A CLINICAL AND PATHOLOGICAL STUDY

of

RENAL TUMOUR GROWTHS.

by

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A study of a series of kidney tumour growths from clinical and pathological aspects with special reference to cases of renal carcinoma and hypernephroma.

This paper is based on a series of cases which were studied by me during the tenure of a Muirhead Scholarship in the Clinical Laboratory at the Victoria Infirmary.

The post-mortem and clinical records together with specimens and microscopical slides were put at my disposal for the purposes of this study. All the tumours which were considered had developed as primary growths of the kidney or adrenal gland.

Few cases of simple tumour growth were met with, and for the present study these cases have been set aside. I have only considered the embryonic type of growth and the growths arising in cystic kidneys, apart from the main part of the study, which deals with renal carcinoma, hypernephroma, blastocytoma and neuroblastoma.

Historical Introduction.

The history of the malignant tumour growths has passed through two or three phases in the course of time, and an expression of this can best be shown by taking/

taking the principal references in the order in which they have been published. For some time the hypernephromata were universally believed to be the most frequent kidney tumour growth; and also to have their origin in accessory suprarenal tissue.

Lubarsch in 1910 makes the very definite statement that all malignant epithelial tumours of the kidney with the exception of those of the pelvis arise in accessory suprarenals. Present opinion is directly opposed to this view, and although there has been considerable controversy on this subject, the more recent papers, which have appeared, have advocated the development of such tumours from renal tissue.

In order of publication the following writers may be considered.

Grawitz, 1883, separated certain common tumours of the kidney, and suggested that they arose in emigrant suprarenal tissue. He gave the following arguments in support of his theory -

(1) The position of these tumours in the cortex, close under the renal capsule, where displaced supra - renal tissue is not uncommonly met with.

(2) The structure and shape of their epithelial cells, which differ radically from those of the renal tubules, but are strikingly similar to those of the suprarenals./

renals.

(3) The fat contents of the cells, in the form of large globules. Renal epithelium does not undergo an infiltration with fat, (as against a fatty degeneration) but this occurs regularly in the suprarenal cortex.

(4) The presence of a capsule around the tumours.

(5) The relation of the epithelium to the stroma.

Grawitz compared his tumours with two adenomata of the suprarenal cortex, and concluded that their structure was identical.

In the following year Grawitz returned to the subject. He recapitulated his former arguments, and divided the tumours of the kidney into papillary and alveolar forms. He was prepared to claim an origin from suprarenal tissue in the case of the alveolar growths. The papillary forms differed too much from them for the assumption of an identical origin for both types. The papillary growths he was prepared to grant as originating in renal epithelium.

Sudeck and Driessen, 1893, published papers about the same time which were opposed to the views stated by Grawitz.

Sudeck maintained that these tumours were tubular in type and true renal adenomata. The papillary forms were nothing more than cystic tubular specimens. Papillae/

Papillae were never true, and they did not end in free points. Sudeck described transitions between the cells of a large malignant hypernephroma, and those of the neighbouring hyperplastic renal tubules, and believed that they proved the renal origin of the tumour.

Driessen, after studying a tumour of the ulna, wrote a paper on endotheliomata rich in glycogen. The general application of Grawitz's theory to all tumours of kidney was to him inadmissable, though no doubt correct in individual cases. Although Driessen's renal neoplasms possessed all the structural characters of hypernephromata, the same characters were shared equally by the tumour of the ulna. He considered that it was too much to expect that the tumour of the ulna could be regarded as of the nature of an adrenal rest tumour.

Lubarsch, 1894, wrote a defence of Grawitz and criticized Sudeck and Driessen. He discussed the morphological characters and staining reactions of the hypernephromata; and pointed out their correspondence to tumours of the suprarenals, and to the suprarenals themselves. He placed great stress on the presence of glycogen in the tumours of the kidneys, and suprarenals, and said it was of great diagnostic importance.

Targett, 1896, said "During the past five "years I have examined a very large number of renal "tumours

"tumours of various kinds, and I feel certain that the "specimen here recorded is the only one in my exper- "ience which has the features of an adrenal tumour. "Hence, while thoroughly accepting the hypothesis of "Grawitz as to their origin I believe that the frequency "of this class of tumour has been much exaggerated by "some writers."

Richer, 1897, divided the tumours of the kidneys into two groups. Both of these were subcapsular.

(1) Solitary tumours of rare occurrence. They consist of solid columns of polygonal epithelial cells containing large amount of fat with tendency to formation of giant cells. The structure of the tumours is solid, but secondary spaces and cavities may be introduced by central degeneration of cells. These tumours originate in suprarenal tissue.

(2) Tubular or cystic tumours, frequently multiple. The spaces and cysts are traversed by trabeculae, which often contain a considerable amount of connective tissue in addition to capillaries, but in the older parts the epithelium rests on the capillary endothelium. These tumours are true renal adenomata.

Richer showed that they arose in fibrous scars of old infarcts and arterio-sclerotic patches, in chronic nephritis kidneys, and occasionally in apparently normal kidneys./

kidneys. Closely related to the second type were the solitary small cysts of healthy kidneys. Their epithelium consisted of a single layer of tall club shaped cylindrical cells, honey combed with globules of fat. (Grawitz's statement, that fatty infiltration of renal epithelium apart from necrosis does not occur, was thus refuted.) Richer was thus the first to prove that renal epithelium undergoes fatty changes, identical with those of hypernephroma.

Pick, 1901, deals with hypernephroma of tht ovary in particular, and accessory suprarenals in general.

Stoerk, 1908, brought forward some very important facts concerning the hypernephromata -

(1) Why are hypernephroma invariably found in the kidneys and never in the suprarenals?

(2) Why do tumours of the latter, be they innocent or malignant, always radically differ from them?

If a hypernephroma originate in accessory suprarenal tissue we should, on Cohenheim's theory, expect them to be commonest in the suprarenals themselves, since small accessory nodules abound in and immediately around these glands; but a typical case has never yet been described in this situation.

The distribution of hypernephromata in the kidneys/

kidneys does not correspond with that of the aceessory suprarenals in these organs. No hypernephroma has even been seen within the layers of the renal capsule, unconnected with the tissues of the kidney, whereas accessory suprarenals are not uncommon there.

The cells in hypernephromata, although grouped similarly to the suprarenal cells, bear no morphological resemblance to them. They are merely degenerate forms of the small protoplasmic deeply staining cells often found in these tumours. Their glassy swollen appearance is caused by hydropic changes, which are invariably absent in the suprarenals. In addition they generally contain numerous globules of fat, part of which is doubly refracting to polarised light.

Stoerk divided hypernephromata into solid alveolar and tubulo perivascular forms. They were all variants of an essentially tubular structure.

In spite of statements to the contrary tubules and cysts never occur in the suprarenals of man. The alveolar forms of the hypernephromata are connected with the small pale nodules frequently found on the surface of granular kidneys by numerous intermediate stages. These consist of solid strands, and buds of renal epithelium which may, however, acquire lumina and contain hyaline/

hyaline casts. They are the result of regenerative hyperplasia. Their cells are hydropic and fatty, and are multinucleated occasionally. Some of these structures function more or less perfectly no doubt, others proliferate as small tumours that possess all the structural characters of, and indeed actually are, hypernephroma of the alveolar type in miniature. Every cyst of the kidney can give rise to villous formations, usually associated with hydropic swelling and hyaline and fatty change of its epithelium.

Stoerk traced the papillary adenomata to these cysts, and pointed out that they increase in frequency as life advances, in proportion to the increase of granular changes in the kidneys. The papillary carcinomata form one more link in the chain. Their structure is exceedingly variable, one segment presenting a villous appearance, and another that of a typical hypernephroma. The evidence is sufficient for the following series to be set up.

1. Sclerosis of the kidneys.
2. Cysts.
3. Papillary cystic adenomata.
4. Hypernephromata.

Stoerk did not deny the possibility of the origin

of tumours of the kidneys in accessory suprarenals, but had not seen an instance of such. His conclusions are -

(1) Tumours of renal and suprarenal origin possess no convincing structural similarity.

(2) All the forms of the hypernephromata are varieties of one common type.

