle in the inner coat become prominent producing the condition described as trabeculation. The changes were described fully by Halle and/

and Motz (1902). The details of the following description are taken from their work. At the beginning and in cases of mild degree the internal surface of the bladder shows only a vaguely reticulated appearance. The muscle bands form superficial linear projections anastomosing with one another and raising the mucosa slightly. Hollows of slight depth separate the prominences of the network. The depth of these hollows or cellules is equal to the projection of the muscular band. Most cellules remain in this first stage of evolution. By the formation of secondary or anastomotic trabeculae the orifice of the cellule becomes more exactly defined. The orifice may become a little narrower than the cavity but the depth of the cellule does not at this stage exceed the thickness of the hypertrophied plexiform muscular coat and comes in contact only with the middle muscle coat. Clearly this is compensatory muscular hypertrophy. There is no evidence of failure of compensation. There is no reason to believe that the prostate continues to grow indefinitely, still less that it produces an indefinitely increasing degree of obstruction. It is reasonable to suppose, therefore, that cases occur which remain indefinitely in this first stage of trabeculation and cellule formation. As a more advanced stage the trabeculae form definite projections. The columns become detached from the walls and become almost pedicled./

pedicled. The largest are attached only by a structure resembling a mesentery formed only by mucosa. Trabeculae appear first of all on the posterior wall and reach their most marked degree there. The lateral walls are affected next and finally the anterior wall and summit. Their arrangement when fully developed has been found to correspond with the normal anatomy of the internal or plexiform coat of the bladder wall. Cellules develop in a parallel manner but their formation is neither so constant nor so early as that of the trabeculae. In the second stage of cellule development the cavity penetrates the thickness of the middle and external coats of the bladder muscle and comes into contact with the fibro-serous layer. In these interstitial cellules the orifice is always narrower than the cavity but the cavity usually remains of small size. At this stage failure of compensation has not necessarily taken place but it is imminent. Finally the cellule passes through the whole thickness of the vesical wall and forms a prominence in the perivesical tissues. It is really a hernia of the mucosa through the vesical muscle. Such cellules vary in size and are frequently multiple. They are definite evidence offailure of compensation.

The presence of trabeculation and multiple sacculations is frequently given as an indication for operation in cases of prostatic enlargement and Millin (1947) points out that the/

absence of trabeculation is a strong contra-indication to operation.

In the series of 124 cases discussed in this paper cystoscopy was not performed except in cases of haematuria or when the evidence of prostatic enlargement on rectal examination was doubtful. Consequently, information about trabeculation is only available in 54 cases. Trabeculation of at least a slight degree was found in almost all of these cases. Trabeculation with multiple sacculation did not occur in this series as all such cases were treated by operation. In the experience of the writer such cases have always had a significant amount of residual urine. In Table No. 13 the incidence of strongly marked trabeculation is shown in the groups arranged according to the evidence of progressive obstruction.

Table No. 13.

Incidence of Strongly Marked Trabeculation.

	Strong Trabeculation	Slight or no Trabeculation.	Percentage strong Trabeculation.
Cases cystoscoped (54 cases)	14	40	39%
Treated expectantly at first, operation later. (8 cases)	4	4	50%
Progressive obstruction known or assumed. (6 cases).	3	3	50%
Definite evidence of progressive obstruction. (5 cases).	2	3	40%

In this series trabeculation does not appear to have been very significant. Ten cases where strong trabeculation was noted at the first examination have shown no evidence of progressive obstruction. Four of these have been followed for about four years. Patient No. 35 has no change in his slight frequency of micturition, he still has slight difficulty in micturition but his residual urine is only one ounce. Patient No. 36 had an extreme degree of frequency in October, 1943. He is now disturbed once only at night and holds his urine for 4 - 5 hours during the day. There was some difficulty and hesitancy in micturition in 1943. Both have now disappeared. His residual urine is less than 2 ounces. Patient No. 41 has no change in his frequency of micturition and his residual urine is ½ ounce. Patient No. 43 could hold his urine for 2 hours only in December, 1943. He can now hold it for 4 hours. He is never disturbed more than once per night and usually not at all. His residual urine is less than ½ ounce.

Residual Urine.

"It would be of the greatest service to medicine if the determination became general to submit every minor problem of clinical work in which the conditions allow to methods by which an exact decision would be possible." (Wilfred Trotter (1941)). The measurement of the amount of urine

which/

which the bladder is unable to evacuate appears to be just such a method. Few authorities would go so far as to make a decision for or against operation on this estimation alone. Barrington (1923) has said "There is no object in instituting surgical treatment if the residual urine is less than 400 c.c. and clear." This view would be considered extreme by most but the amount of residual urine is considered to be the most important fact in assessing the danger to be feared from an enlarged prostate and the necessity for operation. Cases are recorded, however, where the upper urinary tract is dilated and renal function impaired although the bladder is capable of emptying completely. Millin (1947) has recently drawn attention to this danger and he believes that the faith in residual urine estimations has been excessive.

The danger to life produced by prostatic obstruction is due entirely to impairment of kidney function. The significance of residual urine is, therefore, closely connected with the question of how the obstruction at the bladder neck is communicated to the upper urinary tract. The lower end of the ureter passes obliquely through the bladder wall and normally contraction of the bladder muscle closes the ureteric orifice. In this way pressure used to expel urine from the bladder is not transmitted to the ureter and kidney pelvis. Graves and Davidoff (1923) investigated the possibility/

possibility of regurgitation of bladder urine into the ureter and formed the opinion that it was by this means that bladder neck obstruction affected the kidney. When the bladder is distended and its outflow obstructed they believed that contraction of the detrusor could cause the ureteric orifices to open up and regurgitation to occur. This theory was accepted widely and supports strongly the reliability of the residual urine test. It is unlikely that such a mechanism could be effective in the absence of considerable residual urine. However, more recent investigations appear to disprove the regurgitation theory in the majority of cases. Bumpus (1924) studied the cystograms of 527 cases of prostatic hypertrophy and found evidence of reflux in only 4.74 per cent. Young (1936) explains back pressure by a theory which does not require the concept of vesico-ureteral regurgitation. He says "During the prolonged contraction necessary to pull down the obstruction in the median portion of the prostate and allow the urine to be forced out of the bladder the ureteral orifices are ipso facto closed. During this time the peristaltic waves of urine are arrested at the bladder. This results in interference with the physiological action of the ureter, accumulation of urine within it and gradual dilatation of the structures above the uretero-vesical junction. As micturition becomes more difficult and more frequent and the/

the contraction of the trigone more prolonged the arrestation of the urinary outflow from the ureter becomes more and more pronounced and the dilatation of the upper urinary passages progressively greater." A similar view held by Kreutzmann requires neither the idea of renal regurgitation nor Young's theory of the predominant importance of the trigonal muscle in urinary obstruction. Kreutzmann (1928) says "The most common cause of upper urinary tract dilation in obstructive lesions of the bladder neck and urethra in adults is a constriction of the intramural portion of the ureter. This constriction is due to the hypertrophy of the bladder musculature surrounding the ureters." If either of these theories is correct it is clearly possible for a bladder to hypertrophy considerably to overcome an obstruction, to succeed in overcoming this obstruction but to produce back pressure and dilatation in the upper urinary tract; in other words there is hydronephrosis and hydroureter but no residual urine. Does this happen sufficiently frequently to reduce the value of residual urine estimation? Young, who devised one of these theories clearly does not think so as he gives considerable importance to the residual urine estimation. In the series discussed in this paper pyelography was only done in cases where haematuria had occurred or where there was lumbar pain or some other reason for suspecting kidney disease. In 39 cases/

cases of prostatic enlargement without significant residual urine, examination of the pyelograms showed no evidence of dilatation in the upper urinary tract. This suggests that such cases are not common. On the other hand it is well to know that they occur. If residual urine is considered the only indication of danger from prostatic enlargement such cases will be missed. If, however, extreme difficulty in micturition without residual urine is considered seriously and if doubtful cases are examined by intravenous pyelography the possibility of error is very small indeed.

Residual urine estimation retains its position as the most important method of assessing the prostatic patient. The fallacies and dangers of the test must, therefore, be considered.

When the bladder is distended its muscle loses tone and complete emptying is not possible. Normal individuals frequently feel a sense of distension of the bladder and an impulse to evacuate its contents on occasions when it is not convenient for them to do so. The impulse to evacuate the bladder can be controlled voluntarily and some relaxation of the bladder wall is produced. By making a special effort it is possible to accommodate large quantities of urine in the bladder. An individual who does this, though quite free from bladder neck obstruction will be found/

found to have a quantity of residual urine. After a short rest his bladder recovers its tone and the residual urine disappears. This has been demonstrated by Kirwin and Hawes (1939). Six individuals who had no disease of the bladder neck were studied. Each was told to empty the bladder as soon as the desire was felt and residual urine estimations were made. Quantities varying between nothing and 31 c.c. were found. Each man was then instructed to drink 2,000 c.c. of water during the next three hours and to suppress the desire to pass water as long as possible. When the desire could no longer be suppressed he was instructed to empty his bladder completely. Residual urine estimations were then made. On this occasion the amounts varied from 62 c.c. to 365 c.c. - quantities which almost any surgeon could consider significant. The same investigation in a group of prostatic patients gave even more striking results. In a series of 13 the residual urine under normal conditions varied from 3 c.c. to 320 c.c. With voluntary distension it rose to levels between 180 c.c. and 1080 c.c. Three patients developed acute retention. This fallacy in residual urine estimation is of obvious practical importance. Many patients suffering from a urinary complaint feel it their duty to arrive for advice with a full bladder in order to be able to provide a "specimen." Despite modern "appointments systems" they

are/

are still likely on occasion to be kept waiting for a considerable time. In these circumstances they may be examined at a time when the bladder muscle is overstretched and a false impression of the residual urine may be obtained. Patients should, therefore, be asked carefully about the last occasion when they passed urine and if there is doubt about the condition of the bladder muscle another appointment should be made for a residual urine estimation.

It is well known that many men experience difficulty in micturition in the presence of others and this difficulty is increased by the state of nervous strain associated with a consultation. It is of considerable value for the surgeon to confirm the patient's description of the force of the flow of urine but in many cases it is advisable to allow the patient to pass urine alone in order to obtain an accurate estimation of the residual urine.

An attack of urinary infection will reduce the amount of residual urine. During the acute phase the residuum may disappear altogether. It will reappear as the acute condition subsides but if the infection becomes chronic it will never reach its former level. (Ogier Ward (1943)). Such changes must not be mistaken for improvement.

When the bladder muscle is extremely lacking in tone it may not empty itself even through a catheter. It is, therefore, advisable to apply pressure to the abdominal wall/

wall at the end of the test. Extreme lack of tone suggests the possibility of a disease of the nervous system such as tabes dorsalis in addition to the prostatic enlargement. The characteristic feature of the tabetic bladder is the funnel neck deformity and the presence of an enlarged prostate confuses the cystoscopic picture. However, a careful examination of the nervous system and appropriate blood and cerebro-spinal fluid tests will usually give the diagnosis. Extreme lack of tone is evident when estimating residual urine but exact measurements may be made by the method of cystometry. A record may be made by apparatus such as that described by Band (1945). The bladder is gradually filled with water and the pressure changes are recorded on a Kymograph by means of a tambour and lever. A simple method described by Marion (1940) distinguished three degrees of contractility of the bladder. With a normal degree of contractibility the bladder will empty with the external end of the catheter above the level of the bladder neck. When some loss of contractile power has occurred the bladder will empty only partially with the catheter in this position. With complete loss of contractile power nothing will escape from the catheter until it is lowered below the level of the bladder neck.

The amount of residual urine is not constant and some variations/

variations from day to day undoubtedly occur. Several reasons for these variations have been mentioned and attention to these must reduce the risk of error. When the decision for or against operation is being influenced strongly by a residual urine estimation and especially when the result does not correspond with other findings it should always be repeated. It has been the practice of the writer to ask the patient to return in one week and to have the test repeated. A second test after a patient's first visit to the Clinic has sometimes shown a marked reduction. Patients frequently seek advice during the exacerbation of symptoms caused by an attack of congestion of the prostate. The subsidence of this congestion may explain the reduction in residuum. The nervous tension produced by a first visit may also play a part. Patients who had a residual estimation in the course of a "follow up" visit have rarely shown any marked change when the estimation was repeated one week later.

It has been thought for a long time that it was a dangerous procedure to empty the bladder suddenly in a prostatic patient especially if the retention was of the chronic type. Recent work has cast some doubt on this view and there appears to be greater danger from the infection produced by an indwelling catheter than from the sudden emptying of the bladder. Creevy (1939) compared two series/

series of cases, one treated by gradual decompression and the other by sudden decompression of the bladder. There was no difference in mortality rate. Wilson Hey (1945) has performed prostatectomy on a large series of cases without regard to the state of distension and with low mortality. Bagot Walters (1948) has recently confirmed Wilson Hey's theories. Sudden decompression with prostatectomy, however, is not quite comparable to sudden decompression alone. In the case of the large hypertrophy there is considerable pressure on the lower ureter which is released by prostatectomy. It is common experience that sudden emptying of the grossly distended bladder may cause haematuria and even kidney failure. This is not likely to occur in the case of a moderate quantity of residual urine. When the bladder is grossly distended no estimation or residual urine is necessary. During the period of the present investigation a few cases were encountered where the bladder was not palpable but where the residual urine was found to be considerable. In such cases the bladder was not emptied. When it became obvious that there was a considerable quantity present the catheter was withdrawn. In these cases admission to hospital was considered urgent and prophylactic treatment with Penicillin and Sulphonamides was given. Wilson Hey's work shows that infection is more important than changes of pressure.

pressure. No ill effect has been produced by the catheterisation of such patients.

Kirwin and Hawes (1939) have shown that a soft rubber catheter empties the bladder less completely than a cystoscope sheath. In a series of patients these investigators estimated the residual urine using a soft rubber catheter and then immediately afterwards a cystoscope sheath was passed. From 3 to 10 c.c. more urine was usually obtained. On this account Kirwin and Hawes recommend that residual urine estimations should be made with a metal catheter. It is very important, however, to reduce the trauma of this procedure to an absolute minimum as attacks of prostatic congestion are very readily produced. The writer has seen acute retention follow cystoscopy in a prostatic patient on several occasions. These retentions were brief and recovery from them was complete but they demonstrate the effect produced by the passage of metal instruments. On the other hand the passage of a soft rubber instrument for the estimation of residual urine has not produced any marked increase in obstruction. In a small proportion of cases there has been some discomfort on micturition for a short period. Most patients have submitted to a second residual estimation with much greater cheerfulness than they showed on the first occasion. A difference of 3 to 10 c.c. in the/

the residual urine would rarely influence the decision about a prostatic case and in the doubtful case the estimation ought to be repeated. The writer has, therefore, made a practice of using soft rubber catheters for residual urine estimation except in cases where for other reasons a cystoscope had to be passed.

Infection is the most serious complication of prostatic obstruction and it is obvious that catheterisation must be done with full aseptic precautions.

In the series of cases which form the chief subject of the present discussion a low residual urine was considered an essential feature of all cases advised to have expectant treatment. The only two exceptions were the aged men (Nos. 17 and 120). In these cases the residual urine was not estimated and the decision against operation was made on general grounds. The comparisons between progressive and non progressive obstruction which have been made in discussing the other clinical features are not possible in the case of residual urine. The fact that only 15 of 124 cases have required operative treatment for any reason suggests that a low residual urine is a sound indication for expectant treatment. The only patient who showed evidence of renal impairment (No.7) had not reported during a period of over two years and had had numerous catheterisations during this time. Despite its imperfections/

imperfections the residual urine estimation is the most exact method we possess of assessing the degree of prostatic obstruction.

Discussion.

In this study of the signs and symptoms of a series of prostatic patients certain features are sufficiently constant to justify deductions being drawn from them.

1. Difficult micturition. In those cases where no difficulty in micturition was experienced at the time of the first visit the development of difficult micturition or increasing obstruction at a later stage has been extremely rare even in those cases where the patient was relatively young and the enlargement considerable.

2. Age. Above the age of sixty years progressively increasing obstruction was very uncommon.

3. Size. There is no relationship between the size of the prostate and the degree of obstruction which it produces.

4. Residual Urine. When the residual urine is low, renal damage from prostatic obstruction is unlikely to occur in the near future.

Hesitancy of micturition, marked trabeculation of the bladder and haematuria were more common in the progressive cases but the incidence was not sufficiently high to justify any deduction.

Extreme/

Extreme frequency of micturition had no significance whatever in these cases. Frequent micturition is an indication to the patient to seek advice but is not in itself an indication for any form of treatment.

The all-important factor appears to be the form of the gland - whether obstructive or non obstructive. A very small enlargement may produce acute retention. A huge mass may not obstruct at all. The power to obstruct the flow is increased temporarily and sometimes very considerably by attacks of congestion. The rate of growth appears to be much more rapid in the presenile phase, that is, up to the age of sixty years. During this phase the prostate which is slightly obstructive must be expected to become permanently more so. The prostate which although enlarged is non obstructive has shown little tendency in the present series to become so. The risk of this is presumably greater in the presenile phase and one such case has occurred. Patient No. 26 at the age of 56 years was referred for the investigation of haematuria and had no difficulty in micturition. An attack of acute retention occurred about $6\frac{1}{2}$ years later. In the interval some hesitancy of micturition had been observed by the patient and the residual urine had increased to $3\frac{1}{2}$ ounces. After the age of sixty years the danger of increasing obstruction of a permanent type appears to be slight, and symptoms appear to vary/

vary according to the vascular state of the gland. When an elderly patient has a phase of obstruction which is sufficiently severe to cause considerable distension a new factor complicates the situation. The bladder tone in the very aged is not easily regained and it is said that the patient of over seventy years of age who has an attack of acute retention is unlikely to recover the power of emptying the bladder completely. (Keyes and Ferguson (1936)).

The Clinical Course in Prostatic Enlargement.

Several clinical types are well recognised - the classical progressive type, the unheralded acute retention and the victim of "silent prostatism." The present investigation suggests the addition of a non-progressive type. This is a clinical type - the prostate produces symptoms. It must be distinguished from the enlarged prostate which is carried by its bearer to the grave having produced neither symptom nor ill effect. The symptom-producing non-progressive group contains two types of patient. The first type seeks advice on account of frequent micturition, hesitancy, haematuria or other symptoms. He has little or no residual urine and no difficulty in micturition, that is, he can produce a satisfactory flow and no prolonged effort is required to reach a stage when the bladder feels empty. It is frequently stated that the first/

first symptom of prostatic enlargement is frequency of micturition and that this is followed later by hesitancy and difficulty. The present investigation suggests that a patient who has had frequency of sufficient duration and intensity to cause him to seek advice and who has not had any difficulty in micturition is not likely to develop difficulty for a long time if at all. It is possible, of course, that many of the patients discussed here may in the future develop obstruction. The small proportion where this has occurred and the duration of the follow-up in some cases (eleven cases over seven years) suggest that this need not be expected in a large number. The second type is the man of over sixty years who complains of fairly recent slight difficulty in micturition and who has only a negligible quantity of residual urine. In patients of this type the difficulty in micturition has usually been found to decrease quite soon and not to reappear during the course of the follow-up. The cause was, no doubt, an attack of congestion. The growth of the prostate is, in all probability very slow indeed and the degree of obstruction practically stationary. Of course, many patients in this age group were seen with extreme difficulty in micturition and were treated by operation. The majority of these had also considerable quantities of residual urine. Most patients seek advice as a result of an exacerbation of

symptoms/

symptoms due to a phase of congestion. If after the age of sixty years an attack of congestion can only produce slight difficulty and a negligible quantity of residual urine then the likelihood of progressive obstruction is very small indeed.

In the series of 124 cases treated expectantly 93 would be classified in these two types of non-progressive prostatic enlargement. This constitutes about 15 per cent of all the cases of enlarged prostate referred to the writer during this period. When non-progressive cases are mentioned in the literature the impression is usually given that they are of rare occurrence. The members of the lay public are much better informed nowadays about the dangers of prostatic obstruction. Also it is known that prostatic operations are now less dangerous and less distasteful than in former times. It is, no doubt, much more common at the present time than in the past for a patient to seek advice about mild prostatic symptoms. This is much to be encouraged as it is the only way in which the numbers of advanced uraemic cases can be reduced. It is equally important, however, to be able to recognise the non-progressive case and to avoid meddlesome interfering surgery. It is evident that a considerable proportion of patients seeking advice at the present day may be classed as non-progressive and the subject is, therefore, one of practical importance./

importance.

To the reader who is interested in this aspect of the subject the literature of prostatic disease appears to abound in question-begging terms. A mild degree of prostatic obstruction is frequently called an "early prostate." Expectant treatment is described as "postponing operation." Examples occur in the writings of the greatest authorities. For example, Young and Lewis (1936) write under the heading "Palliative Treatment", "Why is this not justifiable in the cases of true prostatic hypertrophy? It may be tried as a temporary expedient but then only in the early stages of the disease, but in the light of our present experience always under protest rather than as a measure possessing the full recommendation of the surgeon." The paragraph which follows shows that the writers are not discussing "cases of true prostatic hypertrophy" a condition which is frequently present without ill-effect. They are writing of established prostatic obstruction.

"The Arrest of Prostatic Enlargement."

The fact that prostatic enlargement occurs at a definite time of life suggests the possibility of introducing some treatment to prevent its development or to arrest its progress so as to "avert the full prostatic syndrome." Various forms of hormone treatment, X-Ray therapy and the Steinach operations/

operations have been suggested. These forms of treatment have also been used to treat the well-established disease but it has usually been held that their sphere of usefulness, if they had one, would be in arresting the progress of an early case. The reports of series of cases often lack detail and the proportion of cases apparently benefited shows extremely wide variations. Lower, Schlumberger and Ferguson (1940) discussing an extensive review of hormone therapy stated that "As most of the patients under hormonal treatment obtain a feeling of well being, the psychic effects of the therapy must be evaluated." A direct effect of a hormone treatment on the vascularity of the gland is also possible. It is reasonable to suppose that the variable results obtained in these series of cases depended on the proportion of non-progressive cases included. Lower, Schlumberger and Ferguson (1940) examined the reports of twenty-one workers or groups of workers who have studied the effects of the various types of male hormone including inhibin, the hormone which is believed to act by inhibiting the action of the pituitary on the testis. Considering these reports as a whole they found that 40 to 60 per cent of the patients obtained relief of their functional symptoms. It is interesting to compare this result with the normal clinical course of the mild case as shown in the present investigation. The results there showed/

showed a decrease in night frequency in about 45 per cent, a decrease in day frequency in 48 per cent, a decrease in difficulty in micturition in 55 per cent, and a decrease in hesitancy in 41 per cent. It must be remembered, however, that many of the examples of hormone therapy had considerable residual urine. It is not easy to find a group of cases in the literature of hormone therapy which is precisely comparable with the present series.

Klein and Newman (1944) investigated the effect of the oral administration of Diethylstilboestrol on cases of benign hypertrophy. They gave details of a series of seventeen cases in which the chief complaint was night frequency of an extreme degree and in which the residual urine was not high. The hormone therapy was followed by a marked decrease in frequency in most of the cases. The longest follow-up was six months. In the writer's series 29 patients who had a night frequency of four times or more, gave a precise reply to the next questionnaire. Table No. 14 shows the night frequency in times per night in Klein and Newman's cases before and after Diethylstilboestrol therapy and the writer's cases at the first visit and at the time of the next questionnaire.

Table No. 14./

Table No. 14.

Night Frequency - Effects of Diethyl-Stilboestrol Therapy and of Expectant Treatment.

Diethyl-Stilboestrol Therapy. (17 cases).		Expectant Treatment. (29 cases).	
Before Treatment.	After Treatment.	At first visit.	At time of next questionnaire.
4	0	3 - 4	0 - 1
6 - 8	1	1 - 6	1 - 5
5	5	3 - 5	2
4	2	3 - 4	2
5	3	2 - 5	2 - 3
4	1	3 - 4	2 - 3
8 - 10	Diminished	2 - 5	1
4 - 5	2	3 - 4	2 - 3
4 - 5	1	4 - 10	2 - 5
7 - 8	3	6	0
Every hour	2	5 - 6	1
3 - 4	3 - 4	1 - 6	1
5 - 6	2	0 - 5	3 - 4
6	2	Every half hour	0
2 - 3	2	8	0
5	2	2 - 5	2
4	0	3 - 4	3
		3 - 4	3 - 4
		5 - 6	0 - 2
		3 - 4	4
		3 - 4	1 - 4
		3 - 7	2 - 3
		4 - 5	3
		4	1 - 2
		0 - 6	4 - 5
		+++	1
		3 - 4	3
		+++	1
		3 - 4	3 - 4

+++ has been used to indicate the type of patient who

is/

out of bed almost throughout the night.

15 of the 17 cases treated by Diethyl-Stilboestrol showed an improvement. 23 of the 29 cases treated expectantly showed an improvement. Anxious to avoid overstating their case Klein and Newman did not classify a patient as improved unless the number of nocturnal urinations was reduced by at least 50 per cent. Judged by this standard 14 of the 29 cases may be considered improved. This is a much smaller proportion than in the hormone treatment series (12 in 17 cases) but it is clear that this degree of improvement occurs quite commonly in the normal course of the disease. It is of interest to note also in the writer's series of cases that the improvement was well maintained. For example Patient No. 25 in October, 1941 gave his night micturition as 3 - 4; in December, 1944 as 0 - 1; in April, 1946 as 0 and in November, 1947 again as 0. His prostate was one of the largest encountered in the series.