(3) The renal hypernephromata originate in the epithelium of the kidneys.

Trotter, 1909, gave a full account of a typical renal hypernephroma and admitted that before the appearance of Stoerk's paper he had been in agreement with the accepted views, but since then he had been impressed with his arguments and thought the following points might be added.

(1) The hypernephromata are essentially tubulo cystic in structure. He described a typical case of renal hypernephroma, and says his specimen shows clearly that the dominating perivascular arrangement is a secondary development, caused by degeneration of the cells at the centre of the alveoli with persistence of a peripheral zone of healthy cells next to the vessels.

(2) The great relative frequency with which those tumours occur. To-day it would be almost justifiable to say that all primary epithelial tumours of the kidney, with/

with the exception of those of the pelvis, are of this nature. This would leave us in the remarkable position of having to believe, if we maintain Grawitz's hypothesis, that in a glandular organ so subject to malignant disease as the kidney, a true carcinoma of the gland substance does not occur.

(3) Many facts of the growth of those tumours are quite as consistent with the views of Stoerk as with those of Grawitz. For example, if the tumour originates in the convoluted tubules it must be always primary in the cortex: again, the convoluted tubules receive their blood supply entirely through veins from the glomeruli; and the growth of the tumour will begin in the most intimate relation to the purely venous network surrounding those tubules.

(4) What influence may we expect the original structure of an organ to exercise upon that of a carcinoma developing in it? It would seem probable, a priori, that the more elaborate the normal arrangement of the epithelium of a glandular organ is, the more complicated may we expect to be the picture which a carcinoma growing in it may present.

Zehbe, 1910, corroborated Stoerk's arguments. He concludes that epithelial tumours of the kidneys, including hypernephromata, arise in compensatory hyperplasia of renal epithelium. He says the characteristics of renal tumours/

tumours are the lumina and villi, the "glassy" cells that result from hydropic distention of the epithelium, and small deeply staining non-degenerate cells often seen in hypernephromata and adenomata of granular kidneys, but never in the suprarenals. He emphasises more strongly than Stoerk did the intimate connection between sclerosis of the kidneys and regenerative tumour formation. All the epithelial tumours of these organs which he examined, including hypernephromata, were associated with granular changes of the kidneys, whereas sarcomata and mixed tumours were often found in otherwise healthy organs. Two of his typical hypernephromata arose in the hilum of the kidney, where displacements of suprarenal tissue do not occur.

Kostenko, 1911, advocated the suprarenal origin of hypernephromata. He compares them with adenomata and carcinomata of the suprarenals and finds them identical with the hypernephromata in several respects.

Wilson and Willis, 1911, agreed with Stoerk that no convincing agreement exists between tumours of the suprarenals and the hypernephromata, and that all forms of the latter are varieties of a common type; but they did not agree that the hypernephromata are derived from renal epithelium. Two arguments are produced -

(1) Accessory/

(1) Accessory suprarenals of kidneys are of the nature of Wolfian tubules.

(2) Remains of nephrogenic tissue are observed in the kidneys of embryo and even in the first years of life. Their fate is by no means determined. (Pohl has shown that the areas of undifferentiated renal blastema in the deep layers of the cortex are nothing more than the turned in edges of the "neogenic" zone of developing tubules that form the caps to the individual renculi. They are strictly localized to the septa between the tubules. In the long series of kidneys he examined of foetuses and children to the 8th year of life, he only found these incompletely differentiated areas once after the first year of life in a child of two years. He concludes that they normally attain majority and therefore cease to exist by the end of the first year.)

Glynn, 1912, made an important communication. His paper brings fresh light to bear on the origin of kidney tumours. He draws attention to certain biological properties of certain neoplasms of the suprarenal cortex, the result of the physiological activity of their cells. These properties were first pointed out by Bulloch and Sequeira, but their bearing on the histiogenesis of the suprarenal cortex had not been appreciated. They/

They produce a diminution of female and the development of certain male characteristics in women before the menopause, as well as precocity in children of either sex. These changes are also met with in simple hyperplasia of the suprarenal cortex. Since they are never associated with hypernephromata of the kidneys, the origin of these tumours from accessory suprarenals is disproved.

Glynn also was the first to point out fully and adequately the marked histological differences between carcinoma of the suprarenal cortex and renal hypernephromata.

Shaw Dunn, 1913, found accessory suprarenals, adeno-papillary structures and papilliferous cysts in the kidneys of several post-mortems. The cysts noted were often multiple, and the kidneys were the seat of chronic interstitial changes. He concluded that any of these structures might conceivably give rise to malignant tumour formation, but of the three the papillary cysts from their peculiar histological features, suggest themselves as the most probable origin of the tumours of the Grawitz type.

Wilson, 1913, suggested that inclusion of masses of degenerated Wolffian tubules in the renal cortex/

cortex.

Gerlach and Gerlach, 1915, agreed with Stoerk and others that all hypernephromata are varieties of a single type, but they also maintain that it is impossible to separate them from other malignant tumours of the kidney. They mention two facts which are incompatible with Grawitz's theory:-

(1) The presence of true lumina with a true secretion inside them. Such lumina are never found in the suprarenals or in the tumours of these glands, though pseudo lumina may be seen.

(2) The large clear glassy cells resembling vegetable tissue. They are always absent in tumours of the suprarenals. Their appearance is caused by the presence of glycogen and cholesterin esters.

It thus appears that solid alveolar hypernephroma consist of suprarenal cortex, whereas tubular and villous forms resemble papillary carcinoma and adenomata of the kidneys, and therefore originate in renal tissue. This was suggested by Richer and is also maintained by Ewing in a later work. Gerlach and Gerlach only maintain this to be true so far as it indicates an error of development. The errors of development which give rise to hypernephromata are -

(1) Accessory/

(1) Accessory suprarenals,

(2) Small cortical cysts of infants (Hamartoma) which often give rise to the papillary forms.

Wright, 1922, took exactly the opposite view. He gives a very careful description of the renal hypernephromata. He insists that papilliform formations are a constant and essential feature of most new growths of the kidney, and that this is one of the ways in which cells of the renal cortex react to the neoplastic stimulus. He declares emphatically that these tumours cannot arise in "a rest" of any kind, either suprarenal or renal; they can only arise in the epithelium of the kidneys.

Nicholson, 1923, studies in tumour formation, concluded that:-

(1) Hypernephromata of the kidneys arise in the renal epithelium. No instance has been described whose origin in suprarenal tissue, assumed by Grawitz, is assured.

(2) This is generally true of the so-called extrarenal hypernephromata. Although these tumours, with the exception of those of the skeleton, have been described in parts of the body in which accessory suprarenals occur:- a connection with these malformations has/

has been established in one case only.

(3) Accessory suprarenals are therefore not predisposed to blastomatous growth, and the hypernephromata give us support to Cohenheim's theory.

Nicholson begins by admitting that Stoerk and Glynn by their researches disproved the suprarenal origin of the hypernephromata. He criticises Grawitz's hypothesis, and finally states it has not been proved.

1. Presence of accessory suprarenals in kidneys. This has been proved but they are not so common in the kidneys as Grawitz supposed, but they are however as common as hypernephromata. Stoerk has shown that the distribution of accessory suprarenals does not correspond to that of the hypernephroma, and if accessory suprarenals and hypernephromata were cause and effect, then the distribution would be identical. Grawitz has therefore failed to establish a certain connection between these displaced tissues and the tumours he believed to arise in them.

2. The cells of hypernephroma and resemblance to suprarenals. The architectural plan is similar to the suprarenal tissue; but Nicholson points out that other tissues have the same arrangement of cells and capillary stroma, e.g. kidney, suprarenal cortex and liver. The relations/

relations of epithelium to the vessels are fundamentally identical in these organs. They cannot therefore be used in proof of the suprarenal origin of the hypernephromata.