Attempts have been made to prevent prostatic enlargement by deep X-Ray therapy. Keyes and Ferguson (1936) recommend this treatment for the relief of symptoms and think that it may have possibilities as a prophylatic. Barringer, Dean, Herendeen and Duffy (1934) mention a group of eleven cases all with residual urine under 60 c.c. in which improvement in symptoms occurred in five cases.

The/

The present investigation suggests that this proportion of such cases might be expected to improve in the natural course of the disease.

In the Steinach II operation the efferent ducts of the testicles are ligatured between the testicle and the globus major of the epididymis. Originally suggested as a means of rejuvenation it has been strongly recommended by Neihans (1937) for the treatment of prostatic obstruction. He has used this treatment for ten years and has treated 6000 patients. He expresses satisfaction with the results. The articles available to the present writer (Neihans 1936,1937) do not give adequate detail for a comparison. Mohanty (1944) describes four cases treated by this operation. All four had had acute retention of urine and no recurrence of acute retention occurred during the period of the follow-up which was a period of less than five years in the first case and seven and a half months in the last case. The present writer has normally recommended operative treatment for patients who have had acute retention. Where some contra-indication has been present, however, and when the bladder recovered its power to empty itself expectant treatment has been advised. Nine such cases are included in the present series. Two of these had repeated attacks of retention later and operation was advised. The remaining seven/

seven cases had no further attacks and have been followed for periods of 8 years 11 months, 7 years 2 months, 4 years, 3 years 8 months, 3 years 1 month, 2 years 11 months and 10 months.

Consideration of the natural course of the disease shows that it will be extremely difficult to obtain convincing evidence of the arrest of this disease in its early stages. Writing of a group of patients who improved after endocrine therapy Lower and McCullagh (1936) say "It may be that this group represents a percentage of patients who would improve under ordinary conditions without medication but if this be true, then we have been operating upon too many patients with this type of prostatic hypertrophy. Whether or not this is true can only be settled by more extensive investigation."

The Risk of Expectant Treatment.

If a clinical type can be recognised where the prostate though producing symptoms is in the great majority of cases not causing progressively increasing obstruction then it is obvious that the treatment of this type is expectant. A certain number of these cases will prove to be progressive and will later require operative treatment, and it is important to consider whether these patients have incurred a greatly increased operative risk by their period of expectant/

expectant treatment.

In the present series all patients treated expectantly were advised and their doctors were advised that the decision in favour of conservative treatment was not necessarily a final one and that any increase in symptoms would necessitate reconsideration. The greatest risk occurs in those cases where the obstruction increases insidiously without any obvious increase in difficulty or frequency of micturition. If as the residual urine increases in amount there is a corresponding increase in bladder capacity, no increase in frequency of micturition will occur. The bladder at the same time loses tone and the patient may be unaware that he is emptying the bladder incompletely. This condition is called "silent prostatism" and the patient's first complaint may be the gastrointestinal disturbances of early uraemia or even a sense of distension in the lower abdomen not definitely associated with a failure to empty the bladder. When this condition develops in a patient who has previously had sufficient urinary symptoms to seek advice the condition is not very likely to be missed. If the patient does not think of the prostate as a cause of his new symptoms his doctor will do so. One such case (No.102) occurred in the present series. The act of micturition was described as "just normal" and occurred at intervals of four hours or more during the day

and/

and not at all at night. There was a large quantity of residual urine. Recent failure of general health had been noticed. Despite the chronic distension of the bladder kidney function was not seriously impaired. Intravenous pyelography showed no dilatation in the upper urinary tract and the blood urea was 47 mgms. per 100 c.c. A transurethral resection was performed without difficulty of any kind and although the bladder tone returned very slowly the patient left hospital in good general health and emptying his bladder completely.

It is possible, also, for obstruction to reach an advanced stage through the patient's failure to report increasing symptoms. A patient, who has found courage to consult a surgeon and then been told that operation is not necessary, will sometimes regard this decision as final, despite advice to the contrary, and will drift into a state of complacency. Another may regard the idea of a second consultation as fussiness on the part of the surgeon or may even suspect commercial motives. To advise each patient correctly according to his temperament is an exercise in practical psychology. So far as is known at present two failures have occurred in the present series. One of these had serious consequences. This patient (No. 7) sought advice about two attacks of acute retention from which he had made a complete recovery. The residual urine

was/

was negligible. He was advised to report any recurrence of acute retention but did not return until he had had innumerable attacks and the urine was infected heavily. Renal function was not impaired at this stage and the blood urea was 39 mgms. per 100 c.c. A transurethral resection was performed apparently very adequately; 40 gms. of tissue were removed. Infection persisted, however, and various measures were tried including a period of suprapubic drainage and the removal of the remnants of the prostate by a suprapubic operation. He died of ascending infection 14 months after his resection having experienced great discomfort during the last eighteen months of his life.

The second patient who might be classified as a psychological failure has been more fortunate. In giving his history this patient made frequent references in an anxious manner to a heart disease from which he had suffered in the past. There was no evidence of heart disease and his own doctor had not mentioned it. This patient was considered a potential neurotic and he was advised very cautiously about the dangers of the future. Attention was concentrated on the likelihood that his bladder symptoms would be transient. Two and a half years later micturition began to be more difficult and more frequent. He decided not to seek advice on the grounds that his bladder condition would probably pass off as it had done before and in any

case/

case his heart condition would render an operation extremely dangerous. He tolerated frequency of micturition of an intense degree for a period of six months. His bladder by this time was distended above the level of the umbilicus and he was showing early signs of uraemia. The blood urea was 72 mgms. per 100 c.c. According to Wilson Hey's theory this patient could have been treated by operation immediately. However, the more orthodox methods were used and gradual decompression and a period of drainage were advised. The blood urea fell to 38 mgms. per 100 c.c. and the prostate was removed successfully. He has recovered excellent general health.

Operations on the prostate gland are rarely advised on account of haemorrhage. One such case (No. 16) occurred in the present series and this patient would have been in better general condition had operation been advised at the time of the first haemorrhage (1940) than at the time of the second (1947). However, the general health and bladder function were excellent during the interval and the succession of severe haemorrhages which preceded the decision to operate was closely related to his second marriage. This is a complication which the surgeon could hardly be expected to foresee. On examination of the blood in 1947 a condition of moderately severe, normocytic orthochromic uraemia was found. The haemoglobin was 50

per/

per cent (7.8 G per 100 c.c. of blood). The red cell count was 2,620,000 per c.mm. He was given a blood transfusion before operation and he made a good recovery. The occurrence of haemorrhage of the degree found in this patient is exceptional and does not affect the general policy towards prostatic patients.

The frail general condition and the advanced state of cardio-vascular degeneration accounts for the greater part of the mortality of prostatic operations when expertly performed. The postponement of operation will certainly add to this risk. In the present series Patient No. 54 suffered from severe chronic bronchitis and on very slight effort had extreme breathlessness and exhaustion. He was seen first of all in April, 1944 during a phase of marked difficulty in micturition and conservative treatment was advised chiefly on account of the general condition. When difficult micturition recurred in 1946 operation was considered necessary. The prostate was small and transurethral resection was performed without difficulty. The patient was somewhat exhausted but recovered after a few days rest. He returned to his normal and was given permission to go home. While in the act of preparing to go he had a sudden cardiac attack and died within a few hours. There was no marked change in this patient's general condition between the examination of 1944 and 1946 and it is doubtful whether the operation would have been

any/

any safer on the occasion of the first visit.

In the remaining cases treated by the writer there was no evidence of increased operative risk from impairment of renal function or from general causes. Patient No. 105 had a blood urea of 32 Mgms. per 100 c.c. and despite his bundle branch block was quite undisturbed by a transurethral resection. Patients Nos. 11, 21, 26, 44 and 38 had blood urea levels of 37, 16, 31, 37 and 38 mgms. per 100 c.c. respectively. Patient No. 58 has refused operation and is still in apparently very good health. It is considered unlikely that this state will continue as the residual urine has been found to be over 8 ounces on two occasions. Nos. 23, 54 and 82 were treated by other surgeons and details are not known.

Considering the series as a whole it appears that little has been lost by the delay except in those cases where instructions had been flagrantly disregarded.

Carcinoma occasionally develops in prostates which are already affected by benign hypertrophy. The proportion of cases in which this occurs varies considerably in different series of cases due, no doubt to different interpretation of histological appearances. In many accounts, however, it is quite high. Wilson and McGrath (1911) studied 468 prostatectomy specimens and found carcinoma in 15.5 per cent of them. Moore (1935) studied the same subject and

gave/

gave his results in age groups. The figures tended, on the whole, to be higher than those of Wilson and McGrath.

In view of these figures it is perhaps remarkable that in only one case in the present series has carcinoma been suspected. Patient No.33 was examined first of all in June, 1933 and the prostate was considerably enlarged, rather soft and quite homogeneous. In January, 1948 the size of the prostate had not changed appreciably and the sulci had not been invaded but an area of distinct firmness was palpable in one lobe. The urinary symptoms had not changed but there was a complaint of backache. X-Ray examination of the spine showed no evidence of secondary growth and the serum acid phosphatase was within normal limits. However, this prostate has been considered as malignant and endocrine treatment has been given. It has been the writer's practice to give the benefit of endocrine treatment to all cases where even a suspicion of malignancy existed. These have been excluded from the series of cases treated expectantly and this is a possible explanation of the small number where malignant change has been found in the follow-up. No doubt other cases will show evidence of carcinoma later and this must be considered in discussing the risks of conservative treatment. Although this risk has been clearly recognised in the literature it has not been considered a justification for what would otherwise be

a/

a "prophylactic prostatectomy." Recent work has strengthened this view very definitely.

It appears that benign hypertrophy of the prostate and carcinoma of the prostate are two distinct and separate diseases and that in the great majority of cases the carcinoma is not the result of malignant change in the hypertrophied tissue. The fact that they are fairly frequently associated is not surprising in view of the very high incidence of benign hypertrophy in the upper age groups of the male population. Whatever the precise source of the benign enlargement it is obvious that its origin is near the urethra. Surgeons who enucleate the prostate constantly leave a false capsule of prostatic tissue surrounding the area occupied by the hypertrophied portion. They never leave a mass of normal or atrophied tissue on the urethral aspect of the mass. The site of the origin near the urethra is so definite that Motz and Perearnau and many French authorities since their time, have believed the disease to be one of the submucous glands of the bladder neck and not of the prostate.

Carcinoma of the prostate, on the other hand, was found by Geraghty and Boyd to begin in over 75 per cent of cases in the posterior lobe. Rich (1935) in a search for occult carcinoma of the prostate found the tumours most often at the outer margins of the gland. Moore (1935) after/

after a study of small prostatic carcinomata concluded that although carcinoma may arise anywhere in the prostate it is predominantly a disease of the posterior lobe. He considered that carcinoma and benign enlargement are independent diseases, the malignant form resulting from proliferation of epithelium which has already undergone atrophy. Young and Lewis (1936) say "We have observed areas of carcinoma within lobes of hypertrophy but it appears that those areas were extensions of tumour from the posterior lamella or had their origin in non-hypertrophied acini occurring between lobes of hypertrophy." Bibus (1938) examined 430 operation specimens from suprapubic prostatectomy by serial sections: in 4 - 5 per cent of these he found areas of carcinoma but the position of these in every case indicated that the area of benign hypertrophy was being invaded from outside. When benign hypertrophy and carcinoma are associated in the same gland, the enucleation of the hypertrophied portion appears to have a small chance of removing the malignant portion completely. Boyd (1943) says "Even when a very early growth is discovered accidentally in a prostate which has been removed for simple hypertrophy the patient is likely to die of recurrence or metastases."

The attitude towards prostatic carcinoma has also been influenced by the remarkable changes which have occurred recently/

recently in its treatment. Hormone therapy produces marked alleviation of symptoms in a very large proportion of cases. Many still die of the disease and it is not yet possible to say whether any have been completely cured. Fergusson (1946) compared two groups of cases one treated by hormones and the other without. Hormone therapy has already produced a distinctly increased survival period.

There is little justification for removing a prostate because it may later become the seat of carcinoma. The decision must be made on other grounds.

The Indications for Expectant Treatment.

The orthodox indications for expectant treatment which were employed in the present series appear to be fully justified during the period of observation. 124 cases have been followed up. Two of these (No. 17 and No. 120) may be excluded from discussion as no residual urine estimation was made, the decision against operation having been taken almost entirely on the grounds of feeble general condition and old age. Of the remaining 122 cases fourteen have died, fourteen have been treated by operation and in one other case operation has been advised. The deaths have been due to conditions unconnected with prostatic disease and operative risk has only been increased by flagrant disregard of instructions.

Although expectant treatment appears to have been justifiable/

justifiable in the entire series the study of individual symptoms suggested that there was a clinical group in which progressively increasing obstruction occurred much more frequently. This group consisted of the younger patients whose symptoms included a degree of difficulty in micturition. The upper age limit in this group appears to be just over sixty.

Table No. 15 shows the course with regard to difficulty in micturition, hesitancy in micturition and residual urine in the less progressive group. The dates stated are those of the postal questionnaires and apply exactly to the great majority of the cases. Where a marked change occurred between two questionnaire dates it has been shown under the next date. For example Case No. 11 had some difficulty in micturition when first seen in July, 1940. This increased during the next year and he was treated by operation in October, 1941. Increased difficulty is shown under December, 1944 the next questionnaire date. Cases treated by other surgeons are assumed to have had increased difficulty. This is indicated by enclosing the plus signs in brackets. Slight difficulty or hesitancy is shown by sl. and occasional difficulty or hesitancy by occ.

Table No. 15.

Course in Less Progressive Group - Difficulty.

Serial Number	Age	Difficulty in micturition.				Hesitancy in micturition.				Recent residual urine estimation if known.
		First visit.	Dec. 1944.	April 1946.	Nov. 1947.	First visit.	Dec. 1944.	Apr. 1946.	Nov. 1947.	
2	78	+				+				
3	76	+	0	0		+	0	0		
4	65	+	0	0	0	+	0	0	0	
5	70	0	0	0	0	0	0	0	0	2 ounces.
6	64	0	0	0	0	0	0	0	0	½ ounce.
7	70	+	++			+	+			
8	65	0	0	0	0	0	+	0	0	1 ounce.
9	73	+				+				
10	66	+	0	0	0	0	0	0	0	1 ounce.
12	65	+	less	0	0	+	+	0	0	1½ ounces.
13	68	0	0	0	0	0	0	0	sl.	
14	61	0	0	0	0	0	0	0	0	0
15	64	0	0	0	sl.	0	0	0	+	0
16	67	0	0	0		0	occ.		0	
18	66	0	0			+	+			
19	57	0	0	0	0	0	0	0	0	
20	51	0	0			0	0			
21	68	+	+			+	+			
22	54	0	0	0	0	sl.	+		0	½ ounce.
24	70	0	0			0	0			
25	62	+	0	0	0	0	0	0	0	
26	56	0	0	0	+	+	occ.		occ.	3½ ounces.
27	50	0	0	0	0	0	+	+	+	1 ounce.
28	57	0	0	0	0	0	0	0	0	
29	71	+	0	0	0	+	0	0	0	
30/										

Table No. 15 (Cont.)

Course in Less Progressive Group - Difficulty.

Serial Number	Age	Difficulty in micturition.				Hesitancy in micturition.				Recent residual urine estimation if known.
		First visit.	Dec. 1944.	April 1946.	Nov. 1947.	First visit.	Dec. 1944.	Apr. 1946.	Nov. 1947.	
30	69	+	+	+	+	+	+	+	+	1½ ounces.
31	67	+	0	0	0	+	+		occ.	2 ounces.
32	69	0	0	0	0	+	+			
33	62	+	0	0	0	+	occ.	occ.	+	½ ounce.
34	67	0	0	0	0	0	0	0	0	
39	68	0	0	0	0	0	0	0	0	0
40	67	0	0	0	0	0	0	0	0	
41	51	0	0	0	0	0	+		+	½ ounce.
43	36	0	0	0	0	0	0	0	0	¼ ounce.
47	70	0	0	0	0	0	0	0	0	
48	68	+	+	0	sl.	+	0	0	0	1¾ ounces.
49	58	0	0			0	0			
50	55	0	0	0	0	0	0	0	0	1 ounce.
51	77	0	0	0	0	0	0	0	0	¼ ounce.
52	67	+	0	+		+	+	+		
53	76	+	0	0	0	+	+		0	
54	58	0	(+)			0				
55	72	0	0	0	0	occ.	+	+		
59	59	0	0	0	0	0	0	0	0	
60	65	+	0	0	0	+	+		occ.	1½ ounces.
62	63	0		0	0	0			0	1 ounce.
63	72	0		0	0	0			0	
64	59	0		0	0	0			0	
65	62	+			+	+			occ.	1¾ ounces.
66	83	+		0	0	+			0	
68	61	0		0		0		0		
69	72	0		0		+		+		
70/										

Table No. 15 (Cont.)

Course in Less Progressive Group - Difficulty.

Serial Number	Age	Difficulty in micturition.				Hesitancy in micturition.				Recent residual urine estimation if known.
		First visit.	Dec. 1944.	April 1946.	Nov. 1947.	First visit.	Dec. 1944.	Apr. 1946.	Nov. 1947.	
70	72	0		sl.	sl.	0			Occ.	
71	60	0		0	0	0			0	½ ounce.
72	69	0			0	+			+	
75	63	0		0	0	0			0	3 ounces.
76	67	0	0			0	0			
77	51	0		0	0	0	0		0	½ ounce.
78	63	0		0		+				
79	78	0		0	0	0		0	0	
80	61	0		0		0		0		
81	66	0			+	+			Occ.	
84	70	+			+	+			+	
85	60	0		0	0	+			Occ.	3 ounces.
86	52	0		0	0	0			0	¾ ounce.
87	66	0		0	0	0			0	0
88	68	+			0	0			0	
90	60	0		0	0	0			0	
92	58	0		0		0		0		
93	65	+			0	+			+	
95	66	+			0	+			sl.	
96	65	0			0	0			0	¾ ounce.
97	69	0			0	0			0	½ ounce.
98	76	0			0	0			0	1½ ounces.
99	70	0			+	0			Occ.	3 ounces.
100	64	+			0	+			0	
101	70	+			0	+			0	2¼ ounces.
102	66	+			0	0			0	+++
103	71	0			0	0			0	
104/										

Table No. 15 (Cont.)

Course in Less Progressive Group - Difficulty.

Serial Number	Age	Difficulty in micturition.				Hesitancy in micturition.				Recent residual urine estimation if known.
		First visit.	Dec. 1944.	April 1946.	Nov. 1947.	First visit.	Dec. 1944.	Apr. 1946.	Nov. 1947.	
104	72	0			0	+			+	½ ounce.
106	68	+			0	+			0	
107	65	0			0	+			0	3 ounces.
108	64	0			0	0			0	
109	63	0			0	0			0	2 ounces.
110	72	+			+	+			+	¼ ounce.
112	61	0			0	0			occ.	¼ ounce.
114	73	0			0	+			0	¾ ounce.
115	71	0			0	0			0	3½ ounces.
116	57	0			0	+			occ.	2 ounces.
118	61	+			0	0			0	¾ ounce.
119	58	0			0	0			0	¼ ounce.
121	71	+			0	+			0	
123	62	0			0	0			0	1 ounce.
124	73	+			sl.	+			occ.	3½ ounces.

Table No. 16 gives the same information about the more progressive group.

Table No. 16.

Course in More Progressive Group - Difficulty.

Serial Number	Age	Difficulty in micturition.				Hesitancy in micturition.				Recent residual urine estimation if known.
		First visit.	Dec. 1944.	April 1946.	Nov. 1947.	First visit.	Dec. 1944.	Apr. 1946.	Nov. 1947.	
1	58	+	0	0		+	+			
11	56	+	++			+				
23	59	+	(++)			+				
35	56	+	+	+	+	+	+	+	+	1 ounce.
36	49	+	0	0	0	+	0	0	0	1¾ ounces.
37	47	+	0	0	0	+	+	+	+	
38	55	+	+	++		+	+			
42	52	+	0	0	0	+	0	0	0	½ ounce.
44	55	+	+	+	++	0	+	+	0	8 ounces.
45	60	+	0	0	0	+	0	0	occ.	
46	58	+	+	+	+	+	+	+	+	3½ ounces.
56	54	+	+	+	+	0	0	0	+	2¼ ounces.
57	57	+	0	0	0	+	0	0	0	
58	60	+	+	+	+	+	+	+	+	8 ounces.
61	59	+	0	0	0	+	0	0	occ.	
67	60	+		+	+	+		+	+	Palpable distension.
73	50	+		0	0	+		occ.	occ.	
74	57	+		+	+	+		+	+	2½ ounces.
82	55	+		++		+		+		
83	59	+		0	0	+		0	0	
89	55	+			+	+			+	
91	56	+		+	+	+		+	+	¾ ounce.
94	53	+			+	+			+	3 ounces.
105	60	+			+	+			+	
111	59	+			0	+			0	2 ounces.
113	54	+			0	+				
117	50	+			0	+			sl.	0
122	54	+			0	+			0	

Of the 94 patients in the less progressive group 7 (7.4 per cent) have required to have operative treatment. Several of these, however, were from the beginning border line cases. Only 2 (2.1 per cent) showed definite evidence of a progressively increasing degree of obstruction. Many surgeons advise that patients treated expectantly should be seen at intervals of three months and have residual urine estimations. In the present series this advice was frequently disregarded by the patient or by his doctor. A large number of such patients following this advice for the rest of their lives will cause inconvenience to themselves and work to the already heavily burdened hospital staffs. It is doubtful whether it is necessary in the less progressive cases.

Of the 28 patients in the more progressive group 8 (28.6 per cent) have required operative treatment. 6 of these patients (21.4 per cent of the whole group) showed definite evidence of an increasing degree of obstruction. The persistence of a degree of difficulty occurred in 15 of the 28 patients (54 per cent). It is possible that the continued observation of this group may indicate that they should not be treated expectantly at all. The results up to the present time do not suggest this but it is clearly necessary to observe this group very carefully.

Tables No. 17 and 18 show the course with regard to frequency/

frequency of micturition in the two groups. The night frequency is given as times per night and the day frequency as the interval in hours. This is the most convenient form in which to question patients. Slight confusion may be caused in tables as a lower figure shows an improvement in night frequency while a higher one shows an improvement in day frequency. Some patients have not stated a figure but merely said "normal". This has been shown as "norm." Some have indicated that frequency was very variable but severe at times. This has been shown as ++.

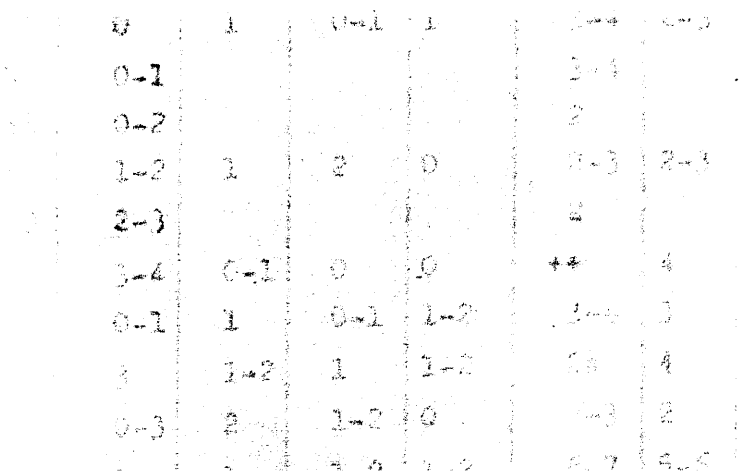

Table No. 17.

Course in Less Progressive Group - Frequency.

Serial Number	Age	Night Frequency (Times per night). First visit	Dec. 1944.	Apr. 1946.	Nov. 1947.	Day Frequency (Interval in hours) First visit	Dec. 1944.	Apr. 1946.	Nov. 1947.
2	78	2				4			
3	76	++	3	0		++	2	4	
4	65	3	0	3	2-3	++	5-6	4-5	4-5
5	70	1-2	2	2-3	3-4	++	?	?	1-3
6	64	2-3	0.	0	0	1 hour	3-4	3-4	4-5
7	70	1				3			
8	65	1	2	2	1	2	4-5	3-4	3-4
9	73	3-4				++			
10	66	2-3	1-2	1-2	1	Ev.hr.	3-4	3-4	3
12	65	0	2	2	2-3	++	1-1½	2½	2
13	68	1	1-2	2-3	2-3	3	4	3½	2-3
14	61	0	4	2-3	2-3	3	1-1½		2
15	64	0-1	1	4	1	++	½-2	½-2	1-2
16	67	0-2	1-2	0-3		3-4	2-3	4-5	
18	66	2-3	1-2	1		3	3-4	4-5	
19	57	0	1	0-1	1	3-4	2-3	4	4
20	51	0-1				3-4			
21	68	0-2				2			
22	54	1-2	1	2	0	2-3	2-3	2-3	3-4
24	70	2-3				2			
25	62	3-4	0-1	0	0	++	4	3	3-4
26	56	0-1	1	0-1	1-2	3-4	3	Norm.	3-4
27	50	3	1-2	1	1-2	2½	4	3	2-3
28	57	0-3	2	1-2	0	2-3	2	Norm.	3
29	71	1	1	1-2	1-2	6-7	5-6	5-6	5-6
30	69	2		2-3	3-4	2-4		2-3	3
31	67	1	0	1-2	1-2	3-4	3-4	2-3	2-3
32	69	2	3-4		0	Ev.Hr.	3		
33/									

Serial Number	Age	Night Frequency. (Times per night) First visit	Dec. 1944.	Apr. 1946.	Nov. 1947.	Day Frequency. (Interval in hours). First visit	Dec. 1944.	Apr. 1946.	Nov. 1947.
33	62	1-3	1	1	2	3-4	4	2	3
34	67	1-3	3	2-3	3-4	2	2	2⅓	2
39	68	0-2	1	1	1	++	2-4	2-3	3-4
40	67	0	0	0	0-1	Norm.	Norm.	Norm.	Norm.
41	51	3-5	2	3	3	3-4	3	3	3
43	36	0-1	0-1	0-1	0-1	2	3	2⅓	2-4
47	70	2-5	2-3	3-4	2-3	2 hrs.	1-3	1½-3	1-3
48	68	3-4	2-3	2	2-3	Ev.Hr.	4	4	4
49	58	2-5	1			3-4	3		
50	55	2	2	1-3	1-2	Ev.Hr.	2-2½	1-2	2-3
51	77	3	3-4	2-3	4	3-4	3	3	3
52	67	3	3	3-4		3	2		
53	76	3-4	2-3	2	1	3-4	2-3	Norm.	Norm.
54	58	3-4				Ev.Hr.			
55	72	++	2-5	3-4	++	2	2	1	1½
59	59	1	1	1	1	1-3	1-3	1-2	1-3
60	65	5-6		1	2	2		3	3
62	63	0-5		3-4	3-4	½-3		2-4	2-3
63	72	++		0	0-1	++		Norm.	Norm.
64	59	++		0	0-1	++		4	5
65	62	2-5			2	1½			2½-3
66	83	2		1	2	2		2	2-3
68	61	3-4		3	2-3	2		1	3
69	72	3				2-3			
70	72	0		1-2	1-2	3-4		Norm.	
71	60	1		0	1	½-4		3-4	3-4
72	69	2-3			2	2			3-4
75	63	2-3		2	2	1½		2-3	3-4
76	67	2-7				2-3			
77/									

Serial Number	Age	Night Frequency. (Times per night) First Visit	Dec. 1944.	Apr. 1946.	Nov. 1947.	Day Frequency. (Interval in hours). First Visit	Dec. 1944.	Apr. 1946.	Nov. 1947.
77	51	1		1	0-1	3		3	2
78	63	0-4		3		++		1½	
79	78	0		0	1	2-3		2-3	3
80	61	3-4				3			
81	66	3-4		3-4	3-4	3		2-3	2-3
84	70	2-3			2	2			2-3
85	60	2		0-1	1	2-3		3-4	1-3
86	52	0		0	0	3-4		3	3-3½
87	66	1		2-3	0	Norm.		3-4	4-5
88	68	5-6			0-2	3			2-3
90	60	1		1	1	4		3-4	3-4
92	58	2		2-3		2		3	
93	65	2			2	2-3			2
95	66	3			0-2	2-3			4
96	65	1			1	½-2			½-3
97	69	3-7			2-3	2½			2-4
98	76	4-5			3	++			
99	70	0				2½			
100	64	2			2-3	2-3			1
101	70	0-1			1	3			2-3
102	66	1			0	2			3-4
103	71	1			1	2			2-3
104	72	2			++	3-4			Norm.
106	68	1			1	3-4			1-1½
107	65	0-6			4-5	1			1-4
108	64	++			1'	++			5-6
109/									

Table No. 17 (Cont.)

Serial Number	Age	Night Frequency. (Times per night) First Visit	Dec. 1944.	Apr. 1946.	Nov. 1947.	Day Frequency. (Interval in hours) First Visit	Dec. 1944.	Apr. 1946.	Nov. 1947.
109	63	2-3			2-3	3			2½
110	72	3			3	2-3			4-5
112	61	0-1			0-1	3-4			2-3
114	73	2-3			2-3	2			2
115	71	1-2			1-2	2			2
116	57	0			0-1	1½-2			1½
118	61	2-3			1-2	4			3-4
119	58	0-2			0-1	1½			2-3
121	71	0-1			0	3-4			Norm.
123	62	0-2			1	2			2
124	73	0-1			0	3-4			3-4

Table No. 18.

Course in More Progressive Group - Frequency.

Serial Number	Age	Night Frequency (Times per night) First Visit	Dec. 1944.	Apr. 1946.	Nov. 1947.	Day Frequency (Interval in hours) First Visit	Dec. 1944.	Apr. 1946.	Nov. 1947.
1	58	0	0	0	-	4-5	6-8	6-8	-
11	56	0				3-4			
23	59	1				1½			
35	56	0-2	0-2	1-2	1-2	2-3	3-3½	1-3	3
36	49	1-2	1		1	++	2-3		4-5
37	47	++	1	1	1-2	++	2	3	2
38	55	1-6	1-5			2	4-5		
42	52	0	0	0	0	3-4	4	3-4	3-4
44	55	1-2	1	1	0-1	4	2-3	2-3	Norm.
45	60	0-1	0		0-1	1½-2		3-4	2½-3
46	58	3-4	2	2	1-3	2-3	3	2-3	2-3
56	54	2-3	3	3-4	3-4	1½	1½	1½	1½
57	57	6	0	1	0-2	2-3	3	3	3
58	60	1-2	2		2	2-3	2		1-2
61	59	1-6	1		0-1	++		3	4-5
67	60	3-4		3	2-3	2		1	3
73	50	1		1	1-2	2-3		2-6	2-4
74	57	0-1		1	0	3		3	2
82	55	1-2				1½			
83	59	4		1-2	2	1-3		4	3
89	55	3-4			4	4			2
91	56	++		1	2	3-4		2-3	2
94	53	3-4			0-4	1½-2			2½
105	60	0			0	3-4			3-4
111	59	3-4			3	5-6			3-4
113	54	++			1	++			3-4
117	50	0-1			0-1	2-3			4-5
122	54	0			0	3-4			Norm.

The clinical course with regard to frequency is irregular and no marked difference is found between the two groups. In the absence of residual urine and difficulty, frequent micturition is not important unless of sufficient degree to exhaust the patient or to render life miserable. A few patients in the present series had a degree of frequency which most men would have found intolerable. These patients were offered operative treatment. They were told, however, that their condition did not endanger their lives and quite probably would never do so. They were also told that operation would probably relieve their frequency but would not necessarily produce a return to normal. All those in the present series refused operation. The capacity to endure frequent micturition varies enormously and depends on the ability to fall asleep quickly after an interruption and on the toilet facilities available in daytime.

The investigation suggests the following plan of treatment:-

Patients who have no difficulty in micturition and no residual urine should be advised to report any change in symptoms or failure of health but do not require periodic estimations of residual urine. Frequent micturition even if extreme is not an indication for early operation, as it is often transient. Frequent micturition should not be regarded/

regarded as the first stage of a progressive downhill course.

Patients who have slight difficulty in micturition and no residual urine and are over the age of 65 should be observed for a few months during which time the difficulty will frequently pass off. If this occurs they also should be told to report changes in symptoms or failure in general health but do not require periodic estimations of residual urine.

Patients under the age of 65 years who have slight difficulty in micturition though without residual urine should be regarded more seriously. Clinical examination and estimation of residual urine at intervals of three months is advisable.

The size of the prostate can usually be disregarded. In a border line case a very large gland may influence the decision to operate.

Slight trabeculation of the bladder may be disregarded. Marked trabeculation may sway the balance in doubtful cases. Trabeculation and multiple sacculation indicate the necessity for operative treatment but this will also be shown by the presence of residual urine.

SUMMARY AND CONCLUSIONS.

The indications for expectant treatment given by twelve specialist writers are discussed. It is agreed that many enlarged/

enlarged prostates produce no symptoms at all. Cases where an enlarged prostate has produced symptoms but where the disease has not been progressive are described by many writers but are usually considered exceptional.

Of seven standard textbooks of general surgery, four do not mention expectant treatment.

131 patients advised expectant treatment during the period November, 1938 to August, 1947 have been followed up.

The indications for expectant treatment were orthodox. The absence of residual urine and of an extreme degree of difficulty in micturition were the chief indications.

Information was collected about the progress of these patients, from the patients themselves on return visits, from their doctors and by postal questionnaires. Questionnaires were sent to the entire group in December, 1944, April, 1946 and November, 1947. Patients who failed to respond or who had changed their address were investigated by the Almoner's Department.

Seven cases remained untraced. The evidence available in these cases does not suggest that increased obstruction has occurred in any of them.

Fifteen patients have died during the period of the follow-up. Fourteen of these died of causes unconnected with the prostatic condition and without increase in urinary symptoms. The fifteenth was believed to die of uraemia.

He/

He was a man of 91 and the decision against operation was made chiefly on grounds of age and general condition. The figures in this series have been studied by Dr. R. A. Robb, Lecturer in Statistics in the University of Glasgow. The mortality was found to be the same as that of a similar group of men of the same ages followed during the same period.

In fifteen patients treated expectantly operation was considered necessary later. In four of these the clinical findings at the first visit indicated a degree of obstruction for which operation was usually advised but owing to special circumstances a period of expectant treatment was tried. Operation was advised later on account of persistent symptoms rather than an increasing degree of obstruction. One patient who had no evidence of increasing obstruction was treated by operation on account of repeated severe haemorrhage. In two cases where operation was advised by other surgeons the exact indications are not known though increasing obstruction is assumed. In the remaining eight cases definite evidence was found of an increasing degree of obstruction.

The clinical features are considered individually. The incidence of each clinical feature is compared in the whole series, in the fifteen patients for whom operation was recommended, in the ten patients where progressively increasing obstruction was demonstrated or assumed and in the/

the eight patients where there was definite evidence of progressively increasing obstruction. Some comparisons are also made with a series of 500 patients seen during approximately the same period and for whom operative treatment was advised at the first examination.

Difficulty in micturition as described by the patient was a very significant symptom. Of 63 patients who had no difficulty at the time of the first examination only one showed evidence of increasing obstruction during the course of the follow-up. Of 500 patients treated by operation 44 stated that they had no difficulty in micturition. The great majority of these were very advanced cases with gross distension of the bladder. Owing to loss of tone these patients believed the bladder to be empty when a considerable quantity of urine remained in it.

Hesitancy of micturition was less significant than difficulty.

The degree of frequency of micturition had no significance whatever. Of 67 cases where frequent micturition was the chief or only complaint only one has shown definite evidence of an increasing degree of obstruction.

Haematuria was commoner among progressive than non progressive cases but the difference was not great.

The size of the gland showed no relationship with the degree of obstruction which it produced and the tendency

to/

to increasing obstruction was only slightly greater in the larger glands.

The age of the patient was very significant. Of 75 patients over the age of 60 only one showed definite evidence of an increasing degree of obstruction. Slight difficulty in micturition in patients below the age of 60 frequently persisted or increased. Slight difficulty in patients over this age was often transient.

Trabeculation of the bladder of at least mild degree was observed in most of the 54 patients examined cystoscopically. Even well marked trabeculation has not been a significant indication of progressive obstruction.

The absence of residual urine was an essential feature of the cases treated expectantly. The small number of cases requiring operative treatment later justifies the use of this test. Its significance and fallacies are discussed.

Three important conclusions may be drawn.

1. The gland, however large, which is non-obstructive tends to remain so.
2. Frequent micturition, often described as the first stage in the development of the prostatic syndrome is, in a considerable proportion of cases, the only symptom which the patient experiences during the rest of his life.

3./

3. The permanent degree of obstruction produced by a prostate is much more likely to increase before the age of 60 than after the age of 60. Variations in the degree of obstruction from day to day and from week to week depend on the vascular state of the gland.

Treatment of various kinds has been suggested to arrest the progress of prostatic disease. Little heed is taken of the possibility of a non-progressive symptom-producing clinical type. Examples from the literature of hormone therapy, X-Ray therapy and the Steinach II operation show little difference from the normal clinical course of similar cases.

In a group of patients treated expectantly, some will always show progressive signs and require operative treatment. The operative risk in these cases may be increased by renal impairment. This may occur, though rarely, without increased urinary symptoms (silent prostatism), or with increased symptoms which the patient fails to report. General failure of health and especially cardio-vascular degeneration in the interval may also increase the operative risk. Up to the present time little has been lost in the series under discussion except where instructions have been flagrantly disregarded. The possibility of malignant change is not important. Benign and/

and malignant disease begin usually in different parts of the prostate, and it is rare for an enucleation to remove a carcinomatous area in its entirety.

The indications for expectant treatment are justifiable in the entire series during the period of observation. The tendency to progressively increasing obstruction was much less in those patients who had no complaint of difficulty in micturition and in those who had transient or slight difficulty after the age of 60. Of 94 patients in this clinical group 7 (7.4 per cent) have required to have operative treatment and only 2 (2.1 per cent) have shown definite evidence of a progressively increasing degree of obstruction. Patients under the age of 60 years who had some difficulty in micturition showed a much greater tendency to increasing obstruction. Of 28 such patients 8 (28.6 per cent) have required to have operative treatment and 6 (21.4 per cent) showed definite evidence of increasing obstruction.

It is suggested that patients whose prostates are enlarged, who have no residual urine and no extreme difficulty in micturition should be advised as follows:-

1. Those who have no difficulty in micturition to report any changes in urinary symptoms or failure in general health.

2. Those who have slight difficulty in micturition and who/

who are over the age of 65 years to be observed for a few months. If, as is usual, the difficulty in micturition passes off, they also need report only if there is a change in urinary symptoms or a failure in general health.

3. Those who have slight difficulty in micturition and are under the age of 65 to report at intervals of three months for clinical examination and residual urine estimation.

4. The size of the gland and the degree of trabeculation of the bladder should influence the decision only in border line cases.

5. Frequent micturition or haematuria which is persistent and of extreme degree may, exceptionally, be an indication for operation.

Patients whose prostates are enlarged but who have neither extreme difficulty in micturition nor significant residual urine frequently seek advice. 20 per cent of the last 600 cases of enlarged prostate examined by the writer were of this type.

REFERENCES.

ADAMSON, W. A. D.,(1947), Textbook of Surgical Treatment (ed. C.F.W. Illingworth) Edinburgh. Livingstone.

BAILEY, HAMILTON & LOVE, McNEILL (1946), A Short Practice of Surgery. London. Lewis.

BAND, David (1945), Brit. Jour. Urol. 17, 1.

BARNES, Roger W.,(1943) Endoscopic Prostatic Surgery. London. Kimpton.

BARRINGER, B. S. et. al. (1934), Amer. Jour. Roentgen. 31.350.

BARRINGTON, F. J. F.,(1923) Clinical Annual. 62. 229.

BIBUS, B.,(1938) Zeitschrift fur Urologie. 32. 108.

BOYD, W.,(1943) Textbook of Pathology 4th Ed. London. Kimpton.

BUMPUS, Herman C.,(1924) J. Urol. 12. 343.

CREEVY, C. D., (1939) J. Urol. 39. 403.

EISENDRATH, Daniel N. and ROLNICK, Harry C.,(1938) Urology. Philadelphia. Lippincott.

FERGUSSON, J. D., (1946) Lancet. 2. 551.

GERAGHTY and BOYD, quoted by LOWSLEY and KIRWIN.

GRAVES and DAVIDOFF (1923) J. Urol. 11. 185.

GUYON (1888) (quoted by MARION, KENNETH, WALKER and others). Les Prostatiques ou Affections chirurgicales de la vessie et de la prostate. Paris.

HALLE, Noel and MOTZ, B. (1902) Ann. des Mal. des Org. Gen. Urin. 20. 138.

HANDFIELD JONES, R.M. and PORRITT, A.E., (1945) The Essentials of Modern Surgery. Edinburgh. Livingstone.

HERMAN, Leon (1938) The Practice of Urology. Philadelphia. Saunders.

HEY, Wilson. (1945) Brit. Jour. Surg. 33. 41.

HINMAN, Frank, (1935) The Principles and Practice of Urology. Philadelphia. Saunders.

ILLINGWORTH/

ILLINGWORTH, C. F. W., (1942) A Short Textbook of Surgery. London. Churchill.

JOLY, J. Swift (1924) Proc. Roy. Soc. Med. Vol. 17.

KEYES, Edward L. and FERGUSON, RUSSELL, S. (1936) Urology. New York. Appleton.

KIRWIN, Thomas J. and HAWES, G. Aubrey, (1939) J. Urol.41.413.

KLEIN, William and NEWMAN, Bernard (1944) Arch. Surg. 48. 381.

KREUTZMANN, Henry A.R., (1928) J. Urol. 19. 199.

LOWER, W. E. and McCULLAGH, D. Roy, (1936) Med. Clin. North Amer. 19, 6, 1949.

LOWER, W. E. et. al. (1940) Surg. Gyn. and Obst. 71. 354.

LOWSLEY, Oswald S. and KIRWIN, Thomas J. (1944) Clinical Urology. Baltimore. Williams and Wilkins.

MACALPINE, James B. (1936) Cystoscopy and Urography. Bristol. Wright.

MARION, G. (1940) Traite d'Urologie. Paris. Masson.

MARSHALL, James, (1947) Lancet 2, 12, 451.

MAXIMOV, Alexander A. and BLOOM, William (1936) A Textbook of Histology. Philadelphia. Saunders.

MILLIN, Terence (1947) Retropubic Urinary Surgery. Edinburgh. Livingstone.

MOHANTY, J. K., (1944) The Antiseptic. 41. 596.

MOORE, R. A. (1935) J. Urol. 33, 224.

MOORE, R. A. (1936) Amer. Jour. Path. 12. 599.

MOORE, R. A. (1943) J. Urol. 50, 683, 709.

MOTZ, B. and PEREARNAU (1905) Ann. Mal. Org. Gen. Urin. 23. 1521.

NEIHANS, Paul. (1937) Presse Medicale. 102. 1858.

NEIHANS/

NEIHANS, Paul. (1936) Lancet. 1. 307.

PANNETT, C. A. (1944) Surgery. A Textbook for Students. London. Hodder and Stoughton.

RANDALL, Alexander. (1931) Surgical Pathology of Prostatic Obstruction. London. Bailliere Tindal & Cox.

RICH, A. R. (1935) J. Urol. 33. 215.

RICHES, E. W. and MUIR, E. G. (1933) Brit. Jour. Surg. 20.383.

ROBB, R. A. (1948) Personal communication.

ROMANIS, W. H. C. and MITCHINER, Philip H. (1941) London. Churchill.

SOUTTAR, H. S. (1940) The Art of Surgery. London. Heinemann.

THOMPSON, Sir Henry. (quoted by YOUNG and others).

THOMSON-WALKER, Sir John (1927) Carson's Modern Operative Surgery. London. Cassell.

TROTTER, Wilfred (1941) Collected Papers. London. Humphrey. Milford.

WAKELEY, Cecil P. G. and HUNTER, John B. (1940) Rose and Carless' Manual of Surgery. London. Bailliere, Tindal & Cox.

WALKER, Kenneth M. (1933) The Enlarged Prostate and Prostatic Obstruction. London. Humphry Milford.

WALTERS' G. A. Bagot, (1948) Brit. Med. Jour. Vol.1. p. 628.

WARD, R. Ogier, (1943) Modern Operative Surgery (ed. G. Grey Turner). London. Cassell.

WARD, R. Ogier, (1946) Brit. Jour. Urol. 18. 105.

WILSON, L. and McGrath, B. F. (1911) Surg. Gyn.and Obst. 13. 647.

YOUNG, Hugh H. (1926) Practice of Urology. Philadelphia. Saunders.

YOUNG, Hugh H. and Lewis, L. G. (1936) Cabot's Modern Urology. London. Kimpton.

VOLUME 2.

Contents

INTRODUCTION.

In the discussion of the clinical course of benign prostatic hypertrophy in the first of these studies it has been shown that the hypertrophied prostate does not necessarily enlarge progressively and even when it does so, it does not necessarily produce an ever increasing degree of urinary obstruction. These facts are very significant, not only in relation to the expectant treatment of the non-obstructive case but also in the discussion of the relative merits of the various operations used to treat the obstructive case. It is commonly stated that any operation which does not remove all the hypertrophied tissue must, of necessity, be followed by early recurrence of obstruction. This is a common argument against the use of perurethral methods. In the present paper information is collected about the subsequent history of a group of patients who have been treated by perurethral prostatic resection. An attempt is made to assess the danger of recurrent obstruction. Other late complications of this operation are also considered.

Surgical Approaches to the Prostate.

The search for the safest and most effective method of relieving prostatic obstruction has been the object of much thought and effort. Great technical ingenuity has/

has been shown. The methods are many and their modifications almost innumerable.

Four approaches have been used with success.

1. The Suprapubic Approach. The incision passes through the abdominal wall and through the anterior wall of the bladder. The affected portion of the prostate is enucleated completely. Some normal prostatic tissue remains pressed outwards by the enlarging mass to form the capsule from which the noduler mass is removed. In the earlier forms of this operation the interior of the bladder was not visualised and suprapubic drainage was used invariably. In Thomson-Walker's operation (Sir John Thomson-Walker (1927)) the cavity is inspected, haemorrhage controlled by ligature, and a wedge of tissue resected from the posterior part of the ridge between the bladder and the prostatic cavity. In Harris' operation (S. H. Harris (1929)) an attempt is made to cover the raw surface with epithelium and the stitches used for this purpose also control haemorrhage. The bladder is frequently closed. In Wilson Hey's operation (H. Wilson Hey (1945)) haemostasis by diathermy is as complete as possible. A wedge is removed as in Thomson-Walker's operation. The bladder is closed.

2. The Perineal Approach. The hypertrophied mass

is enucleated through a perineal incision. The proximity of the sphincter adds to the difficulty of the operation and to the danger of incontinence. There is no interference with the bladder muscle which may, therefore, be expected to recover its normal action at an earlier stage.

3. The Retropubic Approach. Terence J. Millin (1946) demonstrated that this approach might be used successfully. The incision is made through the abdominal wall but the prostate is enucleated through an incision in the anterior wall of its capsule. In this way the prostate is removed without affecting the bladder muscle and without approaching the dangerous sphincter area. After a short experience of this operation Millin found it necessary to add the excision of a wedge from the posterior aspect of the vesico-prostatic region.

4. The Perurethral or Transurethral Approach. The first of these terms is the more accurate but the second has been used by the American exponents of this technique and is the one in general use. The idea of removing the obstructing tissue without open incision is very attractive and attempts were made as early as 1830. Great difficulty was encountered in the earliest efforts. In 1913 Young reported considerable success in the "punching out" of prostatic bars, by means of a circular/

circular knife sliding within the channel of the endoscope. He was much inconvenienced by haemorrhage. Stevens (1913), Bugbee (1913) and Luys (1913), all working independently devised methods of removing the tissue by electro-coagulation. The patient attended on numerous occasions and a small quantity of tissue was coagulated and allowed to slough away. Some success was reported but infection was a serious complication. These early methods represent the two distinct lines of evolution along which perurethral prostatic resection has progressed. In one the tissue is punched out, in the other it is removed by electrical means. Haemorrhage and infection continue to be the bugbears but their danger has been greatly reduced by technical advances.

The "punch" type of operation has been developed by the surgeons of the Mayo Clinic especially Braasch, Bumpus and Gershom Thompson. They have used the direct vision type of instrument. Vision is excellent even in the presence of considerable haemorrhage. The chief part of the instrument consists of two tubes, one sliding within the other. The end of the inner tube is sharpened to form a circular knife. The outer tube has a gap in its side. By appropriate movements of the instrument prostatic tissue may be made to project into the lumen and may be cut off. The instrument is also fitted with a diathermy electrode to coagulate bleeding vessels/

vessels. Throughout the operation the bladder is alternately filled and emptied. During the filling phase the region is inspected, tissue is cut and bleeding vessels are coagulated. Cut tissue passes into the bladder and is evacuated during the emptying phase. It is necessary occasionally to remove tissue from the bladder by means of a suction syringe.

The removal of prostatic tissue by electrical means has been developed by numerous surgeons of whom Stern, McCarthy, Davis, Barnes and Reed Nesbit have been specially prominent. This method was made possible by the introduction of a type of current which would cut tissue under water. The tissue is cut by a fine wire loop which can be moved backwards and forwards by means of a rack and pinion mechanism. Partial haemostasis is produced but arrangements are also made to use coagulating current to deal with troublesome haemorrhage.

Both types of instrument can be used very effectively by expert operators. The glandular tissue, the tissue of the bladder neck and the tissue of the prostatic capsule are easily distinguished from one another. It is, therefore, possible to remove the obstructing tissue and in many cases almost the entire hypertrophied portion.

The "punch" type of instrument has the advantage that very little tissue is coagulated thus reducing the danger of infection to a minimum. The visual field though/

though extremely clear is very small. The operator must accustom himself to move the instrument about and thus gain a composite picture of the field of operation.