3. He maintains that you cannot argue from identity of structure that there must be identity of histiogenesis. Also Bulloch and Sequeira have shown that an important function of the cells of the suprarenal cortex is the influence they exert upon metabolism, and upon the growth of the body and the development and maintenance of certain secondary sex characters. When the suprarenal cortex is increased in bulk these substances are produced in excess, and the disturbances named by Glynn as "Suprarenal virilism" are the result. These changes are present in carcinomata of the suprarenals but invariably absent in the hypernephromata. (Exception, case of Bovin's tumour of broad ligament in a woman who developed suprarenal virilism, which improved after removal.) Since these tumours never produce the only biological effect that is associated with the suprarenal cortex, the last argument in favour of their identity fails. There is no evidence whatever in support of Grawitz third proposition. Hence his hypothesis of their origin has not been proved. The only other epithelium in which these tumours/

tumours can arise is renal epithelium.

Nicholson demonstrated the relationship of the hypernephroma to renal adenomata. He points out that if hypernephromata arise from renal adenomata they ought to contain areas in which these changes have not taken place, i.e. areas where cells have maintained their original structure. He maintains that these areas can generally be found in the tumour, and have been described by most observers. They are the small dark cells of Zehbe and are never found in the suprarenals.

He demonstrates by plates a renal adenoma which has in part undergone the "hypernephroma" reaction. The plate shows at one part the typical solid hypernephroma, and at another the tubular adenoma, its cells deeply stained and protoplasmic. The section also shows clearly evidence that the cells of the hypernephroma are altered swollen adenoma cells. All the cells of a tubule or group of tubules have, in most cases, undergone the "hypernephroma reaction" together. He also believes that the tubules and cysts are secondary formation resulting from degeneration, haemorrhage and necrosis of central cells. In his experience adenomata of the cortex of kidneys have appeared without exception in diseased organs. The kidneys containing those nodules have/

have all been granular, or they have appeared in the fibrous scar of an old infarct. Therefore he agrees with Stoerk and others who emphasise the association of cortical adenomata with chronic interstitial nephritis. He also mentions the extra renal hypernephromata, and remarks that all recorded cases, which were not associated with a tumour of the kidneys, are connective tissue tumours whose cells have undergone infiltration with fat and glycogen, and have thus acquired an accidental resemblance to those of the suprarenals.

Professor Glynn in his paper on hypernephromata of the female pelvis has shown that a considerable number of tumours have been described in the ovaries, where suprarenal rests have never been found. On the other hand very few have been described in the broad ligaments where accessory suprarenals are common. He concludes after a careful study of their morphological characters that all recorded cases are actually composed of luteal tissue, whose histological resemblance to the hypernephroma is purely secondary and accidental.

In conclusion he states that Grawitz's theory has not been established, and that a tumour of the kidney has yet to be described whose structure and behaviour are the same as the epithelial neoplasms of the suprarenal cortex/

cortex. Renal hypernephromata do not indicate that accessory suprarenals, which are found with a greater or lesser degree of frequency over a comparatively wide area of the body, are predisposed to tumour formation.

William Boyd, 1925, in Surgical Pathology, divides kidney tumours into two types, adenocarcinoma and hypernephroma. Regarding the hypernephroma he quotes, "Although there can be little doubt that a large "proportion of kidney tumours which used to be regarded "as hypernephromata are in reality adenocarcinomatous, "there remains a well defined group which fulfils the "requirements of Grawitz tumour. In most cases the "tumour arises in one of the adrenal rests, which Grawitz "conclusively showed to lie under the capsule of the "kidney. In some cases it originates in the adrenal "and invades the kidney. If the adrenal cannot be "found, the tumour is pretty certain to be a hypernephroma. "The peculiar sex changes so characteristic of growth "of the adrenal never occur in renal hypernephromata."

Ewing, 1928, in his book on Neoplastic Diseases admitted that the scope of Grawitz's theory had been much too widely extended, and that a large proportion of the reported hypernephromata were in reality renal adeno-carcinomas, but maintained that adrenal rests occur with moderate/

moderate frequency in the kidneys where they may give rise to tumour formation. He classified his renal tumours as carcinomas and hypernaphromas which are of adrenal origin, and concluded that (1) sufficient evidence has been adduced to prove that adrenal rests may give rise to tumour formation, and (2) the group of adrenal tumours of the kidney differs as a whole, quite distinctly from renal carcinoma with clear cells, though the resemblance between these two types of tumour is very confusing.

He described the adrenal growths and gives their distinguishing features as follows. They have a central fibrous core as emphasized by Grawitz, and tend to reproduce the adrenal gland in benign growths, and show general mesoblastic tendencies in malignant growths. Histologically, chromaffin cells are not infrequently present, and probably arise from the chromaffin structure in the medulla. This statement is in direct contradiction to a statement made in Nicholson's paper. "Grawitz and some of the earlier "writers believed that hypernephromata contain supra- "renal medulla in addition to cortex. But this view "was abandoned when the dual origin of these tissues "was generally accepted, and the reaction of the cells "of/

"of the medulla to chromates became known. Therefore "the origin of these tumours from the cortex only need "be discussed."

Lasagna, quoted by Ewing, found in a bilateral carcino-sarcoma of the kidneys the presence of ganglion cells which could only arise from the medulla of the suprarenals. Ewing at the same time admits that it is extremely difficult to establish an adrenal origin, in man, for tumours of the kidneys which show pronounced papillary structure, or a preponderance of lumina in the tumours.

The character of the cells is another distinguishing feature. "In adrenal tumours the character "of the cells differs distinctly from most renal tumours. "In the former the cytoplasm is foamy, granular and "interspersed with lipoid materials. In the latter "the cells are remarkably clear throughout and resemble "vegetable cells. Areas of diffuse growth, of indiffer- "ent spheroidal cells and spindle cells are practically "unknown in the renal tumours but are frequent in adrenal "growths. Pigmented cells belong to adrenal growths. "The primary structure in adrenal growths differs markedly "from renal tumours, but secondary structures due to "malignant change, degeneration, necrosis and haemorrhage "may/

"may cause renal to resemble adrenal tumours. Hence "the diagnosis must be based on the primary structure "only and in advanced cases it may be impossible to "give a definite origin for the tumour."

Illingworth and Dick, 1932, Surgical Pathology. Malignant tumours of the kidney fall naturally into two principal classes. (1) Adenocarcinoma or hypernephroma, a tumour affecting adults and arising in the renal parenchyma. (2) Adenosarçoma, mixed or embryonic tumour of adults and young children.

In the past attempts have been made to distinguish in this group two varieties - hypernephromata, of adrenal origin, and adenocarcinomata, derived from the tubules of the kidney. The distinction has been made principally on histological grounds according as the tumour resembles the adrenal cortex or contains tubules and papillae more suggestive of a renal origin. It seems probable, however, that this distinction has little foundation, and should be discarded. Variations undoubtably occur in different tumours, but they are variations of degree and often the same tumour varies in its different parts. The question is one of histology and most histologists now follow Nicholson in regarding the tumour as renal adenocarcinomata.

Clinical Investigations.

Symptoms. In the adult the tumour usually had existed for a considerable time before giving rise to symptoms, and attention may first be drawn to it by the discovery of a swelling in the loin, or by the occurrence of profuse haematuria. These are the cardinal symptoms of renal tumour growth.

The shortest history given in this series was a case in which attention had been drawn to a tumour in the loin by the occurrence of pain in that region fourteen days prior to admission. The onset was acute. The longest history obtained was six years. The average was about one and a half years. In a few of the cases there was obvious failure of health with anaemia and a vague feeling of uneasiness in the loin before any swelling was discovered. In the rapidly growing tumours in children, there was emaciation probably from the production of toxic bodies. As a result of haemorrhage into the tumours colic was produced which simulated renal colic from the passage of blood clots. In one particular case the presence of a kidney tumour was masked by secondaries in the lungs and the kidney tumour was only discovered post-mortem. In another case the secondaries in bone gave rise to symptoms, and another

was associated with a left sided varicocele.

Haematuria. The presence of blood in the urine in small amounts, in the absence of the ordinary symptoms of nephritis or involvement of the bladder or urinary passages, is a diagnostic sign of the greatest importance. Unfortunately this is not a constant feature and by no means so common as the indication of tumour. It is said to occur in 50% of all cases. My findings were about 54%.