It is probable that no two surgical units have identical indications for the use of suprapubic, perineal, retropubic and perurethral operations. Most surgeons have a favourite operation which they apply to a large majority of cases, other methods being used in cases where the favourite one does not appear to be suitable.

Pathological Types of Benign Prostatic Obstruction.

There are two chief types of benign prostatic obstruction.

1. Nodular hypertrophy. The mass of nodular tissue is separated from the compressed normal tissue which forms the capsule by a layer of loose tissue - an easy line of cleavage for the surgeon. Many terms such as bilateral lobe hypertrophy, posterior commissural hypertrophy, subtrigonal hypertrophy are in fairly common use and are merely descriptive of the part of the gland most markedly affected by nodular hypertrophy.

2. Prostatic bar. The gland is not markedly enlarged. Sclerosis, associated sometimes with some glandular hypertrophy prevents the normal opening of the bladder neck in micturition. There is no mass which can be enucleated. The conditions described as median bar, sclerosis/

sclerosis of the bladder neck, prostatic fibrosis, prostatisme sans prostate are similar.

The treatment of the prostatic bar is to cut a wedge from the posterior part of the bladder neck. This is done as effectively per urethram as by any other route. It is now generally agreed that perurethral surgery should be used for such cases. Difference of opinion occurs only in the nodular hypertrophies, by far the larger group. Modern technique permits the safe removal of prostatic tissue until the capsule is reached. It would not be suggested, however, that the removal of the affected portions is usually as complete as can be effected by the suprapubic, retropubic and perineal operations. What is the effect of the remnant of hypertrophied prostatic tissue left after the perurethral operations? Does it grow quickly and produce recurrent obstruction? Does it act as a source of persistent urinary infection? Does it produce less complete relief from symptoms? Is it a potential origin for malignant disease? It is with these questions that the present investigation is primarily concerned. Before discussing the late results of perurethral prostatic resection,however, it will be convenient to consider briefly the post operative course and immediate results of this operation.

Post Operative Course in Perurethral Prostatic Resection.

The mortality of perurethral prostatic resection in the hands of experts is, without doubt, very low. Between the years 1933 and 1942 at the Mayo Clinic 8,465 patients were treated by the cold punch technique with a mortality of 1.2 per cent (Emmett 1944). High mortality only occurs when this operation is attempted without a preliminary apprenticeship in cystoscopy and urethroscopy or when large resections are attempted after only a limited experience. The operation is frequently used to treat patients who are considered unfit for other methods. Laurence F. Greene and Gershom J. Thompson (1945) reported a group of 54 patients admitted with blood urea above 100 mgms. per 100 cc. and treated by perurethral resection at a time when the blood urea was still above 100 mgms. per 100 cc. Nine of these patients had a blood urea over 300 mgms. per 100 cc. at the time of admission. Fourteen of them had severe hypertension, ten had cardiac disease and there were numerous other examples of complicating diseases. Only one of the 54 patients died after operation. Charles W. Latcham and John L. Emmett (1945) reported 345 patients of over 80 years of age all treated by perurethral resection. There were nine deaths in hospital, a mortality rate of 2.6 per cent.

The/

The control of haemorrhage has been a major difficulty in perurethral prostatic resection and especially in the "punch" type of operation where tissue is cut by means of a cold knife. The fear of blood loss limited the use of Young's original instrument to the small prostatic bar. The position has been greatly improved by the introduction of electro-coagulation. However it is not practicable to coagulate every minute oozing point. It is doubtful if this could be done and the amount of dead tissue which would result would be a certain cause of infection. Haemorrhage in prostatic resection is a source of danger in two ways - by loss of blood and by obstruction due to clots. The first of these is certainly the less grave. It is not negligible, however, and Kretchner and Ockney (1944) found an average loss of 129.6 cc. in a series of 140 cases. All resection cases should have the blood typed before operation lest the need for transfusion should arise. The danger of obstruction by clots is a serious one. A small clot blocks the catheter. Blood which is extravasated thereafter lies in the bladder and coagulates there. In a short time the bladder is distended by a mass of clot. The writer has not found it necessary in any case to open the bladder supra-pubically to remove clot. A urethral cannula of wide bore and a suction syringe or a Bigelow evacuator have always/

always been successful. However, clot retention and its treatment add a considerable strain to the operation when the patient is frail or very aged. Great efforts have been made to prevent this complication. Most exponents of the "cold punch" type of operation have put their faith in mechanical washing out of the bladder. This has been done at the Mayo Clinic by orderlies using small bulb syringes. An irrigator with Y tube has been popular in other clinics. The amount of washing out varied with the haemorrhage but many cases required almost constant attention. For many years the writer employed a routine of washing out every ten minutes for the first six hours and at longer intervals till the end of the first forty eight hours. Some patients were sensitive to this treatment and found it irksome and even exhausting. Some had spasms of severe pain as small clots were washed from the bladder. In most cases the patient required to have constant attention from the nursing staff for a period of about six hours.

The procedure has been simplified to a remarkable degree by the introduction of Thrombin (Topical) as a haemostatic agent. This substance has the power of arresting haemorrhage by the formation of a thin adherent clot on a bleeding surface. It is prepared from mammalian blood and is stored in the dry state. It/

It dissolves readily in water but is less stable in solution. It is sensitive to heat, acids and alkalis. Special catheters have been devised for the application of this substance to the raw surface after prostatic resection. These are not necessary, however, and a simple technique described by O'Connor (1945) and by Bandler, Roen and Stept (1945) has been used with success by the present writer. Thrombin is used to simplify the post operative care and not to shorten the operation. All arterial bleeding points are coagulated with care and all clot is washed from the bladder. 10,000 units of Thrombin are dissolved in 10 cc. of normal saline and passed into the bladder and prostatic cavity through the catheter (One Iowa unit of Thrombin is the amount necessary to clot 1 cc. of fibrinogen solution in fifteen seconds). The catheter used is of the Foley type and its bag is distended and drawn gently into the prostatic cavity. The catheter is closed for one hour and then drained to a bottle by the bedside without any form of irrigation. Bandler, Roen and Stept (1945) compared 50 cases treated in this way and 50 cases treated by irrigations. In the series treated by Thrombin the urine became clear at an earlier stage and the post-operative stay in hospital was reduced.

Five/

Five cases of severe post-operative haemorrhage occurred in 50 cases treated by irrigation, one severe haemorrhage occurred when Thrombin was used. In the first 100 cases in which Thrombin was used by the present writer there was one case where clot had to be evacuated by cannula. In the previous 100 cases treated by irrigation six such cases had occurred. In addition the changing of catheters, blocked by small clots, was much less frequent in the Thrombin series. Reed Nesbit (1945) after a similar experience considered whether the irrigations might be harmful in themselves. As a control he treated six cases by simple catheter drainage without Thrombin or irrigations. In all six the catheters were blocked by clot. By this new technique the patient is saved from the pain and discomfort of irrigation and the nurse is relieved of much work and anxiety. In addition the apparent simplicity of the technique has a good psychological effect on the patient.

Criticisms of the operation and immediate post-operative course appear to be answered quite adequately. The low mortality in expert hands is not questioned. Many general surgeons treat "good risk" cases themselves and refer "bad risk" cases to a urological surgeon for perurethral resection. With Thrombin the post-operative/

operative course is very smooth indeed in the large majority of cases. For two or three days the patient is aware that his urine is being drained by catheter but he has no other form of discomfort or inconvenience. The absence of an abdominal wound is an obvious advantage from the point of view of comfort and of early mobility.

The Present Investigation.

The case against perurethral prostatic resection depends on the late results. The present investigation is a study of the subsequent history of a group of patients who have survived this treatment. The series is a consecutive one. Each of these patients at the time of his operation had sufficient evidence of obstruction to require operative treatment, according to the standards given in the first of these studies. All the operations were performed by the present writer. The technique was the Mayo Clinic one using the Gershom Thompson resectoscope. In the nodular hypertrophies the complete removal of all glandular tissue was attempted. This was probably less successful in the earlier than in the later cases. The anterior parts of the lateral lobes are more difficult to resect than the posterior parts. The middle lobe is the easiest region to resect. It is known that masses of moderate size were left in the/

the anterior region in some of the earlier cases. In a few cases, also, it was considered wise to interrupt the operation on account of the patient's general condition. Some of these had fairly good immediate results and a second operation was not advised. In the large majority of cases glandular tissue was excised in all directions until the capsular tissue was visible. It is reasonable therefore to draw conclusions about recurrent obstruction, infection and relief of symptoms, from the history of these cases.

On the other hand, this group is of little value in the discussion of the proportion of cases which ought to be treated by one or other method, as the standards in this respect have not been constant. During certain phases perurethral resection was used for almost all the cases where obstruction was treated and only a very small number of the very worst cases was treated by permanent suprapubic drainage. At other times a large proportion of bad risk cases was treated by cystostomy. During certain periods a considerable proportion of the larger glands was treated by open operation.

Most of the patients were seen at the Out-patient department a few weeks after they had been dismissed from hospital. For a variety of reasons some patients have/

have been referred back later by their doctors. Postal questionnaires were sent to the entire group in December, 1941, April, 1945, June,1946, and August, 1948. Many patients who had changed their addresses or who did not reply were traced by the Almoners Department. If the reply to a questionnaire suggested unsatisfactory progress the patient was asked to attend for examination. An attempt was made to see all surviving patients during the months of August and September 1948.

The first two tables show the duration of the follow up in each case. Five patients have been untraced since they were seen shortly after leaving hospital. Four of these were good immediate results, the fifth was considered somewhat doubtful. One of the five has gone to America, the other four are believed to be still alive and in this country but several changes of address have occurred and it has not been possible to trace them. These five cases are not included in the tables. The cases of nodular hyperplasia are shown separately from the cases of prostatic bar as the treatment of the latter is no longer controversial.

TABLE NO.1.

Duration of Follow Up.

Cases of Nodular Hypertrophy.

Serial Number		Age	Date of Operation.	Most Recent Information	Duration of follow - up Yrs.	Mths.
1	J.W.	55	Oct. 1937.	Visit Sept.'48.	10	11
2	J.S.	55	Dec. 1937.	Reply Sept.'48.	10	9
3	C.S.	61	Jan. 1938.	Died July 1938 (Carcinoma of colon).	-	6
4	S.J.	57	Jan. 1938.	Died Oct. 1942 (Cerebral thrombosis).	4	9
5	J.A.	56	Jan. 1938.	Visit Sept.'48.	10	8
6	R.R.	68	Feb. 1938.	Visit Oct.1948.	10	8
7	D.McI.	75	Feb. 1938.	Died Aug. 1938. (Arterio-Sclerosis)	-	6
8	D.McG.	50	Feb. 1938.	Reply Sept.'48.	10	7
9	R.P.	65	Feb. 1938.	Reply Sept.'48.	10	7
10	J.K.	67	Mar. 1938.	Died 1941.(Secondary carcinoma).	3	-
11	G.McG.	71	Apr. 1938.	Died 1940.(Cerebral haemorrhage).	2	-
12	H.T.	71	Apr. 1938.	Died 1941.(Cardiovascular disease).	3	-
13	A.B.	79	May. 1938.	Died 1940.(Coronary disease).	2	-
14	F.G.	70	May. 1938.	Died Sept.'45 (Coronary disease).	7	3
15	L.McK.	81	June 1938.	Died Nov.1943 (Cerebral thrombosis)	5	5
16	C.S.	66	June 1938.	Died 1941 (Carcinoma of colon).	3	-

Serial Number		Age	Date of Operation.	Most Recent Information.	Duration of follow - up Yrs.	Mths.
17	A.I.	68	June 1938.	Died 1940 (Pneumonia)	2	-
18	P.M.	73	June 1938.	Died 1941 (influenza).	3	-
19	F.M.	83	June 1938.	Reply Aug.1948.	10	2
20	A.B.	56	July 1938.	Visit.Oct.1948.	10	3
21	J.D.	65	Aug. 1938.	Visit Sep.1948.	10	1
22	A.S.	69	Aug. 1938.	Died 1945 (carcinoma of rectum)	7	-
23	A.W.S.	67	Aug. 1938.	Visit Sep.1948.	10	1
24	J.F.L.	61	Aug. 1938.	Visit Sep.1948.	10	1
25	J.M.	69	Sept.1938.	Died Oct. 1947 (cerebral thrombosis)	9	1
26	R.McL.	66	Oct. 1938.	Untraced since Feb. 1940.	1	4
27	A.R.	75	Nov. 1938.	Died 1941 (carcinoma of colon)	3	-
28	S.C.	62	Nov. 1938.	Visit Sep.1948.	9	10
29	A.M.	76	Dec. 1938.	Died Jan.1941 (sudden heart failure)	2	1
30	G.S.	70	Dec. 1938.	Reply Sep.1948.	9	9
31	T.S.	78	Jan. 1939.	Died 1941. (senile changes).	2	-
32	M.McP.	56	Jan. 1939.	Died about 1942. Cause not known.	-	-
33.	A.M.	72	Feb. 1939.	Reply Sept.1948.	9	7
34	J.M.	64	Feb. 1939.	Untraced Since Dec. 1941.	2	-
35	W.T.	73	Feb. 1939.	Reply Sep.1948.	9	7

Serial Number		Age	Date of Operation.	Most Recent Information.	Duration of follow - up Yrs.	Mths.
36	T.H.	73	Mar. 1939.	Untraced since 1945.	6	-
37	W.W.	56	May 1939.	Died Oct.1947 (cerebral haem-orrhage).	8	3
38	J.G.	73	June 1939.	Died Feb.1940 (cerebral haem-orrhage).	-	8
39	W.W.	78	July 1939.	Died 1942.(cardio vascular disease)	3	-
40	E.C.	67	July 1939.	Untraced since Oct. 1941.	2	3
41	G.M.	70	July 1939.	Died July 1944 ("Ulcer of back")	5	-
42	D.McD.	54	July 1939.	Reply Sept.1948.	9	2
43	J.M.	64	July 1939.	Visit Sept.1948.	9	2
44	H.D.	72	July 1939.	Died Apr. 1944. (cardiac asthma).	4	9
45	C.B.	72	Aug. 1939.	Reply Sept.1948.	9	1
46	A.M.	72	Aug. 1939.	Untraced since 1944.	5	-
47	R.D.C.	69	Aug. 1939.	Died 1941(Secondary malignant disease)	2	-
48	J.M.	58	Aug. 1939.	Visit Oct. 1948.	9	2
49	T.S.	69	Sept.1939.	Died Apr. 1941. (pyelonephritis)	1	7
50	D.S.	64	Sept.1939.	Visit Oct. 1948.	9	1
51	H.Y.	60	Sept.1939.	Reply Sept.1948.	9	-
52	A.M.	64	Sept.1939.	Reply Sept.1948.	9	-
53	J.M.K.	58	Nov. 1939.	Visit Sept.1948.	8	10
54	J.W.	78	Nov. 1939.	Untraced since June 1946.	6	7

Serial Number	Age	Date of Operation.	Most Recent Information.	Duration of follow - up Yrs.	Mths.
55	W.McL.84	Jan. 1940.	Died 1942 (Senile arterial disease)	2	-
56	A.M.C.69	Feb. 1940.	Died Mar.1947 (cerebral thrombosis).	7	1
57	J.S. 71	Feb. 1940.	Died 1942. (pyelonephritis)	2	-
58	R.H. 60	Apr. 1940.	Visit Sept.1948.	8	5
59	J.P. 71	Apr. 1940.	Died. Sept.1940. (Cause not known)	-	-
60	J.Mc.L75	Apr. 1940.	Died June 1944. (cardiac disease)	4	2
61	R.G. 72	May 1940.	Died 1942. (cardiac disease)	2	-
62	R.H. 71	May 1940.	Died about 1942. (cause unknown).	-	-
63	J.S. 70	May 1940.	Reply Sept.1948.	8	4
64	D.R. 64	May 1940.	Died Jan. 1941. (perinephric abscess)	-	8
65	E.McD.75	June 1940.	Reply Sept.1948.	8	3
66	J.G. 63	June 1940.	Died May 1948. (coronary disease)	7	11
67	P.L. 69	July 1940.	Died 1943.(carcinoma of bladder).	3	-
68	J.M. 54	July 1940.	Visit Sept.1948.	8	2
69	J.B. 69	July 1940.	Reply Sept.1948.	8	2
70	W.C. 67	Aug. 1940.	Reply Sept.1948.	8	1
71	H.G. 76	Aug. 1940.	Died June 1947. (myocarditis)	6	10
72	J.H. 62	Sept.1940.	Visit Sept.1948.	8	-
73	J.B. 69	Sept.1940.	Visit Oct. 1948.	8	1

Serial Number	Age	Date of Operation.	Most Recent Information.	Duration of follow - up Yrs.	Mths.
74	J.T.B. 72	Sept. 1940.	Died 1943 (anaemia)	3	-
75	A.K. 68	Sept. 1940.	Reply Sept. 1948.	8	-
76	J.O.K. 57	Oct. 1940.	Died Dec. 1942 (myocarditis)	2	2
77	T.M. 60	Oct. 1940.	Reply Sept. 1948.	7	11
78	J.W. 69	Nov. 1940.	Visit Oct. 1948.	7	11
79	J.D. 63	Dec. 1940.	Reply Sept. 1948.	7	9
80	J.F. 71	Dec. 1940.	Visit Oct. 1948.	7	10
81	J.F. 69	Dec. 1940.	Died Jan. 1943 (cardiac disease)	2	1
82	T.Q. 67	Dec. 1940.	Visit Oct. 1948.	7	10
83	J.R.D. 64	Dec. 1940.	Died Oct. 1948. (perinephric abscess)	7	10
84	J.G. 66	Jan. 1941.	Visit Sept. 1948.	7	8
85	G.B. 57	Jan. 1941.	Visit Oct. 1948.	7	9
86	J.McN. 68	Jan. 1941.	Died July 1948. (cardio vascular disease).	7	6
87	D.G.J. 57	Feb. 1941.	Visit Oct. 1948.	7	8
88	W.G. 71	Feb. 1941.	Died about Dec. 1941 (cardio vascular disease).	-	7
89	J.M. 68	Apr. 1941.	Died Apr. 1944. (cardiac disease).	3	-
90	F.Q. 63	May 1941.	Reply Sept. 1948.	7	4
91	J.B. 46	June 1941.	Visit Oct. 1948.	7	4
92	J.F. 51	Aug. 1941.	Reply Sept. 1948.	7	1
93	J.P. 60	Sept. 1941.	Died June 1946. (cardio vascular disease)	4	9

Serial Number	Age	Date of Operation.	Most Recent Information.	Duration of follow - up Yrs.	Mths.
94	C.A.S.70	Sept.1941.	Reply Sept.1948.	7	-
95	R.S.C.60	Sept.1941.	Visit Oct. 1948.	7	1
96	A.M. 73	Nov. 1941.	Reply Sept.1948.	6	10
97	A.H. 67	Nov. 1941.	Visit Oct. 1948.	6	11
98	R.McG.65	Nov. 1941.	Visit Sept.1948.	6	10
99	A.G. 56	Feb. 1942.	Reply Sept.1948.	6	7
100	J.T. 71	Feb. 1942.	Died Jan. 1945. (coronary attack)	2	11
101	J.W. 73	Feb. 1942.	Reply Sept.1948.	6	7
102	E.P. 82	Mar. 1942.	Died 1944. Senile arterial disease.	2	-
103	R.S. 67	Mar. 1942.	Visit Sept.1948.	6	6
104	A.W. 73	Mar. 1942.	Died 1944. (abdominal malignant disease).	2	-
105	A.D. 69	Apr. 1942.	Visit Oct. 1948.	6	6
106	G.E. 73	Apr. 1942.	Reply Sept.1948.	6	5
107	A.R. 69	Apr. 1942.	Reply Oct. 1948.	6	6
108	R.B. 72	May 1942.	Visit Oct. 1948.	6	5
109	J.A. 68	May 1942.	Reply Sept.1948.	6	4
110	W.M. 57	June 1942.	Visit Sept.1948.	6	3
111	F.A. 63	June 1942.	Visit Oct. 1948.	6	4
112	R.M. 70	June 1942.	Died July 1948. (cardio vascular disease).	6	1
113	J.M.M.48	June 1942.	Reply Sept.1948.	6	3
114	T.M. 77	June 1942.	Died 31st Aug. 1944. (cause unknown).	-	-

Serial Number	Age	Date of Operation.	Most Recent Information.	Duration of follow - up Yrs.	Mths.
115	H.K. 62	June 1942.	Died Dec. 1946 (carcinoma of stomach)	4	6
116	H.B. 58	June 1942.	Visit Sept.1948.	6	3
117	G.A. 64	July 1942.	Died Nov. 1942. (myocardial disease)	-	4
118	J.K. 67	July 1942.	Visit Oct. 1948.	6	3
119	J.K. 59	July 1942.	Reply Sept.1948.	6	3
120	J.M. 71	July 1942.	Died Sept. 1947. (ascites)	5	3
121	F.B. 64	July 1942.	Reply Sept.1948.	6	3
122	J.B.W. 68	July 1942.	Reply Sept.1948.	6	3
123	R.G. 73	Oct. 1942.	Died Dec. 1945. (coronary disease).	3	2
124	H.McC. 58	Nov. 1942.	Reply Sept.1948.	5	10
125	J.H. 70	Nov. 1942.	Visit Oct. 1948.	5	11
126	J.F. 79	Nov. 1942.	Visit Sept.1948.	5	10
127	M.McC. 71	Dec. 1942.	Reply Sept.1948.	5	9
128	J.W. 72	Dec. 1942.	Reply Sept.1948.	5	9
129	J.N. 74	Jan. 1943.	Reply Sept.1948.	5	8
130	J.G. 59	Jan. 1943.	Reply Sept.1948.	5	8
131	J.McL. 48	Feb. 1943.	Visit Oct. 1948.	5	8
132	J.E.R. 70	Feb. 1943.	Reply Sept.1948.	5	7
133	J.S. 64	Feb. 1943.	Died Jan. 1947. (carcinoma of stomach).	3	11
134	W.B. 74	Mar. 1943.	Reply Sept.1948.	5	6
135	J.A.W. 70	Mar. 1943.	Died May 1944. (pyelonephritis).	1	2

Serial Number	Age	Date of Operation.	Most Recent Information.	Duration of follow - up Yrs.	Mths.
136	A.D. 70	Mar. 1943.	Died Mar. 1948. (carcinoma of rectum).	5	-
137	J.McK. 73.	Mar. 1943.	Untraced since '44.	1	-
138	A.C. 57	Mar. 1943.	Reply Sept. 1948.	5	6
139	J.M. 76	Apr. 1943.	Reply Sept. 1948.	5	5
140	J.F.M. 50	Apr. 1943.	Visit Sept. 1948.	5	5
141	W.McQ. 63	May 1943.	Visit Sept. 1948.	5	4
142	W.M. 63	July 1943.	Reply Sept. 1948.	5	2
143	W.F. 60	July 1943.	Visit Sept. 1948.	5	2
144	T.W. 63	July 1943.	Died Jan. 1948. (pyelonephritis).	4	6
145	R.G. 63	Aug. 1943.	Visit Oct. 1948.	5	2
146	T.McG. 52	Aug. 1943.	Visit Sept. 1948.	5	1
147	R.B. 69	Sept. 1943.	Died Mar. 1944. (uraemia).	-	6
148	W.McF. 61	Oct. 1943.	Died Sept. 1948. (pyelonephritis).	4	11
149	J.L. 77	Nov. 1943.	Reply Sept. 1948.	4	10
150	W.O.H. 53	Nov. 1943.	Visit Oct. 1948.	4	11
151	H.A. 59	Nov. 1943.	Died Dec. 1943. Cause unknown.	-	-
152	Q.M. 75	Nov. 1943.	Reply Sept. 1948.	4	10
153	F.E. 60	Nov. 1943.	Visit Sept. 1948.	4	10
154	J.A. 65	Dec. 1943.	Visit Sept. 1948.	4	9
155	J.L. 72	Jan. 1944.	Visit Oct. 1948.	4	9
156	J.G. 64	Jan. 1944.	Died Sept. 1946. (carcinoma of stomach).	2	8

Serial Number		Age	Date of Operation.	Most Recent Information.	Duration of follow - up. Yrs.	Mths.
157	J.S.	63	Feb. 1944.	Reply Sept. 1948.	4	7
158	W.K.	72	Feb. 1944.	Died abroad 1947. Cause not known.	-	-
159	A.McG.	74	Feb. 1944.	Visit Sept. 1948.	4	7
160	W.G.	52	Feb. 1944.	Died July 1946. (cardio vascular disease).	2	5
161	J.J.	67	Mar. 1944.	Died June 1948. (carcinoma of stomach)	4	3
162	J.McK.	63	Apr. 1944.	Died 1945. (uraemia).	1	-
163	C.S.	54	Apr. 1944.	Visit Oct. 1948.	4	6
164	W.D.	73	Apr. 1944.	Visit Sept. 1948.	4	5
165	G.J.F.	75	May 1944.	Visit Oct. 1948.	4	5
166	D.McK.	59	May 1944.	Reply Sept. 1948.	4	4
167	R.H.	64	June 1944.	Reply Sept. 1948.	4	3
168	A.G.	49	June 1944.	Visit Sept. 1948.	4	3
169	E.M.	65	June 1944.	Reply Sept. 1948.	4	3
170	J.P.	70	June 1944.	Died Feb. 1948. (cardiac failure).	3	8
171	H.A.	61	June 1944.	Visit Sept. 1948.	4	3
172	W.C.	68	June 1944.	Reply Sept. 1948.	4	3
173	A.S.	74	Aug. 1944.	Visit Sept. 1948.	4	1
174	W.H.	65	Aug. 1944.	Reply Sept. 1948.	4	1
175	R.M.	62	Sept.1944.	Reply Sept. 1948.	4	-
176	D.B.	61	Oct. 1944.	Reply Sept. 1948.	3	11
177	J.H.	66	Nov. 1944.	Reply Sept. 1948.	3	10
178	T.G.	70	Dec. 1944.	Died 1947. (cardiac disease).	3	-

Serial Number	Age	Date of Operation.	Most Recent Information.	Duration of follow - up. Yrs.	Mths.
179	J.M.G. 57	Dec. 1944.	Reply Sept.1948.	3	9
180	A.F. 78	Dec. 1944.	Visit Sept.1948.	3	9
181	J.G. 65	Jan. 1945.	Visit Sept.1948.	3	8
182	J.G. 67	Feb. 1945.	Visit Sept.1948.	3	7
183	J.F. 77	Feb. 1945.	Visit Sept.1948.	3	7
184	T.R. 68	Feb. 1945.	Died cardiac disease.	-	-
185	T.McE. 63	Feb. 1945.	Visit Oct. 1948.	3	8
186	A.J. 57	Feb. 1945.	Died Feb. 1947. (cardiac disease).	2	-
187	F.S. 68	Feb. 1945.	Died Feb. 1947. (pyelonephritis)	2	-
188	R.B. 69	Mar. 1945.	Reply Sept.1948.	3	6
189	J.D. 73	Mar. 1945.	Visit Oct. 1948.	3	7
190	D.L. 68	Apr. 1945.	Visit Oct. 1948.	3	6
191	EAMcC. 62	Apr. 1945.	Reply Sept.1948.	3	5
192	J.G. 72	Apr. 1945.	Visit Sept.1948.	3	5
193	W.A.E. 65	Apr. 1945.	Died Sept.1947. (Bright's disease).	2	5
194	J.K. 63	May 1945.	Visit Sept.1948.	3	4
195	J.C. 64	June 1945.	Visit Sept.1948.	3	3
196	M.McC. 63	June 1945.	Visit Oct. 1948.	3	4
197	E.S. 60	July 1945.	Visit Sept.1948.	3	2
198	RAMcL. 76	July 1945.	Reply Sept.1948.	3	2
199	J.N. 71	Aug. 1945.	Reply Sept.1948.	3	1
200	J.S. 65	Aug. 1945.	Reply Sept.1948.	3	1
201	D.D. 63	Aug. 1945.	Visit Sept.1948.	3	1

Serial Number	Age	Date of Operation.	Most Recent Information.	Duration of follow - up. Yrs.	Mths.
202	A.McN. 59	Aug. 1945.	Reply Sept. 1948.	3	1
203	T.W. 74	Aug. 1945.	Died May 1948. (pyelonephritis).	2	9
204	W.P. 62	Aug. 1945.	Visit Sept. 1948.	3	1
205	J.F. 66	Sept. 1945.	Reply Sept. 1948.	3	-
206	J.P. 61	Sept. 1945.	Visit Oct. 1948.	3	1
207	J.M. 63	Sept. 1945.	Died Apr. 1947. (coronary disease).	1	7
208	J.McV. 65	Sept. 1945.	Visit Sept. 1948.	3	-
209	R.A. 55	Sept. 1945.	Reply Oct. 1948.	3	1
210	T.McW. 64	Oct. 1945.	Visit Sept. 1948.	2	11
211	T.H. 61	Oct. 1945.	Reply Sept. 1948.	2	11
212	T.D. 60	Oct. 1945.	Visit Oct. 1948.	3	-
213	A.S. 67	Oct. 1945.	Died Nov. 1947. (chronic nephritis).	2	1
214	J.McI. 64	Nov. 1945.	Visit Sept. 1948.	2	10
215	R.S. 70	Nov. 1945.	Visit Sept. 1948.	2	10
216	J.B. 53	Nov. 1945.	Reply Sept. 1948.	2	10
217	P.C. 63	Nov. 1945.	Reply Sept. 1948.	2	10
218	J.V.C. 69	Dec. 1945.	Visit Oct. 1948.	2	10
219	A.E. 67	Dec. 1945.	Visit Sept. 1948.	2	9
220	E.A. 56	Jan. 1946.	Reply Sept. 1948.	2	8
221	R.C. 56	Jan. 1946.	Visit Sept. 1948.	2	8
222	GFBH. 68	Jan. 1946.	Visit Sept. 1948.	2	8
223	D.M. 74	Jan. 1946.	Died Aug. 1946 (carcinoma of prostate).	-	7

Serial Number	Age	Date of Operation.	Most Recent Information.	Duration of follow - up. Yrs.	Mths.
224	A.G.R.63	Feb. 1946.	Untraced since 1947.	1	-
225	W.L. 65	Feb. 1946.	Reply Oct. 1948.	2	8
226	R.L. 67	Feb. 1946.	Visit Sept.1948.	2	7
227	C.B. 62	Feb. 1946.	Visit Oct. 1948.	2	8
228	T.D. 50	Feb. 1946.	Visit Oct. 1948.	2	8
229	J.B. 52	Feb. 1946.	Visit Oct. 1948.	2	8
230	D.H.W.68	Feb. 1946.	Untraced since 1947.	1	-
231	W.S. 78	Mar. 1946.	Reply Sept.1948.	2	6
232	J.C. 61	Mar. 1946.	Visit Sept.1948.	2	6
233	J.H. 51	Mar. 1946.	Visit Oct.1948.	2	7
234	J.P. 60	Apr. 1946.	Reply Sept.1948.	2	5
235	T.McC.67	Apr. 1946.	Visit Oct. 1948.	2	6
236	J.H. 62	Apr. 1946.	Visit Sept.1948.	2	5
237	W.S. 68	Apr. 1946.	Reply Sept.1948.	2	5
238	P.S. 69	June 1946.	Visit Sept.1948.	2	3
239	J.S. 78	July 1946.	Reply Sept.1948.	2	2
240	G.H. 60	July 1946.	Died Dec. 1946. (cardiac disease).	-	5
241	JBMcD.73	July 1946.	Reply Sept.1948.	2	2
242	W.P. 72	July 1946.	Reply Sept.1948.	2	2
243	A.M. 79	Aug. 1946.	Died early 1947. (cerebral haemorrhage)	-	6
244	A.K. 70	Oct. 1946.	Visit Oct. 1948.	2	-
245	G.T. 68	Oct. 1946.	Died 1947. (cardiac disease).	1	-
246	J.C. 59	Oct. 1946.	Visit Oct. 1948.	2	-

Serial Number		Age	Date of Operation.	Most Recent Information.	Duration of follow - up. Yrs.	Mths.
247	W.S.	67	Oct. 1946.	Reply Sept.1948.	1	11
248	E.A.	60	Oct. 1946.	Reply Sept.1948.	1	11
249	J.P.	66	Nov. 1946.	Reply Sept.1948.	1	10
250	R.D.C.	79	Nov. 1946.	Reply Sept.1948.	1	10
251	H.H.H.	57	Nov. 1946.	Visit Oct. 1948.	1	11
252	R.C.	74	Nov. 1946.	Visit Oct. 1948.	1	11
253	T.McB.	60	Dec. 1946.	Reply Sept.1948.	1	9
254	P.M.	66	Dec. 1946.	Visit Sept.1948.	1	9
255	A.P.	76	Dec. 1946.	Reply Sept.1948.	1	9
256	R.D.	58	Jan. 1947.	Visit Sept.1948.	1	8
257	G.C.	73	Jan. 1947.	Reply Sept.1948.	1	8
258	A.McA.	76	Jan. 1947.	Visit Sept.1948.	1	8
259	C.S.	49	Jan. 1947.	Reply Sept.1948.	1	8
260	D.L.	66	Feb. 1947.	Visit Sept.1948.	1	7
261	M.N.	66	Feb. 1947.	Reply Sept.1948.	1	7
262	J.H.	71	Feb. 1947.	Reply Sept.1948.	1	7
263	G.D.	60	Feb. 1947.	Visit Oct.1948.	1	8
264	J.T.	68	Feb. 1947.	Visit Sept.1948.	1	7
265	C.W.	64	May 1947.	Reply Sept.1948.	1	4
266	E.I.	73	May 1947.	Visit Oct. 1948.	1	5
267	A.M.	73	May 1947.	Reply Sept.1948.	1	4
268	D.B.	76	May 1947.	Died late 1947. (cerebral haemorrhage)	-	6
269	J.G.	59	May 1947.	Reply Sept.1948.	1	4
270	A.A.	68	June 1947.	Visit Oct. 1948.	1	4

Serial Number		Age	Date of Operation.	Most Recent Information.	Duration of follow - up. Yrs.	Mths.
271	F.T.	64	June 1947.	Died early 1948. (pyelonephritis).	-	6
272	J.M.	72	June 1947.	Visit Oct. 1948.	1	4
273	J.C.	61	July 1947.	Reply Sept.1948.	1	2
274	J.F.	68	July 1947.	Died Nov. 1947. (carcinoma of stomach)	-	4
275	J.C.	78	July 1947.	Died June.1948. (strangulated hernia)	-	11
276	J.F.L.	76	July 1947.	Reply Sept.1948.	1	2
277	W.D.	69	July 1947.	Visit Oct. 1948.	1	3
278	A.McD.	66	Aug. 1947.	Died Nov. 1947 (infective hepatitis)	-	3
279	A.R.	67	Aug. 1947.	Died Nov. 1947. (carcinoma of sigmoid)	-	3
280	J.K.	72	Aug. 1947.	Visit Sept.1948.	1	1
281	W.B.	62	Aug. 1947.	Visit Sept.1948.	1	1
282	G.K.	71	Aug. 1947.	Visit Sept.1948.	1	1
283	D.D.	70	Sept.1947.	Visit Oct. 1948.	1	1
284	W.B.	60	Oct. 1947.	Visit Sept.1948.	-	11
285	H.R.	59	Oct. 1947.	Died Jan. 1948. (cardiac disease)	-	3
286	R.S.	61	Oct. 1947.	Visit Oct. 1948.	1	-
287	J.S.	65	Nov. 1947.	Reply Sept.1948.	-	10
288	J.W.	72	Dec. 1947.	Visit Oct. 1948.	-	10
289	C.M.	64	Dec. 1947.	Visit Sept.1948.	-	9
290	J.E.M.	63	Dec. 1947.	Visit Oct. 1948.	-	10
291	W.S.	70	Dec. 1947.	Visit Oct. 1948.	-	10

TABLE NO. 2.

Duration of Follow Up.

Cases of Prostatic Bar.

Serial Number	Age	Date of Operation.	Most Recent Information.	Duration of follow - up. Yrs.	Mths.
292	A.C. 55	July 1938.	Untraced since 1943.	5	-
293	H.C. 68	Feb. 1941.	Visit Sept.1948.	7	7
294	A.A.F.41	Feb. 1941.	Reply Sept.1948.	7	7
295	O.W. 56	June 1941.	Visit Sept.1948.	7	3
296	J.W.J.45	July 1941.	Reply Sept.1948.	7	2
297	F.C. 57	Oct. 1941.	Visit Sept.1948.	6	11
298	M.S. 65	Dec. 1941.	Visit Sept.1948.	6	9
299	A.G. 52	Apr. 1942.	Visit Oct. 1948.	6	6
300	L.C. 51	June 1942.	Visit Sept.1948.	6	3
301	D.B. 68	Aug. 1942.	Visit Sept.1948.	6	1
302	J.H. 63	Dec. 1942.	Died 1944 (pneumonia)	2	-
303	W.M. 72	Feb. 1943.	Reply Sept.1948.	5	7
304	W.J. 31	May 1944.	Untraced since June 1946.	2	1
305	I.R. 49	May 1944.	Reply Sept.1948.	4	4
306	A.McA.65	June 1944.	Visit Sept.1948.	4	3
307	W.S. 59	June 1944.	Reply Sept.1948.	4	3
308	K.M. 42	Apr. 1945.	Reply Sept.1948.	3	5
309	J.A. 66	Jan. 1946.	Reply Sept.1948.	2	8
310	J.C. 68	Mar. 1946.	Reply Sept.1948.	2	6
311	J.K. 63	July 1946.	Reply Sept.1948.	2	2
312	A.McK.69	Sept.1947.	Reply Sept.1948.	1	-
313	D.McL.63	Oct. 1947.	Reply Sept.1948.	-	11

Deaths during the Period of the Follow up.

During the period of the follow up eighty-six patients have died. The causes of death are shown in Table No. 3.

TABLE NO. 3.

Causes of Death.

Cause of Death.	Number of Cases.
Carcinoma of stomach	5
" " colon	4
" " rectum	2
" " pancreas	1
" " bladder	1
Cerebral thrombosis	4
Cerebral haemorrhage	5
Arterio-sclerosis and general senile changes	11
Cardiac disease	22
Chronic nephritis	2
Pneumonia	2
Influenza	1
Anaemia	1
"Ulcer of back"	1
Infective hepatitis	1
Strangulated hernia	1
Ascites	1
Carcinoma of Prostate	3
Pyelonephritis with obstruction	2
Pyelonephritis without obvious obstruction	8
Perinephric Abscess	2
Cause unknown	6

In 42 cases death was due to disease of the heart or blood vessels and in most of these cases the disease was already evident and of advanced degree at the time of the prostatic resection. In one case of carcinoma of colon (No.3) the growth had been deemed inoperable and a colostomy performed before urinary obstruction occurred. A perurethral resection reduced the discomfort of the remaining months of life. In the case of carcinoma of bladder (No.67) no evidence of the growth was present at the time when the prostate was treated. Advice was not sought again until the growth was inoperable. Cystoscopy at that time showed no obvious change in the remnants of the prostate during a period of three years.

In six cases information about the patient's death was obtained very indirectly and the exact cause is not known. Three of these belonged to the group of patients who were advised to retain their suprapubic tubes after imperfect resections. This group is discussed later (p.187). One patient died abroad and it is known that he had a period of urinary symptoms about two years after his operation.

In the ten cases where death was due to pyelo-nephritis, the two cases where death was due to perinephric abscess and the three cases where death was due to carcinoma of the prostate there is a

definite/

definite relationship with the enlargement of the prostate or with its treatment. These cases will be considered in greater detail. In addition three patients who died of other causes had some urinary symptoms at the end of their lives. Patient No.61 had suffered from a severe cardiac condition for many years. He died two years after his prostatic operation. In the terminal months of his life he had some evidence of uraemia but no obvious recurrence of obstruction took place and the urine was not grossly infected. Patient No. 74 had suffered from anaemia of the pernicious type for many years. He died three years after his operation and had pyuria in the terminal stages. Patient No. 17 died of pneumonia but in this case also marked pyuria had been observed at intervals during the two years between his operation and his death. In the remaining 68 patients no recurrance of prostatic symptoms had occurred and there was no reason to believe that the enlarged prostate or its treatment had any harmful effect on the patient's health.

Deaths due to Carcinoma of Prostate.

In three cases death appeared to be due to carcinoma of prostate. The course in these cases will be given briefly.

Patient/

Patient No. 10. J.K. Admitted in March 1938 complaining of difficult, hesitant and frequent micturition. Prostatic resection 31st March 1938. The resected tissue showed no evidence of malignancy. Obstruction recurred early in 1941 and a second resection was performed. Histological examination showed carcinoma. Widespread secondary growths caused this patient's death within a year.

Patient No. 47. R.D.C. Admitted in August 1939 in very poor general condition and with distension of the bladder above the level of the umbilicus. Suprapubic cystostomy was performed. He was referred again in July 1943. The general health was much improved. Prostatic resection 25th July 1943. The urinary flow was considered unsatisfactory and the suprapubic tube was retained. He died the following year. There was evidence of widespread metastases, and his practitioner gave the cause of death as secondary carcinoma of prostate. Dr. Brian Davis (1948) had examined the resected tissue histologically and gave the diagnosis of benign hypertrophy. He thought that the epithelium showed signs of activity but no definite malignant change was seen. Reconsidering the sections later he thought that it was improbable that this patient died within a year of secondary prostatic carcinoma.

Patient No. 223. D.M. Admitted in December 1945 complaining of difficult micturition and having had a recent attack of acute retention. Prostatic resection produced satisfactory urinary function and he returned home. In April 1946 he lost the power of his right leg and this paralysis spread to the left leg and the lower part of the body. His death in August 1946 was considered to be due to carcinoma of the prostate. There was no evidence of malignant disease at the time of his operation.

A fourth patient No.21 has had recurrent obstruction and the clinical findings suggest malignant change in the prostate. He will be considered in greater detail in a later section.

Two patients Nos. 162 and 203 have died of recurrent obstruction and no information about the nature of the obstruction is available.

In this series of 313 apparently benign cases of prostatic obstruction four or at most six cases of malignant change have occurred. Most of the published work on this subject suggests that a larger proportion would be expected. Wilson and McGrath (1911) examined 468 prostatectomy specimens and found carcinoma in 15.5 per cent. Bibus (1938) examined 430 specimens and found malignant change in 4 - 5 per cent. It is probable that malignant change is present but has not yet/

yet shown itself in other cases in the series discussed in the present paper.

It is important to consider whether such patients might have been saved by an operation which removes the entire hypertrophied portion of the gland. If the malignant disease begins as a change in the nature of the cells of the hypertrophied portion, then, clearly, there is an advantage in the more complete type of operation. Evidence, which has already been discussed (p.114), suggests that this is not the normal origin of the disease. Much more frequently the malignant disease appears to develop in the part of the gland unaffected by benign hypertrophy. These findings suggest that the suprapubic, perineal or retropubic prostatectomist has no better chance of performing a complete excision of the malignant tissue than has the perurethral operator.

Deaths due to Urinary Infection.

Ten patients have died of pyelonephritis and two have died of perinephric abscess, the origin of which appeared to be renal infection. These cases form an important group worthy of special consideration.

In two cases there was a recurrence of obstruction in the prostatic region.

Patient No. 162 J.Mc.K. (aged 63) was admitted in April/

April 1944 with grossly distended bladder and overflow incontinence. Prostatic resection 14th April 1944. The resection was noted as incomplete at the time of operation but function was good and he was allowed to return home. On 30th March 1945 he was referred to another surgeon suffering from acute retention and in very poor general condition. A suprapubic cystostomy was performed but the patient died of ascending infection on April 12th 1945.

Patient No. 203 T.W. (aged 74) was admitted on 3rd August 1945 in acute retention and having had a long period of difficult micturition. Prostatic resection 8th August 1945. The immediate result was not good but after about a fortnight bladder function improved considerably. He returned home but slight difficulty occurred quite soon afterwards. He developed acute retention of urine in January 1948 and was referred to another surgeon. A suprapubic tube was inserted but he did not regain his health. He died of pyelonephritis on 4th May 1948.

In three cases the operation was recognised as a failure from the beginning.

Patient No. 64 D.R. (aged 64) was admitted in May 1940. Suprapubic cystostomy had been performed by another surgeon three months previously and it was hoped by prostatic resection to get rid of the tube and restore normal/

normal function. An attempt was made but normal micturition was not achieved. He was advised to retain his suprapubic tube. Death from perinephric abscess occurred six months later. A fairly heavy urinary infection was present when this patient was first seen and persisted to the end of his life.

Patient No. 147 R.B. (aged 69) was admitted on 24th September 1943. The bladder distension was obvious even on inspection and the general condition was very poor. A prostatic resection was attempted but a good immediate result was not obtained. As the general condition was alarming it was decided to insert a suprapubic tube. Only a slight temporary improvement in health followed and he died six months later. The cause of death was given as uraemia and the renal failure was no doubt due to ascending infection.

Patient No. 135 J.W. (aged 70) was admitted in February 1943. Numerous attacks of acute retention had occurred and his existence for some months had been almost "catheter life". A prostatic resection was performed on 2nd March 1943 and 40 grammes of tissue removed. Thereafter the patient was able to empty the bladder completely but micturition was painful and very frequent. The bladder was contracted and the urine was heavily infected. Medical treatment

of various kinds was tried but no improvement resulted. Suprapubic drainage also failed to produce comfort. The remainder of the prostate was removed by suprapubic operation and he died soon afterwards of ascending infection.

In the remaining seven cases the immediate result of the operation was good and evidence of serious infection occurred some time later.

Patient No. 49 T.S. (aged 71) was admitted in September 1939 suffering from extremely frequent and painful micturition. The bladder was distended. The general condition was very poor. X ray examination showed a large stone in the bladder. It was decided to remove this stone by open operation and leave a suprapubic tube in position for a few weeks. The general condition improved markedly. Prostatic resection was performed on 24th October 1939. Good bladder function resulted and the tube was removed. This patient reported in December 1940 that his general health was "very satisfactory" and "the action of the bladder normal". He was readmitted on 25th April 1941 suffering from severe urinary infection with evidence of uraemia and advanced dehydration. Evidence of urinary infection had been observed about two months before. He lived in a remote part of the country and there was delay in seeking advice. He died a few days

after/

after his re-admission to hospital.

Patient No. 71. J.S. (aged 71) was admitted in February 1940 suffering from difficulty in micturition. A prostatic resection was done and he made a good recovery. His general health was excellent and in a letter a few months later he boasted of his skill on the bowling green where he had won several prizes. He reported in December 1940 and in December 1941 that the intervals between acts of micturition were normal during the day but that he was disturbed occasionally at night. An attack of acute urinary infection occurred in the late months of 1942 which caused his death.

Patient No. 83 J.R.D. (aged 64) was admitted in December 1940 suffering from difficult, frequent micturition. A prostatic resection was performed with a good result. He reported in December 1941 that he had no difficulty in micturition and that he held his urine for three hours during the day and was disturbed once in the night. Replies in April 1945, June 1946 and August 1948 showed a similar state, the only change being a slight increase in night micturition, usually twice. A few weeks after his last reply to a questionnaire he developed an acute pyrexial illness and died on 9th October 1948. Post mortem examination showed a considerable perinephric abscess which had not

been/

been obvious on clinical examination and which was thought to be the primary cause of death. There was a moderate degree of urinary infection. An interesting additional finding was an area of carcinoma in the pancreas which had not developed sufficiently to produce symptoms. Some prostatic tissue was found in the anterior parts of the lateral lobes. In the region from which the middle lobe and posterior parts of the lateral lobes had been resected seven years ten months before there was a smooth surface running from the verumontanum into the bladder. It appeared that no regrowth of tissue had occurred in these regions and it is doubtful also whether the anterior masses had grown. Such masses of tissue might easily have been left at the original operation.

Patient No. 144. T.W. (aged 63) was admitted in July 1943 suffering from gross distension of the bladder with overflow incontinence. The general condition was poor and prostatic resection was preceded by suprapubic cystostomy. He made a good recovery. No difficulty in micturition was reported in April 1945 and in June 1946. The day intervals were about three hours. He was disturbed each night once (1945) and twice (1946). An attack of pyelonephritis occurred in January 1948 of which he died.

Patient No. 148 W.Mc.F. (aged 61) had a prostatic resection/

resection in October 1943 for difficult micturition. A year later he had some recurrent obstruction which was due to a small calculus. This was treated by lithotrity and he recovered good bladder function. He continued to be free from urinary symptoms until the beginning of 1948. Attacks of acute urinary infection occurred from that time until his death in September 1948. A residual urine estimation during his last illness showed only a negligible amount. Post mortem examination showed gross pyelonephritis on both sides. In the prostatic region the findings were almost identical with Case No. 83. There was a mass of moderate size in the anterior part of each lateral lobe but no evidence of growth in the region of the middle lobe or in the posterior parts of the lateral lobes.

Patient No. 187 F.S. (aged 68) was admitted in February 1945. A suprapubic tube had been inserted two years previously by another surgeon. Prostatic resection produced satisfactory micturition and the suprapubic tube was removed. His general health and bladder function remained excellent for almost two years. During this time he held an important position in business and undertook many long journeys including transatlantic flights. In February 1947 he died of pyelonephritis after a very short illness.

Patient No. 271 F.W.T. (aged 64) was admitted in November 1946 in an emaciated condition with gross distension/

distension of the bladder. The tone of the bladder muscle was so poor that it seemed unlikely that normal micturition could be achieved even if the obstruction were removed. A suprapubic tube was inserted. He recovered his health remarkably well and a prostatic resection was performed in June 1947 with an excellent result. Good function continued for some months though the urine remained infected. He died of pyelonephritis in January 1948.

Causes of Death - Summary and Conclusions.

86 patients have died during the period of observation.

Of these 71 have died of causes unrelated to prostatic obstruction or its treatment. Three of these 71 patients had some urinary symptoms in the terminal part of their lives.

Three patients have died of carcinoma in a prostate previously considered benign. It is very doubtful whether these patients would have gained any advantage from one of the other types of operation. Benign and malignant disease of the prostate appear to begin in different parts of the gland.