The bleeding was usually spontaneous and intermittent, though a history of injury was obtained in two cases. If the haematuria was profuse, clots were sometimes formed and the passage of such caused typical renal or ureteric colic, and this was also useful as an indication to which kidney was involved. In two cases casts of the urethra were reported to have been seen. In one case the haematuria was so profuse as to require a blood transfusion, and haematuria was the cause of death in another patient.

On the other hand the bleeding may be so slight as to pass unnoticed, and does not arouse the anxiety of the patient, and so no attempt is made to discover the cause. As the attacks became more frequent the bleeding generally lasted longer and the interval/

interval between the attacks was of shorter duration. The blood was generally intimately mixed with the urine, which varied in colour from a slight pink to a deep red according to the amount passed.

Palpable Tumour. The presence of the tumour was seldom known to the patient. It was as a rule only discovered in the early stages in the embryonic type of tumour. The discovery of tumour in the other forms of growth generally indicated a well established case or advanced stage of the disease.

The examination of the abdomen was often negative, especially in stout individuals or where the tumour was situated at the upper pole, but sometimes an enlargement of the kidney was made out as the lower pole was at a lower level than normal. An enlargement of the unaffected kidney was also found in some cases which was probably due to compensatory hypertrophy. In the later stages the swelling was fixed probably by adhesions to the abdominal wall, which should be regarded as a bad prognostic sign. Enlarged lymphatic glands were found in a few cases, mostly in the groin, and the posterior triangle of the neck. Also evidence of metastasis in lungs, bones and liver.

Loss of weight. This is an almost constant symptom in all cases of malignant tumour growth, and was found particularly marked in the embryonic type of tumour. Weakness, or shortness of breath, on account of loss of blood was another frequent symptom in a few cases.

Pain was not a constant feature apart from the passage of blood clot, but sometimes the patient complained of a dull aching pain in the side due to the presence of a large tumour.

Varicocele is usually considered a feature of diagnostic importance, especially if occurring at a time of life not commonly associated with this condition, however only one of the cases showed this symptom. It is usually due to pressure of the growth or enlarged renal glands on the spermatic vein, or may be due to extension of the tumour into the renal vein.

Diagnosis. The examination of any medical case demands a complete investigation of the system suspected of giving rise to the symptoms, and in addition a general clinical examination of all the systems of the body. This should include the history of the onset of illness and also the family history of any notable disease, such as tuberculosis. After a history such/

such as above of haematuria or tumour in the loin, there are several adjuncts to diagnosis which must be employed in all cases. These are (1) clinical examination of the urine, (2) cystoscopic examination of the bladder, (3) radiography of the urinary tract, (4) pyelography.

Unfortunately in a kidney case certain features of the case may be absent, and you have to deal with what may be regarded as a tumour of the kidney syndrome. In the examination of the urine, a careful chemical, microscopical and bacteriological examination is important in the investigation of tumour growth from other lesions.

Cystoscopic examination. After a history of painless haematuria the cystoscope is a valuable aid to diagnosis by indicating from which side of the urinary tract the bleeding has its origin, and by excluding a lesion of the bladder as a possible cause of haematuria. A ureteric catheter may be introduced and a specimen obtained from each kidney separately for examination, but unless the blood coming from the ureter is seen on cystoscopic examination, it is inadvisable to introduce the ureteric catheter as the blood thus found may be traumatic in origin.

In/

In one case the ureter was blocked by blood clot and the ureteric catheter could not be passed.

Radiography was chiefly employed to exclude the presence of a stone, but in a few cases it demonstrated the enlargement of the kidney, or an irregular kidney shadow. It can also be used to show metastatic growths in the lungs or bones. If the diagnosis of a kidney tumour is clear the latter investigation should never be omitted when removal of the kidney is contemplated.

Pyelography has become a routine procedure, and the results obtained are extremely valuable, as an aid to an early diagnosis or in the differential diagnosis from other abdominal conditions. Instrumental pyelography is employed if the side on which the tumour is situated is known. Excretion pyelography gives useful information if there is no previous evidence as to which kidney is affected.

After a cystoscopic examination the suspected kidney can have its pelvis and ureter outlined by an injection of a 12% solution of sodium iodide, introduced through the ureteral catheter. Tumours of the kidney which are impalpable may be demonstrated by the deformity caused by their impinging on the pelvic/

pelvic lumen, e.g. tumours of the parenchyma tend to grow outwards into the renal pelvis and distort its normal outline. The outline of a tumour is smooth, which serves to differentiate it from such ulcerative conditions as tuberculosis. Obliteration of a calyx is also a suspicious appearance. Tumours of the pelvis produce a different appearance depending on the site of the growth. If it is situated in a calyx or more than one calyx these are conspicuous by their absence in the pyelogram. If the whole of the pelvis and calices are filled with the growth the shadow stops abruptly at the upper end of the ureter.

Thus, painless paroxysmal haematuria shown by cystoscopic examination to be coming from one ureter, should always make one suspect the presence of a tumour, which can be most readily and accurately confirmed by a pyelographic examination.

In the series of cases which we have under discussion the cystoscopic and pyelographic examinations employed, as will be seen from results recorded below, were found invaluable in diagnosis, but the ordinary X ray plate as a rule gave a negative result.

Results.

J.M. Case No. 1. Haematuria of ten months' duration./

duration. In the cystoscopic examination both ureteric orifices appeared normal. Indigo carmine was injected intravenously and in five minutes the dye was excreted from the right ureter, but blood only was seen coming from the left. The pyelogram showed no abnormality in the ureters or kidney.

W. McE. Case No. 2. Haematuria lasting one week associated with renal colic. X ray examination was negative. Cystoscopic examination showed blood clot coming from the left ureter. The ureters were catheterized and the urine from the left kidney was found to contain the tubercle bacillus.

R.O. Case No. 3. Haematuria of two months' duration - very profuse. Cystoscopic examination showed a corrugated and hypertrophied bladder wall, and blood was found to be discharging from the left ureter.

M.R. Case No. 5. Haematuria four weeks prior to admission. X ray examination showed a large shadow of the left kidney. Cystoscopic examination showed the bladder was normal but blood was coming from the left ureter, and the catheter could not be passed. Sodium iodide 3 ccs was injected. Result both ureters were secreting normally, but blood was seen coming from the left. Pyelogram - on the left side the pelvis was small/

small and abnormal in appearance.

Mr. W. Case No. 7. Haematuria two years ago of one day's duration. Three months later a recurrence of haematuria lasting three days. Cystoscopic examination and pyelogram showed negative results. Six months later profuse haematuria. Cystoscopic examination and pyelogram repeated showed evidence of tumour of the left kidney.

John C. Case No. 8. Haematuria six months ago. Cystoscopic examination - ureteral catheter could not be passed, as the ureter was blocked. Repeated later but the examination was negative owing to the presence of blood in the bladder.

James C. Case No. 10. History of haematuria four months ago. Cystoscopic examination after injection of indigo carmine:- the right ureter was normal, and the dye was excreted by the right kidney five minutes after injection. The left ureter was puckered and indrawn, and blood clot was adherent to the orifice. There was no excretion of dye from the left kidney.

J. D. Case No. 12. History of intermittent haematuria. Cystoscopic examination was negative as there was a rapid flow of blood from the left ureter. After the operation the urine contained a trace of blood/

blood for five days.

J. F. Case No. 13. History of intermittent haematuria of two years' duration. Lately has had more profuse haematuria with passage of clots of blood. Cystoscopic examination after injection of methylene blue showed the dye excreted by the right ureter, but blood by the left. Pyelogram showed evidence of tumour of the left kidney, and an enlarged kidney shadow.

G. G. Case No. 19. Frequency of micturition of a few months' duration. Haematuria lately. Cystoscopic examination was negative. Pyelogram showed evidence of tumour of the right kidney. The left was normal.

I. B. Case No. 25. History of intermittent haematuria of six years' duration. Urine was bright red in colour, and there were clots of blood passed. Cystoscopic examination showed the bladder was normal, but the right ureter was pouting.

Pathological Investigation.

The large majority of the cases under discussion were obtained from the surgeon. In others the diagnosis of a kidney tumour was only made on the post-mortem table, as the symptoms of the primary tumour were masked by secondary lesions in other organs such as lungs or brain. Whenever possible a full clinical history of the case was obtained, and the clinical investigations carried out as above described. In some of the older cases the history could only be obtained from the chart which at times was inadequate.