Twelve patients have died of urinary infection. In two of those there was definite recurrence of obstruction. The nature of this obstruction, whether benign or

malignant/

malignant, is not known. In three cases the operation was seen to be unsuccessful from the beginning. In the remaining seven cases the immediate result was good and serious clinical evidence of infection was observed after an interval of good health. The longest interval was seven years ten months.

After perurethral prostatic resection the danger of infection appears to be a much greater one than the danger of recurrent obstruction.

Recurrent Obstruction.

In selecting cases for operation great importance was given to the degree of difficulty in micturition described by the patient. In the absence of difficult micturition operation was rarely advised. The relief of this symptom has been regarded as the chief test of the success of the operation and when a patient has given an unqualified statement that he has no difficulty in micturition this has been accepted without further test. A few patients have stated that the flow is normally strong but that there is slight hesitancy or diminution in force in the mornings. Such patients have been asked to attend for one or more estimations of residual urine. If these estimations showed only a very small amount the difficulty in micturition was not considered significant. The present writer has not found it possible/

possible invariably to relieve difficulty in micturition by prostatic resection. Such failures have occurred for the greater part among those patients who had used suprapubic drainage for a long timeespecially in the presence of advanced senility or low mentality. Many of these patients had already been refused suprapubic prostatectomy by other surgeons.

In 51 of the present series of 313 patients there had been a period of suprapubic drainage before the prostatic resection and in nine of these the result of the resection did not justify the removal of the tube. In the remaining 262 patients there was no previous suprapubic drainage. In three of these (Nos. 147, 255 and 267) a permanent suprapubic cystostomy was performed after prostatic resection had failed. These were frail patients whose bladder muscles were very lacking in tone.

These failures must be noted as an indication of the limitations of the operation. In considering the danger of recurrent obstruction after prostatic resection they will be excluded. Six other cases must also be excluded. In three of them the cause of death is unknown and information about bladder function is also lacking. Two patients Nos. 224 and 230 had persistent frequency after prostatic resection and consulted another surgeon. Suprapubic removal of the remaining/

remaining prostatic tissue was performed. In another case (No. 174) haematuria occurred at a time when the present writer was not available. Another surgeon was consulted. Whether haemorrhage was severe is not known but it was considered necessary to remove the remaining prostatic tissue by suprapubic operation.

The exclusion of these cases leaves 295 cases for the study of recurrent obstruction after prostatic resection. Of these cases 274 were examples of nodular hypertrophy and 21 were prostatic bars. Cases where obstruction recurred will be considered individually and will be classified as follows.

1. Recurrent obstruction due to benign nodular hypertrophy.
2. Recurrent obstruction due to malignant disease of prostate.
3. Recurrent obstruction due to prostatic tissue of unknown type.
4. Recurrent obstruction due to prostatic bar.
5. Recurrent obstruction due to urethral stricture.
6. Recurrent obstruction due to meatal stenosis.

Recurrent Obstruction due to benign nodular hypertrophy.

Nine cases of this type occurred.

Patient No. 8. D.McG. (aged 50) was admitted in February 1938. Two attacks of acute retention had occurred/

occurred and the prostate was felt to be considerably enlarged, soft and homogeneous. Prostatic resection 12th February 1938. Good immediate function was followed within a few months by painful micturition and haematuria. A stone had formed around a piece of resected tissue which had not been evacuated. Lithotrity 7th June 1938. The patient returned home two days later and bladder function remained good until May 1943. Four attacks of acute retention occurred soon after that. Second resection 14th December 1943. A considerable mass of obstructing tissue was found chiefly in the lateral lobes, 25 grammes were removed. Since then there has been no difficulty in micturition. Urine is held for three hours during the day and sleep is interrupted once each night.

Patient No. 9. R.P. (aged 65) had an attack of acute retention in February 1938 and gave a history of frequent micturition. (Day every 1½ hours, night 4 times). Prostatic resection 26th February 1938. Frequency of micturition diminished and a strong flow of urine could be produced until 1943. Then a gradual decrease in the force of the flow began to be observed. Frequency increased again and an attack of acute retention occurred. Second resection 31st August 1945. Only small nodules of tissue were found. A total of 6 grammes was removed. Since then there has been no difficulty in micturition but/

but frequency is somewhat troublesome. (Day every two hours: night three times).

Patient No. 46. A.M. (aged 72) was admitted in August 1939 with incomplete retention of urine. A cerebral haemorrhage had occurred five years previously and the general condition was very poor. Prostatic resection 15th August 1939 gave an imperfect result. The patient was able to empty his bladder, however, and in the evacuation of patients at the beginning of the war he was allowed to return home. In January and March 1944 attacks of acute retention of urine occurred. He returned to hospital in June 1944 in a feeble state. Permanent suprapubic cystostomy was considered the safest procedure.

Patient No. 52 A.M. (aged 64) was admitted in September 1939 having had some difficulty in micturition for some years and a recent attack of acute retention. Prostatic resection 30th September 1939. Good bladder function followed the operation. Early in 1943 micturition became more frequent and there was pain at the end of the act. A vesical calculus was found and was crushed. He left hospital three days later. Bladder function remained normal until December 1947 when an attack of acute retention occurred. Second resection 2nd January 1948. 6 grammes of tissue were resected from the posterior parts of the lateral lobes and the region of the middle lobe. Since then the function/

function has been good. There is a strong flow of urine. He holds his urine four hours during the day and is not disturbed at night.

Patient No. 56. A.M.C. (aged 69) was admitted in February 1940 having had an attack of acute retention of urine. Two previous attacks had been relieved by catheter. Prostatic resection 20th February 1940. The day after operation the patient pulled out his catheter and refused to have it reinserted. He passed urine with some difficulty but insisted on returning home. Normally such a patient would have been re-examined endoscopically and it is probable that more tissue would have been excised. Two attacks of acute retention occurred during the next year and he was readmitted to hospital in March 1942. A second resection was performed. He replied to the questionnaires of April 1945 and June 1946 and stated that there had been no difficulty in micturition and that the intervals were of about three hours. He had no further difficulty in micturition and died in March 1947 of cerebral thrombosis and myocarditis.

Patient No. 63. J.S. (aged 70) was admitted in May 1940 complaining of frequent, difficult micturition and having had a recent attack of acute retention. Prostatic resection 28th May 1940. He left hospital seven days later having a strong flow of urine, undisturbed/

undisturbed during the night and holding urine four hours during the day. Replies to questionnaires December 1941, April 1945 and June 1946 indicated that function continued thus. He returned to hospital in January 1948 with distension of the bladder, overflow incontinence and urinary infection. A second resection was performed with the excision of 12 grammes of tissue, and the flow of urine has recovered its force.

Patient 70. W.C. (aged 67) was admitted on 15th August 1940 and gave a history of difficult micturition for many years. The bladder was palpably distended. Prostatic resection 20th August 1940. Bladder function was good until 1945 when occasional difficulty was noted. In November 1946 an attack of acute retention occurred and suprapubic cystostomy was performed by a surgeon in a County hospital. A second prostatic resection was performed on 3rd December 1946 with the excision of 29 grammes of tissue and the suprapubic sinus was allowed to close. In August 1948 micturition is reported as normal and without difficulty. The day intervals are about two hours and he is disturbed once each night.

Patient No. 92. J.F. (aged 48) was admitted in August 1941 having had a recent attack of acute retention. Prostatic resection 29th August 1941. The obstructing tissue was not large in amount but was clearly seen and the resection of 12 grammes appeared

to/

to remove it almost completely. Bladder function was good until February 1945 when another attack of acute retention occurred. Second resection 16th February 1945. 15 grammes of tissue were resected. Since then bladder function has been good. The replies to the questionnaires of June 1946 and August 1948 both stated that there was no difficulty in micturition, that the day intervals were of five to six hours and that sleep was not disturbed at all.

Patient No. 167. R.H. (aged 62) was admitted in May 1944 complaining of difficult and extremely frequent micturition. Prostatic resection 6th June 1944. A good immediate result was obtained. In April 1945 he reported no difficulty in micturition. He could hold his urine for three to four hours during the day and was disturbed once only at night. Function remained good until 1947 when micturition gradually became more frequent. Severe urgency was also experienced. The urine contained Gram positive cocci and numerous pus cells. There was no difficulty or hesitancy. Endoscopy (1st July 1947) showed no well marked regrowth of tissue. A few small pieces, about one gramme in all were resected as it was considered that a slight degree of obstruction might be the cause of persistent infection. In August 1948 he reported no difficulty in micturition but stated that he was disturbed two or

three times per night and held his urine for two to three hours during the day. The urine is still infected despite thorough medical treatment. The organism is now the Bact. Coli.

Recurrent Obstruction due to Malignant disease of prostate.

Two cases of this type have occurred. One of them No. 10 died as a result of widespread metastatic growths. This patient has already been considered (p.176).

The other patient No. 21. J.D. (aged 65) was admitted in September 1938 with gross distension of the bladder and overflow incontinence. He gave a history of difficult and frequent micturition. The flow of urine was quite strong until September 1944 when an attack of acute retention occurred. Resection was repeated on 8th September 1944. Histological evidence of carcinoma was not found but a very hard irregular mass was felt in the right lobe of the prostate on rectal examination. At this time the left lobe of the prostate was of average consistency, quite homogenous and with a smooth surface. As carcinoma begins in the posterior part in many cases it is probable that it had not reached the urethral aspect from which the tissue was removed. It is uncommon, however, in the writer's experience for the histological appearance of the resected tissue to be benign when the

clinical/

clinical findings suggest malignancy. It appears that the malignant process has usually spread far enough in the direction of the urethra to be included in a resection. In the case at present being considered, there was a good result from the operation. There has been no difficulty in micturition. Urine is held for three hours during the day. The bladder is somewhat irritable soon after the patient retires but he usually sleeps undisturbed from 2 a.m. till 7 a.m. Examined per rectum in September 1948 the whole gland is irregular, hard and fixed. The serum acid phosphatase is within normal limits (2.8 King Armstrong units) and there are no symptoms of secondary growths. Endocrine treatment is being given.

Recurrent Obstruction due to prostatic tissue of unknown type.

Two patients occur in this group. In both cases (No. 162 and 203) prostatic obstruction recurred after operation and advice was not sought until the patient was very ill. Suprapubic cystostomy was performed in both cases and both died fairly soon afterwards. They have been discussed previously (p.179). The writer did not see either of these patients at the time of their second operation and no information is available about the state of the prostate gland. One or both

may/

may have been examples of carcinomatous change. Indeed this seems quite probable in view of the low incidence of malignant disease in the whole series.

Recurrent Obstruction due to prostatic bar.

Three recurrences have been observed in the series of cases of prostatic bar.

Patient No. 298. M.S. (aged 65) was admitted in December 1941 in very poor general condition. Micturition was extremely difficult. The urine contained abundant pus cells and was heavily infected with Gram positive cocci. A prostatic bar had been resected by suprapubic operation by another surgeon ten years before. On the occasion in 1941 perurethral resection of a typical fibrous bar produced a return to normal function which continued until 1947. Gradually increasing difficulty was experienced and another perurethral resection was performed on 24th November 1947. He reports in August 1948 that the flow of urine is strong and that he holds his urine for four or five hours by day and by night.

Patient No. 303. W.M. (aged 68) was admitted in February 1943 complaining of frequent, difficult micturition and a weak flow of urine. The obstruction was of the bar type and a perurethral resection was performed (26th February 1943). A good flow of urine

was produced after the operation but frequent micturition continued. Obstruction recurred in 1946 and a second resection was performed. He reports in August 1948 that there is no difficulty in micturition though frequency is still troublesome at night. (Day every three hours: night two or three times).

Patient No. 307. W.S. (aged 59) was admitted in June 1944 complaining of frequent difficult micturition with some hesitancy and urgency. On 30th June 1944 a prostatic bar was resected and function was good immediately afterwards. Symptoms recurred in January 1945 and a second resection was performed. In August 1948 he reports intermittent difficulty but the intervals between acts of micturition have become normal. He has been examined endoscopically in London by Mr. Alban Andrews who found no evidence of recurrent obstruction and believed the present condition to be mainly psychological. (J. Alban Andrews (1947)).

Recurrent Obstruction due to Urethral Stricture.

Prostatic resectoscopes are large instruments and in the course of a resection a considerable amount of manipulation is necessary. It is not surprising that post operative stricture sometimes occurs. Detractors of the operation have exaggerated this danger. It need/

need only occur rarely if instruments are handled with reasonable care and if the operation is not attempted when the urethra is so narrow that the instrument cannot be passed easily. This latter precaution does not limit the use of prostatic resection very much. Urethrae too narrow to accommodate the smaller size of resectoscope are rare. In the present series five examples of post operative stricture have occurred.

Patient No. 5. J.A. (aged 56) was admitted on 24th January 1938, having had an attack of acute retention. Micturition had been hesitant and difficult for some months. Prostatic resection 29th January 1938. A stricture of the anterior urethra followed and has been the cause of occasional phases of difficult micturition. Bougie treatment has not been difficult and has produced complete relief. However, the difficulty tends to recur if regular treatment is not given and this patient attends at intervals of one or two months. He has remained in good health during the ten and a half years since his operation. His blood pressure tends to be rather high and haematuria occurs occasionally. Examination of the urinary tract shows no lesion to account for this. The blood loss has never been great and no harmful results have followed. He holds his urine for four hours during the day but is disturbed twice each night.

Patient/

Patient No. 79. J.D. (aged 63) was admitted in December 1940 complaining of difficult micturition. The residual urine was only two ounces but the difficulty was extreme and operation was advised. Prostatic resection 5th December 1940. A stricture of the anterior urethra followed and he still attends regularly for bougie treatment. An adequate flow of urine is produced but frequency is troublesome at night (four to five times).

Patient No. 128. J.W. (aged 72) was admitted in December 1942 complaining of difficult micturition and haematuria. The bladder was palpable. Prostatic resection was performed and the immediate result was good. The flow became variable in force and frequency of micturition increased in 1944. A tight stricture of the anterior urethra was found and did not respond to bougie treatment. He was readmitted on 4th March 1944 and external urethrotomy was performed. The immediate result was good but difficulty soon recurred. He was readmitted on 14th June 1944. A scrotal fistula had developed. A mass of scar tissue was excised and the ends of the urethra were sutured. He attended for bougie treatment afterwards but as no evidence of recurrent obstruction was found he was allowed to stop this treatment. He attended for examination on 1st April 1948 and a 12/15 bougie passed

with/

with ease. He reported in August 1948 that no difficulty was experienced in micturition. The intervals during the day are about four hours and he is disturbed twice each night.

Patient No. 142. W.M. (aged 58) was admitted in July 1943 complaining of difficult and frequent micturition. The residual urine measured three ounces. Prostatic resection 5th July 1943. The immediate result was good but obstruction recurred and was found to be due to a stricture 4½ inches from the external meatus. Bougie treatment was successful until 1948. In May 1948 external urethrotomy was performed. Bougie treatment is being continued. He reported in August 1948 that there is no difficulty in micturition. The day intervals are of about three hours. He is disturbed once each night.

Patient No. 170. J.P. (aged 70) was admitted in June 1944 complaining of difficult micturition and having had a recent attack of acute retention. Prostatic resection gave a good immediate result but difficult micturition recurred the next year and was due to urethral stricture. Bougies could not be passed and external urethrotomy was performed (19th June 1945). Bougie treatment was continued at increasing intervals - at first a few weeks, later

six/

six months, finally a year. He died of cardiac failure on 11th February 1948 having had no recurrence of obstruction.

Recurrent Obstruction due to meatal stenosis.

Sometimes the urethra is quite adequate to accommodate the resectoscope except at the external meatus. In such cases the external meatus is opened up with scissors. At a later time the narrowing of the meatus may recur. In some cases it becomes definitely narrower than before operation. The patient usually reports some change, such as distorsion of the jet of urine, before real obstruction has been produced. The treatment is simple. Under local anaesthesia an incision is made to increase the size of the external meatus in a ventral direction. The skin and mucous membrane are united on both sides by fine catgut stitches. This operation has been necessary in twelve cases in the present series. It has not been considered necessary to give details of these examples of this simple complication.

Recurrent Obstruction. Summary and Discussion.

The causes of recurrent obstruction have been as follows:-

Benign/

Benign nodular hypertrophy	9 cases
Carcinoma of Prostate	2 cases
Prostatic growth (histology unknown)	2 cases
Prostatic bar	3 cases
Urethral stricture	5 cases
Meatal stenosis	12 cases

33 cases of recurrent obstruction have occurred in a series of 295 patients, an incidence of 11 per cent. The danger of recurrence has been a strong criticism of perurethral prostatic resection and these figures appear to give support to this attitude. However it is not reasonable to consider each type of recurrent obstruction with equal gravity. The danger, discomfort or inconvenience produced by each type must be assessed and those peculiar to one form of prostatic operation must be distinguished.

The twelve patients who had recurrent meatal stenosis had only a slight disturbance of the routine of their lives. One brief out-patient attendance eliminated this cause of obstruction.

Of the five patients who developed post-operative stricture, two have been kept well by bougie dilatation. Both are very tolerant of this type of treatment but a large number of attendances has been required in both cases and the inconvenience produced has therefore been considerable. Of the other three patients, one/

one has had two operations performed on the urethra and two have had one operation. The result in all five cases has been good. Four are alive and well. The fifth died three years after his urethrotomy. There was no evidence of obstruction and death was due to cardiac failure. Urethral stricture is, without doubt, a very disturbing complication but the present study suggests that its incidence has been exaggerated in the literature. For example Grant and Lich (1948) refer to post-operative stricture as a "frequent sequela" of perurethral prostatectomy and Millin (1947) comments on the "high incidence" of this complication. The incidence in the series discussed in this paper was 1.7 per cent.

In the case of prostatic bar the essential part of the operation is the same whether the approach is suprapubic or perurethral. There is no reason to suppose that there will be any difference in recurrence rate. One of the three recurrent cases in the present series was already a recurrent case from suprapubic surgery when first examined by the writer.

Two, possibly three or four, patients have had recurrent obstruction from the development of carcinoma in a prostate previously showing evidence only of benign hypertrophy. Evidence discussed previously (p.114) suggests that this complication is almost as likely/

likely to occur after suprapubic, perineal or retropubic operations as after the perurethral procedures. The writer has seen several patients who had had a recent suprapubic prostatectomy and who were suffering from malignant disease of the prostate.

In nine cases recurrent obstruction was due to growth in the remaining tissue affected by benign nodular hypertrophy. In two other cases growth of benign tissue may also have been the cause. These two patients were treated by other surgeons and the available information suggests that they were in very poor condition before they sought advice. Both were treated by suprapubic cystostomy. One died a fortnight after the drainage operation and the other only survived a few months. Of the nine cases seen by the writer one was in very poor condition. A suprapubic tube was inserted and he returned home. He has not been traced since then and it is probable that he has died. The remaining eight patients had a second resection with good results in all cases. One of these died five years later of cerebral thrombosis. There was no recurrence of prostatic obstruction. The other seven are still alive and have efficient bladder function. The period since their second perurethral resection is 4½ years, 3½ years, 3 years, 1½ years,

1/

1 year and in two cases 8 months. Patient No. 167 is included in this group because he had a second resection. He had made no complaint of difficulty in micturition, however, and a few small pieces of tissue were removed in the hope of relieving a chronic urinary infection. In the writer's experience during the period of observation benign prostatic tissue has caused recurrent obstruction in 3.7 per cent of cases if all possible cases are included and in 2.4 per cent if the definite ones only are included. The period of observation in some cases is quite short however, and the final recurrence rate from regrowth of tissue will be higher than the figure given.

Table No. 4 shows information about the eight patients who have had a definite recurrence of obstruction due to growth of benign prostatic tissue.

TABLE NO. 4.

Serial Number		Age	First Operation	Second Operation	Interval Yrs.	Months.
8	D.McG.	50	Feb.'38.	Dec.'43.	5	10
9	R.P.	65	Feb.'38.	Aug.'45.	7	6
46	A.M.	72	Aug.'39.	Jne.'44.	4	10
52	A.M.	64	Sep.'39.	Jan.'48.	8	4
56	A.M.C.	69	Feb.'40.	Mar.'42.	2	1
63	J.S.	70	May '40.	Jan.'48.	7	8
70	W.C.	67	Aug.'40.	Dec.'46.	6	4
92	J.F.	48	Aug.'41.	Feb.'45.	3	6

Emmett (1944) believes that the recurrence rate at the Mayo Clinic is decreasing rapidly as a result of improved instruments and technique. In the present investigation there is no definite example of recurrence from a benign growth in any case treated since August 1941. This suggests strongly that experience is reducing the risk of recurrence. However, it must be noted that the two cases of unknown histology have occurred since 1941. Also, the average interval between resection and recurrence is six and a half years, excluding the two cases (No. 46 and 56) where the immediate result was imperfect. Some years must pass before it will be possible to estimate the recurrence rate of this series with accuracy but it is extremely improbable that it will reach the "enormous percentage" mentioned by Grant and Lich (1948) and numerous other writers.

Gershom Thompson (1935) points out that a second resection is easier for the patient and for the surgeon than the first operation. Emmett (1944) has found that patients who return for a second resection are "a satisfied and appreciative group of patients. They regard further transurethral operation as a comparatively minor procedure and accept it without fear or concern." The experience of the present writer has been similar.

Other methods of prostatectomy are not free from risk/

risk of recurrence. Millin (1942) found in his records fifty three cases of post prostatectomy obstruction, the result of operations by himself and other surgeons. The original operations in this series were as follows.

Freyer	27
Thomson Walker	4
Harris	8
Perineal	2
Unknown	12
	53

As the Freyer operation is by far the one most frequently performed this series does not indicate that any operation is more likely than another to be followed by obstruction. The cause of obstruction in Millin's series was as follows:-

Complete membrane due to "cross union" of the torn edges of mucous membrane at either upper or lower extremity of the prostatic cavity.....2 cases.

"Shelf" formation probably due to contraction of the circular muscle at the bladder neck, unopposed, after prostatectomy, by the trigonal muscle.....26 cases.

Reformation of prostatic "adenoma"..... 1 case.

Small "adenomata"..... 7 cases.

Calculi in prostatic bed..... 2 cases.

Stricture of prostatic bed..... 9 cases.
Stricture of urethra..... 3 cases.
Stricture of meatus..... 1 case.
Papillary carcinoma of bladder neck..... 1 case.
Papilloma of prostatic cavity..... 1 case.

Millin treated all of these cases without mortality. In 42 cases perurethral methods were used.

In the ten year period 1933 to 1942 the surgeons of the Mayo Clinic treated 102 patients who suffered from recurrent obstruction after suprapubic or perineal prostatectomy (Emmett (1944)). In 36 of these cases the obstructing tissue was malignant although the original operation had been done for benign hypertrophy. In 66 cases the obstructing tissue was benign and in 20 of these obstruction recurred after a period of less than two years.

It is not possible from Millin's figures or from Emmett's figures to estimate the proportion of cases which develop recurrence after the different types of open prostatectomy. Millin (1942) was of the opinion that 2 per cent of all cases had recurrent obstruction but this could be little more than an intelligent guess. It is extremely probable that recurrent obstruction is commoner after perurethral operations than after open operations but it is unlikely that the difference is sufficient in itself to offset the great advantages of the/

the perurethral operations.

It is interesting to compare the incidence of recurrent obstruction in nodular hyperplasia and in prostatic bar. For this purpose the cases of obstruction due to urethral stricture and to meatal stenosis may be omitted. These complications have causes unrelated to the type of prostatic lesion. In 273 cases of nodular hypertrophy, recurrent growth, benign or malignant, caused obstruction in 13 cases, an incidence of 4.8 per cent. In 21 cases of prostatic bar there was recurrent obstruction in 3 cases, an incidence of 14.3 per cent. The high incidence of recurrence in prostatic bar is not surprising to any surgeon experienced in perurethral prostatic resection. In nodular hyperplasia the glandular tissue, the tissue of the bladder neck and the tissue of the capsule are easily distinguished from one another. The operator may continue resecting glandular tissue with safety until the bladder neck or capsule is reached. In the case of the prostatic bar the position is quite different. Fibrous tissue is resected from the beginning and the object is merely to remove enough to permit a good flow of urine. There is no definite indication when the operation is complete and there is a strong temptation to err on the safe side.

It is interesting also to consider this series in relation to the views which have been expressed about the natural course of benign prostatic obstruction. For this purpose the present investigation may be regarded as an animal experiment. A group of men whose prostates were affected by nodular hypertrophy have had a portion of the gland removed but in each case some of the affected tissue has been left behind. In 260 cases this remaining tissue has caused no obstruction to the outflow of urine. This group includes not only those who have had no symptoms of recurrent obstruction but also those cases in which the treatment of a urethral stricture or a meatal stenosis restored normal function. The periods during which these patients have been followed is shown in Table No. 5.

TABLE NO. 5./

TABLE NO. 5.

Period of Observation.

Nodular Hypertrophy without Recurrence.

Period of Observation.	Number of cases.
Over 10 years.	9
9 - 10 "	11
8 - 9 "	9
7 - 8 "	17
6 - 7 "	23
5 - 6 "	22
4 - 5 "	26
3 - 4 "	39
2 - 3 "	50
1 - 2 "	33
Less than one year.	21

The amount of hypertrophied glandular tissue remaining after a perurethral prostatic resection is often small but it is very significant that this tissue has caused no obstruction in 20 cases during a period of over 9 years and in 91 cases during a period of over 5 years. The progress of this group of patients supports strongly the view expressed on page 2 , that (1) the prostate which has begun to enlarge does not necessarily continue to/

to do so and (2) that continued enlargement does not necessarily produce increased obstruction.

On several occasions cystoscopic examinations have been performed on patients who had been treated several years previously by perurethral prostatic resection. In some of these the appearances have suggested some growth in the remaining tissue. In many there was no evidence of growth. The post-mortem examinations of patients No. 83 (p. 182) and No. 148 (p.184), showed a smooth surface passing from the bladder neck to the verumontanum on the posterior and on the greater part of the lateral aspects of the prostatic capsule. In some cases the patient has made no complaint of difficult micturition, there has been no residual urine, the endoscopic appearances have not indicated any growth but rectal examination has shown a definite increase in the bulk of the gland. According to Joly's theory (J. Swift Joly (1924)) the prostate whose lobes form a wide open crater leading into the urethra is not obstructive. It has been shown (p.61) that the prostate which by its form is non-obstructive has a strong tendency to remain so. It may be that in certain cases the effect of perurethral prostatic resection is to change the form of the prostate from an obstructive to a non-obstructive type. In such cases/

cases growth may continue without producing obstruction.

The close relationship between age and progressive obstruction, which was shown (p. 76) has not been found in the series treated by prostatic resection. In the eight cases where growth of benign tissue caused recurrent obstruction only two were under 60 and in two cases the age was over 70. In these cases, however, the progress is influenced by the completeness or incompleteness of the resection. Also it must be noted that most of the cases treated expectantly had never had gross distension of the bladder. The opposite is true in most of the cases treated by operation. In the very aged patient the bladder tone is not readily recovered. Some say it is never recovered. (Keyes and Ferguson). It may be that lack of bladder tone prevents the more senile patient from overcoming a mild recurrent obstruction.

Urinary Infection.

The male urethra has a normal bacterial flora. Among the commonest organisms which occur in the urethra of a healthy subject are the Staphylococcus albus, the Streptococcus faecalis and a group of organisms classed as micrococci (Dukes 1939), but many other types are found occasionally. There is an obvious danger of transferring organisms from the urethra to the bladder in all procedures which include the introduction of catheters or other instruments. Wilson Hey (1945) considers this danger so important that he has devised a prostatectomy technique in which the passage of instruments from the urethra to the bladder is scrupulously avoided. At the end of his operation a catheter is passed from the bladder outwards. The danger of introducing infection is present in most forms of prostatectomy and is probably greater in the perurethral methods on account of the large size of the instruments and the multiplicity of manipulations. Flocks (1937) has pointed out another reason for infection after perurethral resection. In a study of the blood supply of the prostate he found that there are normally two group of arteries - (1) the urethral group which enter the prostate from the vesico-prostatic junction and supply the part of the prostate nearest to the urethra and (2) the capsular group which course

along/

along the external surface of the gland sending in branches over practically the whole surface and supplying the outer part of the gland. Prostatic hypertrophy begins in the part of the gland supplied by the urethral group and as hypertrophy progresses these arteries increase in size. Flocks has demonstrated that the hypertrophied portion receives its blood supply almost entirely from arteries which enter at the vesico prostatic junction. Now this is the region at which a prostatic resection begins, and these vessels are normally coagulated at an early stage. The rest of the hypertrophied portion is thereby deprived of most of its blood supply. If a fairly complete resection is carried out no harm is done. If so much tissue is left that it cannot be supplied by the capsular group of arteries, then a devitalised mass will remain which will soon become infected.

Clearly it is of importance to consider the subject of post-operative infection, in view of these theoretical considerations and also of the fact that twelve patients in the series discussed here ultimately died of pyelonephritis. (p.178). Most patients after the immediate post operative phase pass urine which is perfectly clear on naked eye examination and the simple test of inspection is often considered sufficient in this/

this and other types of prostatic surgery. However, it must be noted that several of the patients who died later of pyelonephritis, had no obvious evidence of infection for a considerable period, in one case over seven years. The incidence of lesser degrees of chronic urinary infection is worthy of investigation.

All patients resident in or near Glasgow were invited to attend. 111 responded and a mid-stream specimen was obtained from each of them. This procedure is simple. The patient is provided with two sterile bottles and is asked to pass some urine into each. It is assumed that the urethral organisms are removed by the first one and the state of the bladder and upper urinary tract is assessed from the second specimen. This method is considered by Dukes (1939) and many others as satisfactory for bacteriological tests if examined within a few hours. When delay in examining the specimen was expected it was stored in a refrigerator. The specimens were examined by Dr. Brian Davis and his assistants in the Clinical Laboratories, The Victoria Infirmary, Glasgow. In consultation with Dr. Davis the reports have been divided into two groups - those with and without evidence of infection. The presence of an abnormal number of leucocytes in the urine has been regarded as the most important indication of infection. Organisms without leucocytes have been considered/

considered to be contaminants. Dukes (1939) considers the leucocytes to be normal if these are less than 10 per cubic millimetre of urine. In the specimens discussed here no leucocyte count was made but the standards were strict and a number about 10 per cubic millimetre was invariably reported as abnormal.

Table No. 6 . gives some information about the urine examination in the infected cases.

Table No. 7 . gives the same information about the non-infected cases.

Under Albumin: + = a trace and ++ = a definite positive reaction.

Under Leucocytes: 0 = number of leucocytes within the limits of normal, + = slight increase, ++ = moderate increase, +++ = great increase.

Under Organisms in Film an indication is given of the number of organisms seen on direct examination.

Under Culture: + = scanty growth, ++ = moderate growth, +++ = heavy growth.

The coagulase test has been used to distinguish between pathogenic and non-pathogenic staphylococci. The result is shows as coag. +ve or coag. -ve. In mixed growth the predominant organism is shown first. The bacteriological terminology is that used in Topley and Wilson's Principles of Bacteriology and Immunity (1940).

TABLE NO. 6.

Urine Examination. Infected Cases.

Serial Number	Albumin	Leucocytes	Organisms in Film.	Culture.	Organisms in Culture
20	++	++	+++	++	Bact.coli.
28	+	+++	++	++	Str. faec. Bact.coli.
43	++	++	+++	+++	Bact.coli.
50	+	++	+++	+++	Ps.pyocyan.
58	0	++	+++	+++	Bact.coli.
72	+	++	++	++	Bact.coli.
78	+	++	+	++	Bact.coli.
80	++	++	+++	+++	Bact.coli.
97	+	+++	++	+++	Bact.coli.
98	++	+++	+++	+++	Bact.coli.
103	+	++	++	+++	Bact.coli. Str. faec.
116	++	+++	+++	++	Diphtheroid org. Bact.coli.
126	+	++	+++	+++	Bact.coli. Str.faec.
134	++	+++	++	++	Staph. alb. (coag -ve) Ps.pyocyan.
143	+	+++	+++	+++	Bact.coli. Str. faec.
146	+	++	+++	+++	Bact.coli. Str. faec.
153	++	++	+++	++	Bact.coli. Staph.aur.
164	++	++	+++	+++	Bact.coli. Str. faec.

Serial Number	Albumin	Leucocytes	Organisms in Film.	Culture.	Organisms in Culture.
165	+	+	+++	++	Bact. coli. Str. faec.
167	++	+++	+++	+++	Bact. coli.
168	+	+	++	+	Staph. alb. (coag. -ve)
181	+	++	+++	++	Bact. coli.
182	0	++	+++	+++	Bact. coli.
194	0	++	+	+	Staph. alb. (coag. -ve)
210	++	+	+	+	Bact. coli.
212	+	++	0	0	-
214	+	++	+++	+++	Bact. coli.
238	++	++	+++	+++	Prot.vulgar. Bact. coli.
244	++	++	+++	+++	Bact. coli.
252	+	+	++	+++	Bact. coli.
260	0	++	+++	++	Ps.pyocyan.
262	+	+++	++	+++	Bact. coli.
264	0	+	++	+++	Bact. coli.
280	++	+++	++	+	Bact. coli. Str. faec.
282	0	++	++	+++	Prot.vulgar.
284	0	+	0	0	-
288	+	+	++	++	Bact. coli.
295	+	+++	+++	+	Bact. coli.
301	++	+++	+++	+	Bact. coli. Str. faec.

TABLE NO. 7.

Urine Examination. Non Infected Cases.

Serial Number	Albumin	Leucocytes	Organisms in Film.	Culture.	Organisms in Culture.
1	0	0	+	++	Staph. alb. (coag -ve)
6	0	0	+++	+++	Bact. coli.
21	+	0	0	0	-
23	0	0	++	++	Bact. coli.
48	0	0	+	+	Bact. coli.
68	0	0	+	0	-
73	0	0	0	0	-
85	0	0	0	0	-
87	0	0	0	0	-
91	0	0	0	0	-
95	0	0	0	0	-
105	0	0	0	0	-
108	0	0	0	0	-
110	+	0	0	0	-
111	0	0	0	0	-
118	0	0	0	0	-
125	0	0	0	0	-
131	0	0	+	+	Bact. coli.
140	0	0	+	0	-
141	0	0	+	++	Bact. coli.
145	0	0	0	0	-
150	0	0	+	++	Bact. coli. Str. faec.

Serial Number	Albumin	Leucocytes	Organisms in Film.	Culture	Organisms in Culture.
154	+	0	0	0	-
155	++	0	+	0	-
159	+	0	+	+	Staph. alb. (coag. -ve)
163	0	0	0	0	-
171	0	0	0	0	-
173	+	0	+	+	Staph. alb. (coag. -ve)
180	++	0	++	+++	Bact. coli. Str. faec.
183	+	0	0	0	-
189	0	0	0	0	-
190	0	0	0	0	-
192	+	0	0	0	-
195	+	0	+	++	Bact. coli. Staph. alb. (coag. -ve) Str. faec.
196	+	0	+	+	-
197	0	0	0	0	-
201	+	0	0	++	Staph. alb. (coag. -ve)
204	0	0	0	0	-
206	0	0	0	0	-
208	+	0	+	++	Bact. coli. Staph. alb. (coag. -ve)
215	++	0	+	++	Staph. aur. (Coag. +ve)
218	+	0	0	0	-

Serial Number	Albumin	Leucocytes	Organisms in Film.	Culture	Organisms in Culture.
219	+	0	+	+++	Prot. vulgar
221	0	0	0	0	-
222	0	0	+	++	Bact. coli. Str. faec.
226	0	0	0	0	-
227	0	0	0	0	-
228	0	0	0	0	-
229	+	0	+++	+++	Bact. coli.
232	0	0	+	+	Staph. alb. (Coag. -ve) Bact. coli.
233	0	0	0	0	-
235	0	0	+	++	Str. faec. Bact. coli.
236	0	0	0	0	-
246	0	0	+	+	Str. faec.
251	0	0	0	0	-
254	0	0	0	0	-
256	0	0	0	0	-
258	++	0	0	++	Bact. coli.
263	+	0	0	0	-
266	+	0	0	0	-
270	++	0	0	++	Bact. coli.
277	0	0	0	0	-
281	0	0	0	0	-
283	0	0	0	++	Bact. coli.
286	+	0	0	0	-

Serial Number	Albumin	Leucocytes	Organisms in Film.	Culture	Organisms in Culture.
289	++	0	+	++	Ps. pyocan.
290	0	0	+++	+++	Bact. coli.
291	0	0	0	0	-
298	++	0	0	+	Staph. alb. (coag. -ve) Str. faec.
299	0	0	0	0	-
300	+	+	0	0	-
306	++	0	0	+	Bact. coli.

Of 111 cases examined 39 have shown evidence of urinary infection, - an incidence of 35 per cent. These patients were seen in the course of a follow up investigation and there was no reason to suppose that they were in an acute phase. It may be assumed, therefore, that chronic urinary infection follows perurethral prostatic resection in about one third of all cases treated by the writer. This is a subject which demands attention especially in view of the fact that twelve deaths from ascending infection have occurred in the series.

This complication is not, by any means, confined to perurethral operations on the prostate. Cases of pyuria after other forms of prostatectomy are commonly seen. It is not usual in describing the results of these operations to give details of the bacteriological examination of the urine. Authors are usually satisfied if they can say that the patient is passing a clear urine, a statement which could have been made in a large majority of the cases discussed here. Also it is not usual to attempt to follow the patient to the end of his life as has been done in the present investigation.

In those cases where the operation was performed on a patient who had a previous suprapubic cystostomy the incidence of chronic urinary infection was specially high. Thirteen cases of this type were included in the series/

series of patients whose urines were examined. Nine of those showed evidence of infection, - an incidence of 69 per cent compared with 35 per cent in the whole series. However, these figures are not nearly so significant as they appear. Suprapubic cystostomy is used by all surgeons for cases of very bad operative risk and it is very probable that grave urinary infection was present in many of these patients when they sought advice for the first time.

Frequency of Micturition.

It has been shown (p. 71) that the degree of frequency of micturition has little or no significance in the assessment of the danger to life and health produced by an enlarged prostate. It is, however, one of the most obvious features to the patient and when an extreme degree is reached exhaustion may be produced by lack of sleep and great mental distress may occur from interference with normal social life.

The frequency of micturition stated at various stages of the present investigation is given as an appendix (p.244). The first table shows the day frequency and the second the night frequency. The simplest form of question on this subject asks the patient to state the interval between acts of micturition/

micturition by day and the number of times he is disturbed each night. It is in this form that the figures are given in the appendix. It must be noted in assessing progress that an increasing number in the day frequency table shows improvement while the opposite is true in the night frequency table. When exact information could not be obtained the case has been omitted from the tables. This occurred in many cases when questions were asked after a patient's death. The general practitioner and the relatives of the patient knew that he had experienced no difficulty in micturition and that frequency was not troublesome but, naturally, they were unable to give exact times.

A general examination of the tables shows a considerable number of cases where frequency was not relieved. It is natural to associate this finding with the high incidence of chronic urinary infection which has been found (p.224). However, the relationship is not very close. In the group of 111 patients whose urines were examined bacteriologically twenty-four had a regular or occasional frequency of more than twice per night. The distribution of these cases is shown in Table No.8.

Table No. 8. /

Table No. 8.

Chronic Urinary Infection and Persistent Frequency of Micturition.

	Total.	Cases with persistent frequency.
Infected Cases.	39	16
Non-infected Cases.	72	8

Persistent frequency of micturition is about four times commoner among the infected than among the non-infected cases. It is probable that chronic urinary infection is the cause of this symptom in some cases but it is clear that other causes must also be effective. Eight patients whose urine showed no evidence of infection had persistent frequency. On the other hand, eight patients whose urine was infected were undisturbed at night and seven others of the same group were disturbed, at most, once.

Unsuspected recurrent obstruction with residual urine would explain the frequent micturition in these cases but this has been eliminated in a large majority. Patient who have returned with this complaint have always had a residual urine estimation. When the symptom has been noted in the answer to a questionnaire the patient has been asked to attend for this purpose.

In the tables (p.244) the records of 247 cases are shown./

shown. Of these patients 39 are disturbed more than twice per night, an incidence of about 16 per cent. If cases are included where the patient is occasionally disturbed more than twice per night the number rises to 54 (21 per cent). Prostatic operations of other types also fail to relieve patients of this symptom in many cases. Riches and Muir (1933) investigated the post operative course of a series of suprapubic operations by nine different surgeons. The patient was disturbed more than twice per night in 12 of a series of 68 cases (17 per cent).

The examination of individual cases of persistent frequency shows some where infection is known to be present and others where it may be reasonably assumed, for example, patients who were catheterised frequently during months or years before they sought advice from a surgeon. When prostatic enlargement and urinary infection occur in the same patient, the two conditions are not invariably related to one another. Before advising operative treatment the surgeon should feel sure that the prostate is causing some obstruction. This decision is rendered more difficult by the fact that infection tends to cause a diminution in the amount of residual urine (Ogier Ward (1943)). In the present series one patient of this type No. 224 was wrongly advised. The result was an increase in frequency/

frequency and the infection remained unresponsive to medical treatment.

In five cases of persistent frequency there was no evidence of infection before or after operation. In all five the residual urine before operation was less than two ounces. In addition to an extreme degree of frequency four of them complained of difficulty in micturition. The fifth was an exceptional case. His chief complaints were extreme urgency and incontinence. (Patients who had no difficulty in micturition and only a small amount of residual urine were normally treated expectantly (p. 27)). No other lesion was found and it was thought that the prostate might be the cause. Four of these patients were relieved of their difficulty in micturition and the fifth was relieved of his incontinence. However, extreme frequency persisted in all five. Many similar patients, that is, patients suffering from frequent and difficult micturition and with low residual urine, have been relieved at least partially of their frequent micturition. In ten such cases in the present series the intervals became normal.

It is not surprising that the results, as regards frequency of micturition, are difficult to foretell in such cases. The detrusor has hypertrophied to overcome an obstruction and has been successful or almost successful in doing so. The obstruction is removed and the/

the sphincter must be left in a weak state relative to the detrusor. The final result depends on the capacity of these two muscles to recover the normal balance. The study of this group confirms the view that operation should not readily be advised for frequent micturition alone (p. 71). It may be justifiable in extreme cases but the result is uncertain.

The most satisfactory type of case from the point of view of the relief of extreme frequency is the patient with a considerable amount of residual urine, provided that infection is absent and can be avoided. In such cases the result is almost invariably good.

Incontinence of Urine.

Incontinence of urine is often stated to be a common complication of perurethral prostatic resection. When the operation is performed by a surgeon with little experience of cystoscopy and urethroscopy and without the help of an expert in this operation, it is probable that many cases of permanent incontinence are produced. Such a surgeon might easily excise a part of the sphincter muscle. When the operation is properly performed, however, this error will not occur. The verumontanum is easily recognised and tissue should never be cut below the level of this landmark. If this rule is observed the sphincter will never be cut. It

may/

may suffer, however, from a temporary loss of tone. In performing a large resection wide movements of the instrument are sometimes necessary and these cannot be accomplished without some strain on the sphincter muscle. Also the weakness of the sphincter relative to the detrusor, which results in some cases, and which has been discussed in connection with persistent frequency (p.230), is more obvious after perurethral than after most of the other types of operation. There has been no interference with the detrusor or the abdominal wall and the patient attempts normal micturition at an early stage.

In the present series a brief period of incontinence was not uncommon in the first few days after the removal of the catheter . In one case No. 24 treated in August 1938 the urine trickled from the patient's urethra without his knowledge for twenty four hours. Within a few days he recovered control and during the ten years which have elapsed he has passed urine at normal intervals. He is disturbed at most once per night. In four cases incontinence persisted for a few months then gradually disappeared. In one of these there was a period of two and a half years of complete control but recurrence took place. He had gone abroad and no details were available. The other three continued to have complete control. In one case incontinence/

incontinence continued for more than a year but natural recovery took place and appears to be permanent. In two cases the incontinence persisted for several years. One of these patients had been incontinent for many years before his operation. This was due to a nerve injury. He had been involved in a motor accident and X ray examination showed gross damage to the sacrum. Incontinence continued after his prostatic resection but was not related to it. The other patient developed incontinence as a direct result of his prostatic resection in 1938. Phases of improvement occurred but incontinence continued for more than three years. He was treated by a procedure described by Millin (1939). In this operation a midline incision is made from the root of the scrotum to the central point of the perineum. The bulb is exposed by blunt dissection, the bulbo-cavernosus muscle divided along its median raphe and its two halves drawn laterally. The corpus spongiosum containing the cavernous urethra is then separated from its loose attachment to the triangular ligament. A piece of ribbon catgut is then passed twice round the corpus spongiosum and tied tightly, a bougie having been passed along the urethra. In the writer's case this operation was very successful. The patient could sleep eight hours without being disturbed and could undertake normal exertions without accident./

accident. He developed cerebral thrombosis nine months later but even then he retained complete control until his death. Millin (1939) reported three successful cases. It is probable that this operation would only succeed in a case where the sphincter had almost recovered. Other surgeons have had unsatisfactory experience of it (Lane 1947).

Incontinence of urine has been troublesome in seven cases in the present series. The only case of permanent incontinence was due to causes unrelated to the prostatic obstruction. In perurethral resection for malignant prostatic obstruction incontinence occurs more frequently and is more likely to persist. Incontinence occurs very rarely indeed after suprapubic prostatectomy but is an occasional complication of perineal operations. It is not common, however, when the operation is performed by a surgeon of experience in the perineal approach. Young (1926) reports 450 cases with three examples of incontinence.

Urinary Calculus.

Obstruction is a definite aetiological factor in the causation of urinary calculus and it is not surprising that prostatic enlargement and urinary calculus are fairly commonly found together.

In twelve cases in the present series calculi were present/

present in addition to prostatic obstruction at the time when they were referred for treatment. In two of these the stone was very large and the general condition very poor. In these cases the stone was removed by a suprapubic operation and a period of drainage was advised before the prostatic resection was performed. In the remaining ten cases the stone was removed by lithotrity.

The relationship between prostatic obstruction and calculus formation was shown very clearly in Case No.296. During the years 1937-1941 this patient had four bladder stones at intervals of about fifteen months. These were treated by lithotrity and although a prostatic bar had been observed it was not considered sufficiently marked to justify resection. In 1941 the bar was resected and no stone has formed in the seven years which have elapsed.

In seven cases stones have developed after perurethral prostatic resection. The intervals between the resection and the diagnosis of the calculus were as follows: 4 months, 1 year, 3 years, 4 years (2 cases) and 6 years (2 cases). Six of these patients were treated by lithotrity. In the seventh case there were several large stones and they were removed by suprapubic operation. In one of these cases the patient died four years later of pyelonephritis.

Health/

Health in the interval had been good. In two of the seven cases obstruction recurred about five years after the removal of the stone. The occurrence of a calculus after a prostatic resection should arouse suspicions about recurrent obstruction and a careful search should be made for obstructing tissue which has been left at the original operation or which has grown in the interval.

The Future of Perurethral Prostatic Resection.

The results of perurethral prostatic resection as shown by the present investigation gave three chief reasons for dissatisfaction.

1. The high incidence of chronic urinary infection.

2. The persistence of frequent micturition in a considerable proportion of cases.

3. The fact that twelve patients have died ultimately of ascending urinary infection.

These defects are all related to the spread of infection from the urethra and they are, by no means, confined to the perurethral method. The danger of chronic urinary infection is a subject to which all varieties of prostatectomist should direct their attention. Whether it is necessary to adopt the revolutionary methods of Wilson Hey is doubtful. It seems/

seems a pity to discard the great advantages of the perurethral method especially in the absence of definite bacteriological evidence that Wilson Hey's method produces a low rate of chronic urinary infection.

The writer has made efforts by other means to reduce the risk of infection. During the last eighteen months all patients have been given Penicillin 200,000 units twice daily and Sulphacetamide 1 gramme three times daily beginning one day before operation and continuing until four days after operation. The immediate results show a distinct improvement. More recently efforts have been made to sterilise the urethra. Bladder and urethral instillations have been given using a fluid of the following composition.

Sodium penicillin	0.1 mega units.
2:8 Aminoacridine hydrochloride	0.01 gm.
Sodium sulphacetamide	1.5 gm.
Pyrogen free sterile water	100 c.c.

Experiments conducted by Dr. Brian Davis and his assistants in the Clinical Laboratories of the Victoria Infirmary showed that these were the most effective proportions of these antibacterial substances against the common organisms. Variations of this technique are still on trial and at the present time the results are/

are inconclusive.

The other complications, continued growth of prostatic tissue, post-operative stricture of the urethra, incontinence of urine and calculus formation were neither sufficiently common nor sufficiently serious in their effects to balance the advantages of the perurethral technique. The incidence of these complications has never been high and with increasing experience it is diminishing.

SUMMARY AND CONCLUSIONS.

The surgical approaches to the prostate are discussed briefly.

Benign prostatic obstruction is of two types - nodular hypertrophy and the prostatic bar. Many terms used in the literature are synonymous with these or describe the part of the gland chiefly affected by nodular hypertrophy.

It is agreed by most surgeons that the prostatic bar should be treated by perurethral methods. There is great diversity of opinion about the place of perurethral resection in the treatment of nodular hypertrophy.

There is little criticism of the immediate results of perurethral prostatic resection. The mortality is low and the convalescence is smooth, especially since the introduction of the Thrombin technique. The writer's experience with this technique is described.

The chief criticism of perurethral prostatic resection concerns the late results.

A group of 313 patients is studied. They were treated by perurethral resection during the period between October 1937 and December 1947. Five cases treated during the same period are untraced since operation/

operation and are omitted. The general method of investigating the progress of these patients was the same as in the follow up of the group treated expectantly. Questionnaires were sent in December 1941, April 1945, June 1946 and August 1948.

86 patients have died during the period of observation. Of these 71 died of causes unrelated to the prostatic obstruction or its treatment. 3 patients died of carcinoma of the prostate, no evidence of this having been found at the time of operation. 12 patients died of urinary infection. 10 of these had no evidence of recurrence of obstruction and several of them had long periods of apparently good health between their operation and their final illness.

Reasons are given for the exclusion of 18 cases in the consideration of recurrence of obstruction.274 cases of nodular hypertrophy remain. In 13 of these recurrent prostatic obstruction has occurred. The obstructing tissue was benign in 9 cases, malignant in 2 cases and in 2 cases the histology was unknown.