The affected organ was examined and described macroscopically, and then blocks of tissue were taken from various parts of the tumour and prepared for microscopic examination. An area of uninvolved kidney tissue was also examined microscopically as well. The post-mortem cases were examined more fully, and careful attention was paid to the condition of the suprarenal glands. In all cases secondary tumour nodules were examined histologically, and found to represent similar appearances to the conditions met with in the primary tumour. In some of the older cases the staining results obtained were unsatisfactory and/

and made the diagnosis of the case increasingly difficult. In others there were only one or two slides of the case available and a diagnosis had to be made from examination of these slides alone. Another difficulty was met with in the larger tumours where practically the whole tumour had undergone degeneration, and the tissue did not yield results from the ordinary staining methods. Fortunately, however, the enlarged renal glands were more satisfactory, and enabled the nature of the growth to be correctly determined.

Classification of the Tumours.

The classification of the various writers is based almost entirely on the histology of the tumour.

Professor Muir (17) in his text book adopts the classification :- Simple tumours of the connective tissue type, e.g. fibroma, lipoma, adenoma, and the villous papilloma of the pelvis: and malignant tumours, e.g. the hypernephroma or Grawitz's tumour and the mixed tumour or blastocytoma which he deals with more fully. Carcinomata and sarcomata he considers to be rare.

Beattie and Dickson (1) in a similar fashion refer to simple adenomas originating in kidney tissue as rare growths. The hypernephroma type they consider the more frequent tumour, and in their view belonging to the suprarenal rest type of growth. They do not emphasize the view that hypernephroma can originate in the kidney proper. Primary cancers they regard as comparatively rare, and consider such growths when present to be of the malignant adenoma type.

MacCallum (14) classifies them as simple tumours, e.g. adenoma, fibroma and lipoma: malignant, e.g. lymphosarcoma, hypernephroma, and blastocytoma. He believes that the hypernephroma arises in adrenal tissue./

tissue.

Mallory (16) regards the most important new growth of the kidney as of the hypernephroma type and refers to such tumours as adrenal carcinoma, hypernephroma or Grawitz tumour.

Ewing (4) in his neoplastic diseases gives a more elaborate classification but in which there is evidence of overlapping in the types of growth described. His classification permits of four groups of tumour of the epithelial type.

1. In the case of the adenoma he refers to the cases with papillary structure on the one hand and to those of alveolar structure on the other.

2. The carcinoma or malignant tumour of epithelial class he places under a similar category, viz:- (a) papillary adenocarcinoma and (b) alveolar carcinoma.

3. He also refers to the special types of growth which he classifies as embryological tumours, and to the separate group of renal tumours of adrenal tissue - the hypernephroma.

4. Tumours of pelvis. Papilloma and papillary carcinoma.

Nicholson (18) in his studies on tumour formation deals solely with the hypernephroma, and gives very/

very complete literary references and discussion on the different views expressed as to the nature and origin of this type of growth. He proves the relationship to adenomata of the kidneys and states that - "Grawitz's theory has not been established "and that a tumour of the kidney has yet to be des- "cribed whose structure and behaviour are the same "as those of the epithelial neoplasms of the supra- "renal cortex."

Shaw Dunn (21) in an article in the Journal of Pathology and Bacteriology, Vol. 17, deals with "Aberrant Epithelial Structures found in the renal cortex in the course of eighty consecutive post- mortems."

He distinguishes three groups -

I. Rests of suprarenal tissue.

II. Adenopapillary tissue.

III. Papilliferous cysts.

The classification which I have adopted after having gone carefully over the naked eye appearance of the individual specimens, and consideration of their microscopic appearances, is based closely on that adopted by Ewing; but some of the cases presented features which made them extremely difficult to be placed into

a/

a hard and fast group. For example, the differentiation of the papillary adeno-carcinoma into the clear and granular types was aided by the macroscopic appearance of the specimens.

In regard to the hypernephromata Ewing maintains that they form a very small but definite group of the tumours of the kidney, and that they originate in adrenal tissue. He accounts for the preponderance of hypernephromata in literature by the fact that they are in reality renal carcinomata. On the other hand Nicholson's arguments regarding the renal origin of such tumours, supported by Storek's and Glynn's findings, are convincing, but one of the tumours in my series contains definite nerve cells, and if adrenal rests are to be excluded as a source of hypernephromata, how can the presence of these cells be explained? Hence I have classified one small but definite group of tumours as hypernephromata or tumours of adrenal origin, and the others come under the heading renal carcinoma.

The adrenal tumours of my series are those which show nothing histologically to suggest a renal origin, e.g., no evidence of tubules, no papilliform structure in the sections examined, and in which the cells/

cells are of the granular foamy type rather than the hydropic. In addition these tumours on histological examination show at one part a sarcomatoid structure, having areas of spindle cells resembling a spindle cell sarcoma. The renal carcinomata which are numbered among my specimens, all show some definite evidence of renal origin, e.g. the presence of tubular structure, cystic spaces containing secretion, and an attempt at papilliform formation. The tumours showing marked papillary structure came under the heading cystadenomas.

The following classification seemed to meet the cases which I had under consideration:-

Histological Criteria used in Classification of Types.

1. Renal adenomas. Renal adenomas appear as single or multiple tumours in the cortex or capsule of the kidney. The multiple tumours appear generally in sclerotic kidneys, and in normal kidneys there may usually be seen one single nodule. The majority are small in size. In the five specimens I collected, all were single tumours, three of them reached a fair size, one was of considerable size, but in this case there was a definite tendency to malignant change. The tumours were definitely encapsulated, and two were of pale/

pale colour; the other three showed haemorrhage and degeneration on section. One of the tumours was present in a kidney which was the seat of tuberculous infection.

2. Papillary adenocarcinoma with clear cells. These tumours have formed the majority of my specimens. They appear as single circumscribed tumours of large size, generally showing vascular or haemorrhagic change on section. Histologically they show papillary strands of connective tissue, lined by one layer of cubical or cylindrical clear fatty epithelium. This is the type of tumour which is often confused with the hypernephroma, but their papillary structure, and the occasional presence of areas containing characteristic renal epithelium usually permit of their true recognition.

3. Papillary adenocarcinoma with granular cells. These tumours appear as multiple solid cellular growths of pale colour. They are less distinctly encapsulated, commonly free from haemorrhage, and composed of numerous branching strands of connective tissue, lined by one or several layers of opaque granular epithelium. They resemble the multiple adenomas found in sclerotic kidneys, and commonly arise from these simple growths, but they may appear in otherwise normal organs. Histologically/

Histologically they may be difficult to distinguish from the papillary adenocarcinoma with clear cells, but their macroscopic appearance is quite distinct. Fatty change and haemorrhage are usually absent, but many invade the kidney diffusely, perforating the pelvis and capsule and involving the lymphatics. The invasion of the renal vein occurs less frequently than with other renal growths.

4. Malignant cyst adenomas. These tumours show the same characteristics as the renal carcinoma, but show marked papillary formation and cystic change.

5. Tubular adenocarcinoma. This group includes the majority of malignant alveolar growths of renal epithelium. They are quite distinct from papillary adenocarcinoma and adrenal growths, and they form a small proportion of malignant growths of the kidney. The structure is uniformly alveolar or tubular and resembles renal parenchyma in appearance. This tumour is distinctly less frequent than other forms of renal carcinoma. I found only one such tumour among my specimens. The tumour was a large pale growth distinctly encapsulated, but occupying almost the entire kidney. Histologically the tumour was a very cellular growth, and showed segments of renal/

renal tubules.

6. Squamous celled carcinoma of renal pelvis. These tumours are of large size. The tumour starts in the pelvis and may spread to the surrounding kidney tissue, or down into the ureter. Squamous changes are very pronounced, though the specimen I examined (No. 26. Mrs. F. McD.) showed no evidence of epithelial cell nests. Hydronephrosis is often a feature of the specimen, or the kidney itself may be infiltrated and destroyed. The development of squamous celled carcinoma in a transitional epithelium is evidence of a metaplasia of epithelium, the result of chronic irritation.