The 9 cases of known benign recurrence of obstruction were all referred to the writer. In one of these the general condition did not justify a second resection and suprapubic cystostomy was performed. The other 8 have had a successful second resection. One

died/

died 5 years later of cerebral thrombosis without recurrence. Seven are alive and free from obstruction.

The 2 cases where the histology is unknown were in very poor general condition and were referred to other surgeons. Both were treated by suprapubic cystostomy and died soon afterwards.

Of 21 cases of prostatic bar 3 had recurrent obstruction - a much higher incidence than in the cases of nodular hypertrophy. In perurethral resection for prostatic bar it is much more difficult to judge how much tissue should be removed.

Suprapubic and perineal operations are not free from the risk of recurrent obstruction. Millin found 53 examples in his own records. Emmett found 102 examples in the records of the Mayo Clinic for a period of ten years.

Perurethral prostatic resection does not remove all the hypertrophied tissue but the tissue left behind has caused no obstruction in 260 cases. 20 of these have been followed for over 9 years, 91 for over 5 years.

Five cases of post operative urethral stricture have occurred. All have been treated successfully, two by repeated bougie dilatation and three by external operations on the urethra.

The/

The urine of 111 previous resection cases was examined bacteriologically and evidence of chronic infection was found in 39 cases. Chronic urinary infection also occurs after other forms of prostatectomy.

Frequent micturition has persisted after operation in a considerable proportion of cases. Definite information about the intervals between acts of micturition was obtained in 247 cases and of these 39 are disturbed more than twice per night. Similar results have been described after suprapubic prostatectomy. Chronic urinary infection explains some cases of persistent frequency of micturition. This symptom is most likely to occur in the type of patient who had very frequent micturition before operation but had only a small amount of residual urine.

Incontinence of urine for a few days after the catheter is removed is not uncommon. In seven cases the incontinence persisted for several months and in three of these for more than a year. One recovered as a result of an operation to constrict the urethra just distal to the sphincter. One patient is still incontinent but in his case there is a gross injury of the sacrum from a motor accident and the cause of the incontinence is probably unrelated to the prostate. Incontinence is very rare after suprapubic operations but occurs occasionally after perineal prostatectomy./

prostatectomy.

Prostatic obstruction and urinary calculus are commonly associated. In twelve cases in the present series both conditions were found at the first examination. In seven cases perurethral resection was followed, usually with an interval of several years, by the formation of a stone. Two of these seven patients developed recurrent obstruction at a later stage. Stone formation after prostatic resection is, therefore, suggestive of an imperfect result or of obstructive regrowth of prostatic tissue.

The chief reasons for dissatisfaction with the results of perurethral prostatic resection are the incidence of chronic urinary infection and of persistently frequent micturition. In an effort to reduce these sequelae penicillin and the sulphonamides are being used in various ways. These defects are not confined to perurethral methods but the comparative incidence after different operations is not easily determined.

In other respects the results of perurethral prostatic resection have been satisfactory. The incidence of recurrent obstruction from the continued growth of prostatic tissue is not high and when it occurs it is easily treated. Post operative stricture of the urethra/

urethra is also rare and has also responded to treatment. Incontinence of urine is usually of brief duration and almost always disappears spontaneously.

It cannot be claimed that perurethral prostatic resection has established its position except in the case of the prostatic bar. This method has many advantages, however, and the results of the present investigation justify its continued use. There is reason to hope that recent advances in chemotherapy will eliminate the chief defects of this operation.

APPENDIX

Day Frequency

The figures represent the average interval in hours. Decreasing frequency is, therefore, shown by an increasing number.
An extreme degree of frequency is shown +++.
When the patient has given no time but simply stated that the intervals are normal this is indicated by "norm."

	2	2-3	-
	2	2-3	3
	2	3	-
		norm.	norm.
		2-3	
		4-7	
		-	

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
1	1	-	2	-	2
2	3	-	3	4+	4+
5	2	3	3	3-4	3-4
6	+++	-	3	3-4	3
8	1	4	3	2-3	3
9	1½	2	2	2	2
14	1½	2-3	2-3	-	-
15	4	4	-	-	-
20	2	4-5	3-4	4-5	4
21	3	-	2	2	3
22	1½	1½	2-3	-	-
23	+++	norm.	norm.	norm.	norm.
24	2-3	3	3-4	3-4	3-4
25	2	3-4	4	3-4	-
28	1½-2	2	2	2	2-3
30	2-3	4-5	4-5	4-5	4-5
33	-	-	3-4	3-4	4
36	2	2-3	-	-	-
37	2	2-3	3	3	-
41	2	3	-	-	-
42	3	norm.	norm.	norm.	norm.
43	3	2-3	2½-3	3-4	2-4
44	2-3	4-7	-	-	-
45	-	-	2-3	2-3	2-3
46	+++	4	-	-	-

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
48	-	4	4-5	5	5
50	-	-	2-4	-	2½-3
51	++	2	2-4	2-3	2-3
52	3-4	-	3	3	3½-4
53	2	4	4-5	4	3½-4
54	1½	3-4	3-4	3-4	-
56	3½	2-3	2-3	2½-4	-
58	-	3-4	1-2	3-4	3-4
60	ev.hr.	3-5	-	-	-
63	ev.hr.	4	2	2	1
65	++	2	2	1	1
66	4-5	6	4-6	4-6	-
68	-	2	2	2	2
69	1	3-4	norm.	-	4
70	1½	2½-3	2	-	2
71	1-3	2-3	2-3	2-3	-
72	2-3	4	4-5	norm.	norm.
73	2	3	3-4	3-4	3
74	2	3-4	-	-	-
75	3-4	3	3	3½	2½-3
76	2-3	3-4	-	-	-
77	2	3	3	3	3
78	-	2-4	2-3	3	4
79	2	-	3-4	3-4	4-5
80	3	2	3	2	2-3

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
81	3-4	3-4	-	-	-
82	1-2	3	4-5	3-4	2
83	2	2-3	1½	2	2-3
84	++	2	3	-	3-4
85	1	3-4	5-6	6	4
86	3-4	-	-	4	-
87	++	-	-	3-4	4
90	½ hr.	-	4	3	4
91	2	3-4	2-3	-	3½
92	2-4	-	-	5-6	5-6
94	2	-	3½-4	1	2½-3
95	4-5	-	3-5	2-4	2-4
96	3-4	-	4-5	3-4	4-5
97	4	-	4-5	4-5	4-5
98	2	-	3-4	3	2-3
99	-	-	3	-	2-3
101	2-3	-	2-3	2-3	1-3
103	4	-	4	2-3	2
105	3-4	-	4-5	3-4	5
106	3-4	-	4	3	3
107	2-3	-	2-3	3-4	3-4
108	3-4	-	6	-	4-5
109	ev.hr.	-	3	3-4	2-3
110	1-2	-	2½-3½	2½-3½	2-3
111	2	-	3-4	3	3

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
112	1½	-	3-4	4	-
113	2½	-	4	4½	4
115	-	-	4-5	3-4	-
116	-	-	3-4	-	3-4
118	ev.½hr.	-	3	2	2-4
119	++	-	4-6	-	-
121	3-4	-	3-4	4-5	5-6
122	2	-	2-3	-	-
123	2	-	3-4	-	-
124	2	-	2	2½	4
125	3-4	-	4	5-6	2-3
126	3-4	-	5	3	4
127	3	-	2	1½-2	1-1½
128	3	-	3	3-4	4
129	2	-	1½-5	2	2-3
130	3	-	-	-	2-3
131	2	-	3	4	3-4
132	2	-	3	3	3-4
133	1	-	3	-	-
134	2	-	3	2½-3	2
135	2	-	1½	-	-
136	3	-	5-7	5	-
138	-	-	3	4	3-4
139	2	-	1	1	1
140	2	-	3	3-4	2-3

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
141	2	-	3	3-4	3
142	2-3	-	2	-	2½-3
143	++	-	2-3	3	2-3
144	1½-2	-	3	2-3	-
145	-	-	3	-	2½-3
146	-	-	1½-2	2-3	2-4
148	¾-1	-	2-3	3-4	3-4
150	1	-	2½	2-3	2-4
152	-	-	4-5	4	5
153	4	-	4	4	3-4
154	2	-	2-4	3	3
155	1½	-	3	3-4	norm.
156	+++	-	4	4	-
157	+++	-	3-4	3-4	4-5
158	1½	-	2-4	-	-
159	3	-	2-3	3-4	3-5
160	2	-	3-4	2	-
161	1-2	-	3-4	3-4	-
163	1½	-	3	2	3
164	+++	-	3-4	4	4
165	1-4	-	3	3-4	5-6
166	2-4	-	-	4-5	4-5
167	2-3	-	3-4	2	2-3
168	2	-	-	2	1½-2
169	2	-	2½	2	2-3

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
170	1-2	-	2-3	-	-
171	3-4	-	-	4	norm.
172	1-4	-	++	-	1
173	4	-	4	5	4
174	2-3	-	4-5	-	-
175	-	-	5	2-5	4-6
176	2	-	2½-3	3	3-4
177	2	-	-	3	4-5
178	+++	-	-	3-4	-
179	3-4	-	-	5	4-5
180	1½-2	-	-	2-3	3
181	4	-	-	-	3-4
182	1-2	-	-	2-3	2-3
183	2	-	-	-	4
185	1-2	-	-	3	2-2½
186	2	-	2	2-3	-
188	1	-	-	-	3-4
189	2	-	-	-	4-5
190	+++	-	6	4	5-6
191	2	-	-	-	4-5
192	2	-	-	3	3
194	3-4	-	-	1½-2	2-3
195	8	-	-	-	2-3
196	1-2	-	-	3	3
197	1	-	-	3	3-4

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
198	3	-	-	-	3
199	1-2	-	-	-	4-6
200	3	-	-	3-4	2-3
201	3	-	-	-	norm.
202	1	-	-	-	4
204	3-4	-	-	-	4
205	2	-	-	2-3	2-3
206	norm.	-	-	-	4-5
208	1	-	-	-	2-3
209	2	-	-	4	4
210	1	-	-	2½	2-3
211	3	-	-	-	norm.
212	2-3	-	-	-	2-4
214	1-4	-	-	-	4
215	6	-	-	-	2-3
216	3-4	-	-	-	norm.
217	3-4	-	-	-	6
218	3	-	-	-	2-4
219	2	-	-	-	4-5
220	2	-	-	-	3-4
221	1	-	-	-	3
222	1	-	-	-	1-1½
223	1	-	-	2	-
224	2	-	-	ev.½hr.	-
225	2	-	-	3-4	3-5

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
226	2-3	-	-	-	2-3
227	3-4	-	-	-	4-5
228	2	-	-	-	norm.
229	1-2	-	-	-	5-6
230	3	-	-	1½-2	-
231	2	-	-	-	2-3
232	6	-	-	-	norm.
233	1	-	-	-	4
234	2-3	-	-	-	3
235	2	-	-	-	3-4
236	2	-	-	-	4-5
237	2½	-	-	-	2-2½
238	3	-	-	-	3-4
239	+++	-	-	-	norm.
241	1-2	-	-	-	2-4
242	2	-	-	-	1½-3
244	3	-	-	-	3-4
246	1	-	-	-	2
247	2	-	-	-	2
248	3	-	-	-	3
249	2-3	-	-	-	5
250	1-4	-	-	-	4-5
251	1-1½	-	-	-	3-4
252	2-3	-	-	-	3
253	1-2	-	-	-	+++

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
254	1-2	-	-	-	1½-3
256	2	-	-	-	1-2
257	½-2	-	-	-	1
258	½ hr.	-	-	-	3
259	1½	-	-	-	5-6
260	2	-	-	-	1-4
261	2	-	-	-	4
262	1½-2	-	-	-	2-3
263	1	-	-	-	2
264	2-3	-	-	-	4-5
265	2-4	-	-	-	3-4
266	1½-2	-	-	-	3
269	1	-	-	-	3-4
270	+++	-	-	-	4
272	½-1	-	-	-	1-2
273	½-4	-	-	-	5-6
276	1½	-	-	-	3-4
277	1½-2	-	-	-	2-2½
280	4	-	-	-	5-6
281	1	-	-	-	1
282	2½	-	-	-	2-3
283	½-2	-	-	-	1-2
286	+++	-	-	-	2
287	3	-	-	-	2-3
288	3	-	-	-	4-5

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
289	3-4	-	-	-	5
290	2	-	-	-	3
291	2	-	-	-	3-4
294	2	2	4	2	2
295	1	-	4-6	2-5	3-6
296	1½-2	-	3	-	1½-3
297	+++	-	4½-5	4	4-5
298	+++	-	-	-	4-5
299	2	-	4-5	3-4	3-4
300	3-4	-	3-4	3-4	3-4
301	2-3	-	2	2	1-2
303	1	-	2-3	2-3	2½-3
304	1	-	2-3	3	-
305	+++	-	-	-	norm.
306	2½-3	-	2½-4	2½-4	2½-4
307	2	-	-	1	norm.
308	2	-	-	3	2-3
309	½ hr.	-	-	-	3
310	1-2	-	-	-	3-4
311	3-4	-	-	-	4-5
312	2-3	-	-	-	+++
313	1-2	-	-	-	norm.

Night Frequency.

The figures represent times per night. Decreasing frequency is, therefore, shown by a diminishing number.

	3	-	3-4	3
	4-8	1-3	2	-
	2-3	-	2	1
	1	0-1	0-1	0-2
	3-4	0	1	1
	3-4	2-3	2	3
	2	0	0	0-1
	-	-	0-1	1
	3	1	-	-
	2	0	1	0-1
	2	1	-	-
		-	0-1	0-1
		1	1-2	1
		1		-
				1-2

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
1	4	-	1	-	1
2	1	-	2	0	0
5	1-2	1	2	2	2
6	+++	-	2-3	3	3
8	2-6	1	1	1	1
9	4	1	2	3	3
14	2	1	2-3	-	-
15	0	0	-	-	-
20	2	0-1	2	1	2
21	3	-	3-4	3	3
22	4-8	1-3	2	-	-
23	2-3	-	2	1	1-2
24	1	0-1	0-1	0-1	0-1
25	3-4	0	1	1	-
28	3-4	2-3	2	3	2
30	2	0	0	0-1	1
33	-	-	0-1	1	0-1
36	3	1	-	-	-
37	2	0	1	0-1	-
41	2	1	-	-	-
42	1-2	0	0-1	0-1	0-2
43	2	4	1-2	1	1-2
44	1-2	1	-	-	-
45	-	-	3-6	3-4	6-7
46	+++	2	-	-	-

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
48	-	1	0-1	1	0
50	-	-	2	-	2
51	++	1	3	3	3-4
52	0-1	-	0-1	0	0
53	2	0	0-1	0-1	1
54	4-6	1	1	2	-
56	3-4	3-4	1	3	-
58	-	0	0	0	0-1
60	5-6	0-1	-	-	-
63	2-5	1	3	2	3
65	2-3	2	3	2	2-3
66	2-5	1	1	1-2	-
68	-	2	2	2	2
69	++	2	3	-	4
70	0-1	1-2	3	-	1
71	2-3	1	2	2	-
72	0-6	0	0	0	0
73	3-4	0	0	0	0
74	5	0-1	-	-	-
75	1	1	0	0	0
76	1-3	2	-	-	-
77	2+	4	2	4-5	6-7
78	-	1	0-1	1	0-1
79	4	-	4	4-5	4-5
80	2-3	3-4	2-3	3-4	3-4

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
81	2-3	1	-	-	-
82	3-7	3	3	3-4	3-5
83	3	1	2	2-3	2-3
84	3	1	3	-	2
85	3-4	0-1	1	1	0-1
86	2	-	-	3-4	-
87	++	-	-	1	0
90	6-7	-	2	2	2
91	0	0-1	0	-	0
92	2	-	-	0	0
94	2	-	0-1	1	2
95	0-1	-	0	1	0-1
96	0-1	-	0	0	0
97	4-5	-	2	0	0
98	3-4	-	1	1	2-3
99	-	-	0	-	1
101	2	-	2	2	4-5
103	-	-	0	0	4-6
105	0-2	-	0-1	1	0-1
106	2	-	1	2	2
107	0-2	-	1	1	1
108	1-2	-	1	-	1
109	ev.hr.	-	1-2	1-2	2-3
110	1	-	0	0	0
111	8	-	0	0	0

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
112	3-6	-	0-1	1	-
113	0	-	0	0	0
115	-	-	0-1	0	-
116	-	-	3-4	-	3-5
118	2-3	-	0-1	1	1
119	++	-	2-3	2	2
121	0-1	-	0-1	1	0-1
122	3	-	3	-	-
123	2-4	-	3-4	-	-
124	5	-	2	1	0
125	1-2	-	1-2	2	1-3
126	4	-	2	2	2
127	3-4	-	3-4	6-8	5-6
128	3	-	2	2	2
129	3-4	-	4-5	3	4-5
130	2-3	-	-	2	0
131	1	-	1	0	1
132	0-2	-	3	2-3	3
133	2-3	-	2-3	-	-
134	2-3	-	3-4	3	5-6
135	3	-	4-5	-	-
136	2-4	-	2	1-2	-
138	-	-	1	1	2
139	0-3	-	2	2-3	2-3
140	2	-	0	1	0

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
141	2-3	-	2	1-2	2
142	4-5	-	1-2	-	1
143	++	-	0-1	1	1
144	++	-	1	2	-
145	-	-	1-2	-	1
146	-	-	1	1	1
149	3	-	2	2	2
150	4-5	-	3	2-3	2-3
152	-	-	1-2	0	0
153	3	-	3	3	2-3
154	3-4	-	2	2	2
155	+++	-	1	1	0
156	+++	-	2	1	-
157	+++	-	2-3	3	3
158	5	-	2-3	2	-
159	3	-	1	0	1
160	2	-	1-2	2-3	-
161	6-7	-	1-2	2	-
163	3	-	1	1	1
164	+++	-	1	1	2
165	0-1	-	0-1	0	0
166	1-5	-	-	0	1
167	2-6	-	1	2-3	2-3
168	3	-	-	4-6	4-6

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
169	2-4	-	1	1	0-1
170	1-2	-	1-2	-	-
171	1-2	-	-	0	0
172	2-6	-	++	-	4-5
173	1-4	-	2	2	1-2
174	4-5	-	0-1	-	-
175	-	-	0	0	0
176	0	-	0	0	0
177	1-3	-	-	1	1
178	+++	-	-	2-3	-
179	6	-	-	1	0
180	5-6	-	-	1-2	0-1
181	2-4	-	-	-	0
182	1-2	-	-	0	0
183	2	-	-	-	0
185	2-3	-	-	2	0-1
186	+++	-	0	1	-
188	+++	-	-	-	0
189	0-2	-	-	-	0-1
190	2-8	-	0	1	0
191	2-3	-	-	-	1
192	2	-	-	1	0-1
194	3-4	-	-	6	2
195	4-5	-	-	-	1-2
196	3-4	-	-	2-3	2

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
197	4	-	-	2	1
198	2	-	-	-	1
199	6	-	-	-	1-2
200	8	-	-	3	1
201	2	-	-	-	0
202	6	-	-	-	0
204	0	-	-	-	0
205	1-6	-	-	2	2-3
206	3+	-	-	-	0
208	2+	-	-	-	1
209	1-6	-	-	1	1-2
210	2	-	-	0	0-1
211	0	-	-	-	0
212	2	-	-	-	2
214	1+	-	-	-	0
215	6	-	-	-	0
216	1-2	-	-	-	1
217	5-6	-	-	-	0
218	+++	-	-	-	0
219	2-5	-	-	-	1
220	2-3	-	-	-	0
221	5-6	-	-	-	1
222	1-3	-	-	-	1-2
223	3-4	-	-	6-8	-
224	2	-	-	6-8	-

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
225	1+	-	-	0-1	1
226	4-6	-	-	-	3-4
227	0-1	-	-	-	0
228	2-3	-	-	-	0
229	2	-	-	-	0
230	4	-	-	4	-
231	3-4	-	-	-	1
232	4-6	-	-	-	0
233	6	-	-	-	0
234	2	-	-	-	2
235	2-3	-	-	-	1
236	3-4	-	-	-	0
237	2-3	-	-	-	2
238	3-4	-	-	-	0
239	4-6	-	-	-	1-2
241	1-2	-	-	-	2-3
242	3-4	-	-	-	3-4
244	3	-	-	-	2
246	1-3	-	-	-	1-2
247	2-3	-	-	-	4
248	1-3	-	-	-	1
249	3-4	-	-	-	0
250	1-2	-	-	-	0-2
251	5-6	-	-	-	0-2
252	2-3	-	-	-	2

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
253	3-4	-	-	-	+++
254	3-6	-	-	-	1-2
256	3	-	-	-	2
257	4	-	-	-	3-4
258	7-8	-	-	-	0-2
259	+++	-	-	-	0
260	2	-	-	-	1-2
261	2-4	-	-	-	1
262	3	-	-	-	3
263	2-3	-	-	-	0
264	2	-	-	-	3
265	0-2	-	-	-	0-1
266	3-4	-	-	-	1
269	3-4	-	-	-	0
270	+++	-	-	-	1-2
272	2-3	-	-	-	3
273	8	-	-	-	0-1
276	4	-	-	-	2
277	0-1	-	-	-	0
280	2	-	-	-	1
281	2	-	-	-	3
282	2	-	-	-	2
283	1-2	-	-	-	1
286	+++	-	-	-	0-2
287	0-1	-	-	-	0

Serial Number.	First Visit.	Dec. 1941.	Apr. 1945.	June 1946.	Aug. 1948.
288	2-3	-	-	-	0-1
289	0	-	-	-	0
290	7	-	-	-	0-1
291	+++	-	-	-	0
294	3	2	1	1	1
295	2-3	-	0	0-1	0
296	2	-	1-2	-	1-2
297	5-6	-	1-2	2	2
298	0-2	-	-	-	2
299	5-6	-	0	0	0
300	1	-	1	1	0
301	2	-	1-2	1-2	2
303	4	-	2	2	2-3
304	1	-	2	1	-
305	+++	-	-	-	1
306	4-5	-	1-2	1-2	1-2
307	2-3	-	-	2-3	1
308	0	-	-	0	0-1
309	2-3	-	-	-	0
310	2-6	-	-	-	0
311	3-5	-	-	-	0
312	2	-	-	-	+++
313	+++	-	-	-	1

REFERENCES

ANDREWS, J. Alban, (1947) Personal communication.

BANDLER, Clarence J., ROEN, Philip R., STEPT, Raymond, (1945) Amer. Jour. Surg. 70 : 337.

BARNES, Roger W., (1943) Endoscopic Prostatic Surgery, London. Kimpton.

BUGBEE, H.G., (1913) (quoted by BARNES) New York State Jour. 13 : 410.

DAVIS, W. Brian, (1948) Personal communication.

DUKES, C.E., (1939) Urine, Examination and Clinical Interpretation. London. Oxford Univ. Press.

EMMETT, John L. (1944) Surg. Gyn. and Obst. 79 : 449.

FLOCKS, R. H., (1937) J. Urol. 37 : 524.

GRANT, Owsley and LICH, Robert. (1948). Ann. Surg. 127 : 5 : 1010.

GREENE, Laurence F., and THOMPSON, Gershom J. (1945) J. Urol. 54 : 166.

HARRIS, S. H. (1929) Brit. Jour. Urol. 1 : 285.

HEY, Wilson H., (1945) Brit. Jour. Surg. 33 : 129 : 41.

JOLY, J. Swift (1924) Proc. Roy. Soc. Med. 17.

KEYES, Edward L. and FERGUSON, Russell S., (1936) Urology. New York. Appleton.

KRETCHMER, Herman L., and OCKULY, Edward F., (1944) J. Urol. 51 : 69.

LANE, T. J. D., (1947) Personal communication.

LATCHEM, Charles W., and THOMPSON, Gershom J. (1945) J. Urol. 53 : 482.

LUYS, G. (1913) (quoted by BARNES) Clinique 44 : 693.

MILLIN, Terence J. (1939) Proc. Roy. Soc. Med. 32 : 777.

MILLIN/

MILLIN, Terence J. (1942) Brit. Jour. Urol. 14 : 3 : 113.

MILLIN, Terence J. (1947) Retropubic Urinary Surgery. Edinburgh. Livingstone.

NESBIT, Reed. (1945) J. Urol. 53 : 589.

O'CONOR, Vincent. (1945) J. Urol. 53 : 584.

RICHES, E. W. and MUIR, E. G., (1933) Brit. Jour. Surg. 20 : 383.

STEVENS, A. R. (1913) (quoted by BARNES) New York M.J. 98 : 170.

THOMPSON, Gershom J. (1935) J. Urol. 5 : 405.

THOMSON WALKER, Sir John (1927) Carson's Modern Operative Surgery. London. Cassell.

TOPLEY and WILSON (1940) Principles of Bacteriology and Immunity 3rd. Ed. London. Arnold & Co.

WARD, R. Ogier., (1943) Modern Operative Surgery (ed. G. Grey Turner) London. Cassell.

WILSON L. and McGRATH, B. F., (1911) Surg. Gyn. and Obst. 13 : 647.

YOUNG, Hugh H., (1913) J.A.M.A. 60 : 253.

YOUNG, Hugh H., (1926) Practice of Urology. Philadelphia. Saunders.