7. Adrenal rest tumours. All tumours showing a central fibrous core, broad sheets of cells without alveolar formation, with a foamy opaque protoplasm and showing spindle and spheroidal cells, were classified by me as hypernephroma or adrenal rest tumours.

8. Mixed or embryonic tumours. Blastocytoma. The rapid growth of these tumours combined with the age of the patient are fundamental features in the diagnosis. The tumour lies within a distended renal capsule. The growth is solid and variously subdivided into lobules. Histologically/

Histologically there is a preponderance of glandular, fibrous, muscular or very cellular tissues. The embryological structure is however the distinguishing feature, and the usual composition is of isolated tubules of high cylindrical cells with indistinct lumina surrounded by broad zones of indifferent spindle cells. Cartilage appears in the form of small isolated islands. Bone has also been observed in certain cases.

9. Neuroblastoma. This tumour is composed of embryonic nerve tissue, and is of neuro-ectodermal origin. Such tumours may arise in amy part of the nervous system but the great majority are derived from the sympathetic nervous system, and may arise from the suprarenal bodies. The most characteristic appearance found histologically is that of a ring of small round cells giving rise to a definite rosette appearance together with a considerable amount of fine fibrillar material. They are generally found in children or young adults.

Metastasis.

Of the thirty-five specimens examined, twenty-five were specimens from the operating theatres, and ten were obtained from the post-mortem room.

In the case of the surgical specimens the question of metastasis did not present itself in the same way, unless especially referred to in connection with the examination of the specimen, or in the clinical history of the case.

In a number of the cases the symptoms of the secondary tumours masked the presence of the primary in the kidneys, and were misleading as to the nature of the primary tumour, and in two cases the secondary tumours gave rise to symptoms after removal of the primary kidney tumour, e.g., case No. 11, where the symptoms arose five years later, and Case No. 21, where the symptoms arose a few months later.

Only two of the cases gave rise to secondary involvement of bone, though this site is generally recognised as a common one for secondaries in kidney tumours.

Secondaries in bone. Case No. 11. Mrs. M. aet 56. The tumour was a papillary adenocarcinoma with clear cells. The symptoms had been present for three/

three months before she was operated on, and the kidney tumour removed. Five years later she complained of lumbar pain, and an X ray examination revealed secondaries in the third and fourth lumbar vertebrae. She died three months later, but no post-mortem was obtained.

Case No. 15. A.S. aet 77. The kidney tumour was a papillary adenocarcinoma with clear cells. There were no symptoms of renal tumour, but a swelling over the clavicle was present which was supposed to be due to a mal-union of a fracture two years previously. Shortly after admission she sustained a spontaneous fracture of the right humerus, and at the post-mortem examination a primary tumour of the kidney was found with secondaries in the left clavicle, right humerus and two of the ribs on the right side.

Secondary tumours of the brain were found in other two cases. One gave rise to symptoms after the removal of the primary kidney tumour, and in the other the kidney tumour was only diagnosed post-mortem.

Case No. 21. G.C. aet 50. The tumour of the kidney was a papillary adenocarcinoma with granular cells. Symptoms of renal tumour were present for one year prior to operation. Patient died one year after removal of kidney with symptoms of brain tumour, pro-

bably due to metastasis.

Case No. 31. W.I. aet 61. The kidney tumour was an adrenal rest tumour. Six months prior to death he had symptoms suggestive of a brain tumour, but no urinary symptoms at all. The post-mortem examination revealed secondaries in the lungs, liver, pancreas, brain and heart.

Secondaries in lungs. Secondary involvement of the lungs was found in two cases, and in both cases the symptoms were very misleading as to the nature of the primary tumour growth.

Case No. 24. T.D. aet 43. The tumour was a papillary adenocarcinoma with granular cells. The symptoms which had been present for two years were mostly pulmonary, though he had in addition a left sided varicocele associated with haematuria, which he attributed to a strain at work. The percussion note was impaired on the left side of chest, anteriorly and posteriorly, and he had a very purulent sputum. At the post-mortem examination there was a tumour of the main bronchus with numerous secondary nodules in the lung tissue. The left kidney showed a tumour at the upper pole with smaller tumours scattered throughout the kidney tissue. Right kidney showed two nodules./

nodules.

Case No. 30. A.F. aet 50. The tumour was an adrenal rest tumour. There was no history available, but he was admitted as an acute pleurisy and died two days later. The post-mortem showed a tumour of the right kidney. The right pleural sac contained two and a half pints of blood stained fluid. The left pleural sac contained blood stained fluid, and the left lung was collapsed and the pleura studded with metastatic nodules of small size, but there was no tumour in the lung tissue.

Secondaries in liver. Case No. 10. J.C. aet 39. The tumour was a papillary adenocarcinoma with clear cells. History of renal colic and haematuria of four months' duration. At the laparotomy there was a tumour in the left kidney with extensive secondary deposits in the liver.

Case No. 35. J.B. aet 4½ years, was of interest, as the child had previously had a tumour removed from the splenic region, the nature of which was unknown as the operation had been performed in Canada. On admission she had a large swelling in the left hypochondriac region and two smaller swellings in the right and left iliac regions. The mass

from/

from the right iliac region was removed and thought to be ovarian in origin, but at the post-mortem examination the uterus and ovaries were found to be normal, and the large tumour in the hypochondriac region was found to be arising in the kidney, and the type of tumour was a blastocytoma.

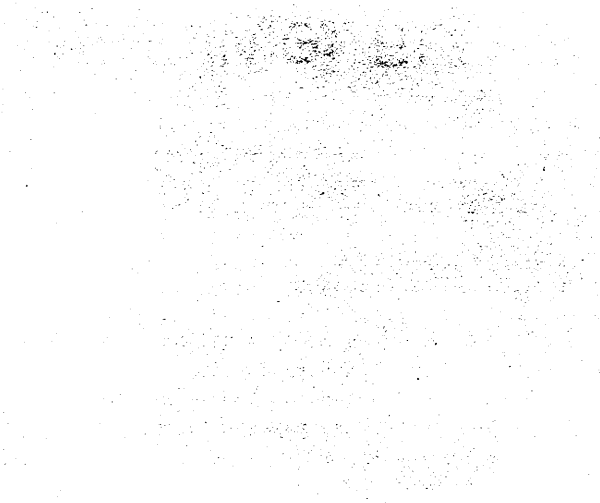

Figure 1. J.M. Case No. 1.

Kidney showing a large white globular swelling at lower pole, 4" x 3½" x 3½" in size.

The sections showed an adenomatous type of tumour with presence of small cysts containing papilliform projections, and tendency to adeno-carcinomatous change.

Reported on as an adeno-carcinoma.

Figure 2. J.M. Case No. 1.

Papillary adenoma with tendency to malignant change.

The photograph shows the characters of an adenomatous tumour arising from the tubular structure of the kidney.

Fig. 1. J.M. Case No. 1.

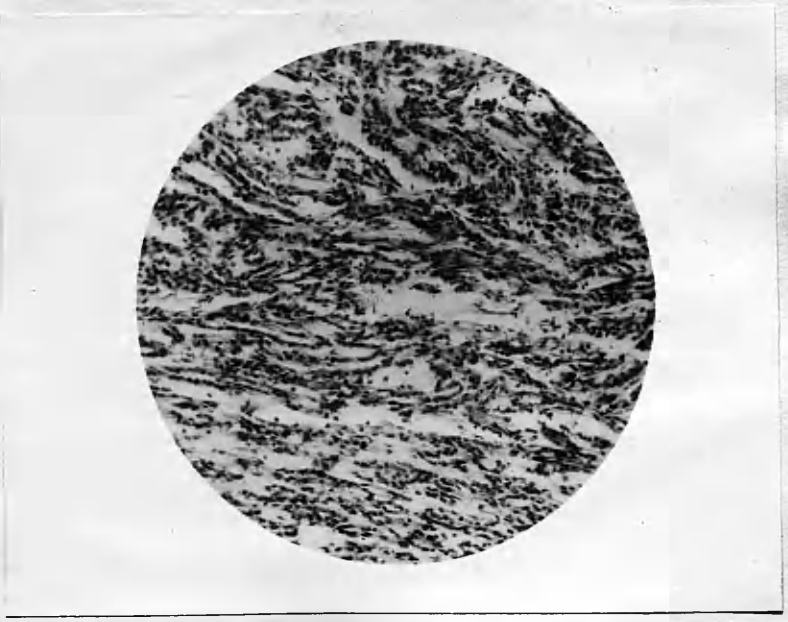

Fig. 2. J.M. Case No. 1.

Notes on Cases.

1. Papillary Adenoma with tendency to malignant change.

Case No. 1. J.M. Male, aet 49. Patient had painless haematuria of fourteen days' duration ten months prior to admission. He had no recurrence until immediately before his admission, when he passed small clots of blood. On admission the urine contained a fair amount of blood.

Abdominal examination showed that neither kidney was palpable, but there was tenderness on deep palpation over the left kidney. Cystoscopic examination showed that both ureteric orifices were normal. Indigo carmine was injected intravenously, and in five minutes time the dye was seen coming from the right ureter, while blood only appeared at the left ureter. The pyelogram revealed no abnormality in ureters or bladder.

The kidney was removed by lumbar incision. It was enlarged and had a large white globular swelling at its lower pole, 4" x 3½" x 3" in size. The tumour was solid and remarkably free from haemorrhage having throughout a fleshy appearance, and it was definitely encapsulated. There was about two thirds of normal kidney tissue present in the specimen.

Microscopical examination showed the characters

of/

of an adenomatous tumour arising from the tubular structure of the kidney. There were numerous small cysts scattered throughout the section, which showed a tendency to intracystic papillomatous formation. The cells were small and cubical in shape. The growth was very cellular in parts suggestive of malignancy, and the stroma was scanty. The uninvolved kidney showed granular change.

Case No. 2. W.McE. Male, aet 28. This patient had recurrent attacks of pain in the right iliac fossa, but the X ray examination proved negative. One week prior to his admission he had haematuria accompanied by severe pain simulating renal colic. On admission there was tenderness on deep pressure over the left iliac region. The left kidney was not palpable.

A cystoscopic examination showed blood clot coming away from the left ureter. Both ureters were catheterized. The tubercle bacillus was found in the urine examined from the left kidney. The left kidney was removed surgically.

The ureter was dilated and filled with tuberculous material. The kidney was enlarged and showed thickening of the cortex. There was a tuberculous nodule/

nodule of walnut size present on the convex margin. The calices were dilated and the pelvis and ureter contained tuberculous material. On the surface there was a tumour nodule 1" in diameter, which was solid in character, soft in consistence, but showing no evidence of caseation.

Microscopical examination of the tumour showed the characters of an adenoma with intracystic papillary processes. The cells composing the tumour were small and granular in type, and in addition all through the cortex, small patches of adenomatous tissue could be recognised. On account of its cellular character, and this distribution of cells in the cortex, it was regarded as of malignant type.

In addition to the evidence of tubercle, a definite inflammatory reaction was present in the renal tissue.

Case No. 3. R.O. Male, aet 77. Patient had haematuria following on an accident two months previously. He had lost a considerable amount of blood since then and passed clots of blood occasionally, gradually losing weight and becoming very anaemic. Cystoscopic examination showed blood coming from the left ureter. The left kidney was enlarged and palpable, and/

and contained a tumour in the central area, 2½" in diameter, which formed a globular swelling, showing on section large areas of haemorrhagic tissue.

Microscopical examination of the tumour showed the characters of a renal adenoma. The tubules were arranged in adenomatous fashion with papilliform projections. The papillae were lined by a single layer of cells. The section showed a tendency to cystic formation in places. One of the pieces examined showed a more cellular area, in which changes of adenocarcinomatous nature were noted. Another portion of kidney tissue examined showed marked fibrosis and inflammatory reaction.

Case No. 4. Mrs.D. aet 52. This patient had suffered from abdominal discomfort due to the presence of a large tumour. No renal or bladder symptoms were present. The kidney contained a tumour 5½" x 4½" x 3½" in size situated at one pole. It was globular in shape and on section showed areas of necrosis and haemorrhage scattered throughout solid yellow tumour growth.

Microscopical examination of tumour showed an adenomatous arrangement of cells derived from tubular epithelium of kidney. It had a regular appearance but/

but was a compact and cellular growth. Histologically it resembled the papillary adenoma with granular cells and though not definitely malignant was regarded as suspicious of same.

Case No. 5. M.R. Male, aet 55. Patient had haematuria of seven days' duration four weeks prior to his admission. On admission the right kidney was palpable. Cystoscopic examination showed blood coming from the right ureter. X ray showed an enlarged kidney shadow on the right side. The pyelogram showed abnormality in the pelvis of right kidney.

The specimen was a slightly enlarged kidney. On section it showed a small tumour nodule 1" in diameter situated in its medullary region. It had a uniform fleshy appearance but showed central degeneration and was quite definitely encapsulated.

Microscopical examination of the kidney tissue showed marked congestion of the vessels, especially those of the glomeruli. The tubules showed dilatation and cloudy swelling. There was slight fibrosis but no evidence of cystic change.

Microscopical examination of the tumour showed at one part a tubular arrangement resembling a renal adenoma. The cells were granular in appearance and

and had large deeply staining nuclei. Another part of the tumour showed broad sheets of cells arranged in an alveolar manner and containing cystic spaces filled with mucoid. The naked eye and microscopical appearances of this part of the section bore a marked resemblance to the suprarenal gland.

The cells were arranged in columns around a central fibrous core and presented an analogous appearance to the medulla of the suprarenal, but had at one part cystic spaces filled with mucin. The definite tubular arrangement of the cells, which Nicholson would have regarded as probably the original structure of the growth, was such that it had to be regarded as of renal origin and probably of the nature of a cancer of the granular cell type arising in a renal adenoma.

Case No. 6. S.A. Female, aet 36. History of pain and swelling on the left side of six months' duration. The abdomen showed a palpable tumour in the left hypochondrium. The left kidney was removed surgically and was found to be enlarged and showed cystic degeneration on section. At one pole under the capsule there was a small tumour nodule of pale colour.

Microscopical examination of the kidney tissue showed

showed evidence of a chronic fibrosis. The tubular structure showed a tendency to dilatation with areas showing definite cysts lined by renal cells and containing colloid.

Microscopical examination of tumour showed the presence of young connective tissue containing congested blood vessels. At a denser part of the growth there was an area which was adenomatous in character with cells of the renal type and a few cystic spaces. The stroma was loose and connective tissue cells were scattered throughout. The character of the cells suggested an epithelial and tubular origin. At one part of section there was an area of tissue resembling suprarenal cortex, but although this area raised the question of resemblance to suprarenal, this could not be definitely established as the tumour was obviously renal in origin, viz., a renal adenoma arising in a cystic kidney.

This case was an undoubted example of the statement made by Shaw Dunn that adenomata arising in cystic kidneys resemble the hypernephromata in structure.

The ages of three of the above cases were 49 and over. The other two cases gave rise to symptoms earlier/

earlier on account of a cystic kidney in one, Mrs. S.A., and a tuberculous infection in the other, W.McE. In both cases the tumour was of small proportions. Four of the cases had a history of haematuria, the other two gave no history of urinary disorder. Five cases made an uneventful recovery, and as far as could be learned were still alive and well. Case No. 3. R.O. was 77 years of age. He died fourteen days after the operation, but his general condition prior to the operation was not satisfactory.

The tumours histologically showed the characters of an adenoma with in parts a tendency to adenocarcinomatous change. Cases 1 and 2 showed a pale globular swelling of the kidney. Cases 3 and 4 showed in the gross specimen evidence of haemorrhage and degeneration. In case No. 1 the unaffected kidney tissue appeared normal, but in the others there was fibrosis, and in case No. 6 marked cystic degeneration. The presence of a granular change in the kidney in five of these cases was in agreement with Stoerk's argument that there was increased frequency of papillary adenomas with age, due he believed to their association with granular change in the kidney. M.R., case No. 5. was an interesting case in that the tumour was small in size/

size and could be studied histologically in its entire extent. Nicholson has argued that cystic change, hydropic distension of cells and papillary structure in these tumours are merely secondary changes, and that each tumour if examined carefully will show at one part evidence of the "primary structure" which determines the exact nature of the growth. In case No. 5. the tumour macroscopically and histologically showed a definite resemblance to the suprarenal gland, but it also showed evidence at one part of a tubular structure resembling renal tubules which was the primary structure from which the tumour had arisen.

In case No. 6. Mrs. S.A., the tumour had arisen as a small growth in an otherwise cystic kidney, and resembled histologically the appearance of the hypernephroma, agreeing with the view of Shaw Dunn that adenomata arising in cystic kidneys resemble the hypernephroma in structure.

II. Papillary Adenocarcinoma.

Clear Cells.

Case No. 7. Mr.W. aet 62. Two years ago the patient had painless haematuria of one day's duration. Three months later he had a recurrence of the haematuria/

haematuria for three days. He then had a cystoscopic examination and a pyelogram done, but the result was negative. Six months later the haematuria recurred and a palpable tumour was found on examination. Three months after this he had again haematuria and it was associated with renal colic. Cystoscopic examination and pyelogram were repeated and evidence of tumour of the left kidney was found. The kidney was removed surgically and found to be almost entirely replaced by tumour tissue, but for some healthy kidney at the lower pole. The tumour tissue was also found entering the renal vein.

Histological investigation of an area of kidney tissue with adjacent tumour showed that the kidney substance was markedly fibrosed and had inflammatory areas as well, while the tumour part varied considerably in different places studied.

At one part it resembled a tubular adenoma showing a tendency to cystic change. The other part of the tumour showed throughout a tubular arrangement of the cells. The large cystic spaces which were filled with mucin were lined by tall columnar cells, in which droplets of fatty material could be recognised. The cells had a deeply staining nucleus, situated about the centre./

centre. Another part of the tumour had a solid appearance with tubules filled with masses of cells, and presenting the appearance of the hypernephroma type of growth. This was evidently due to a proliferation of the cells lining the tubules. There was a great deal of haemorrhage seen in the section, and some of the cystic spaces were filled with red blood corpuscles. A tendency to papillary structure was also noted and the papillae showed the clear cells corresponding to those of the papillary adeno-carcinoma of renal type which resembles the hypernephroma.

Case No. 8. John C. aet 58. This patient was a seaman and on account of a severe haematuria had a laparotomy performed in New Zealand. A tumour of the right kidney was located, but the surgeon evidently regarded it as inoperable. On his return home he had a continuance of his haematuria, and four months after his original operation had to be admitted to the Victoria Infirmary on account of this symptom.

On admission his urine was blood stained and there was found a palpable tumour occupying the right lumbar region. Cystoscopic examination was carried out but the ureteral catheter could not be passed/

Figure 3. John C. Case No. 8.

Papillary adenocarcinoma with clear cells.

Figure 4. James C. Case No. 10.

Secondary tumour nodule from the liver in a case of papillary adenocarcinoma of the left kidney.

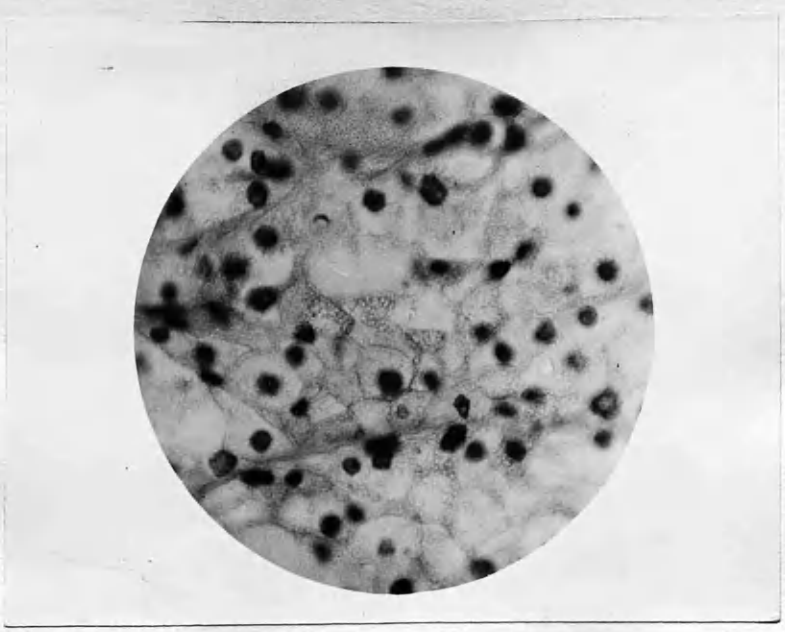

Fig. 3. John C. Case No. 8.

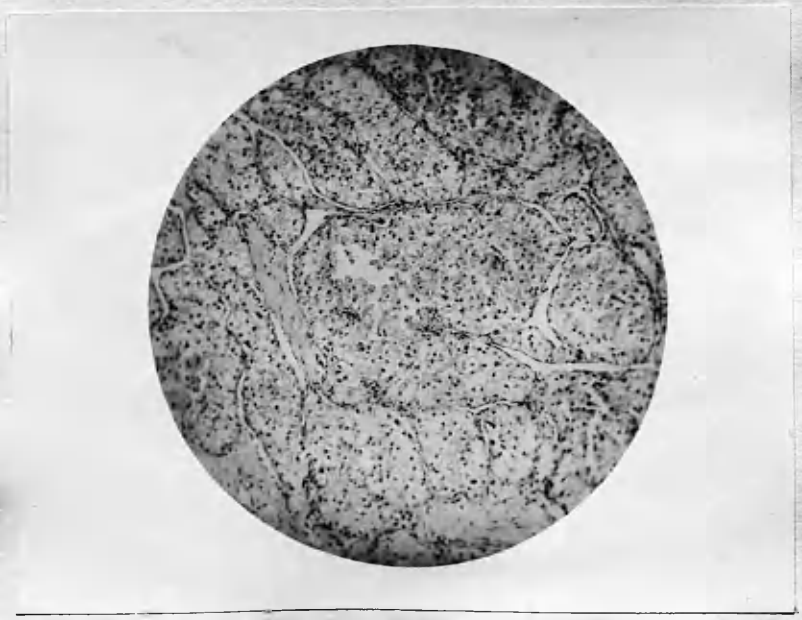

Fig. 4. James C. Case No. 10.

passed as ureter was blocked. The kidney was removed surgically and was enlarged to about the size of a football, measuring 9" x 7" x 6". On section it showed one pole and the entire central area of kidney to be occupied by a large tumour growth. The tumour was definitely encapsulated. The central area consisted of laminated clot with a more fibrous portion at the periphery. There were areas of stroma, yellow and mucoid substance noted. The remaining kidney substance though much displaced showed a normal appearance.

Microscopical examination of the tumour showed the characters of an adenocarcinoma with clear cells. The section showed an attempt at the reproduction of renal tubules. The lumina of the tubules contained blood, mucin, and desquamated epithelial cells. There were also distinct papillae at one part of the section. Adjacent to these tubular areas were areas more alveolar in character. The alveoli were solid, consisting of large clear cells. Some showed central degeneration and were supported by a fairly abundant stroma.

The growth was an adenocarcinoma which had arisen from a renal adenoma with clear cells. The papillary/

papillary structure was not marked but definite papillae were recognised in spite of the degenerated appearance.

Case No. 9. Mrs.L. aet 62. Frequency of micturition of one year's duration and recent loss of weight. She made an uninterrupted recovery from operation.

This was a private case and the history obtained was rather vague. The specimen consisted of an enlarged kidney, one half of which was the seat of tumour growth. The tumour tissue was yellow in colour and areas of haemorrhage and degeneration were present.

Microscopical examination of tumour showed a glandular growth of tubular character with intracystic papillomatous processes and desquamation of cells. The cells were large with clear cytoplasm and columnar in type. The character of the tumour was adenocarcinomatous. Another part of section showed an alveolar arrangement of cells lined by a connective tissue stroma containing thin walled blood vessels. The majority of the cells were large and clear with a central deeply staining nucleus. Some giant cells were also present. One part showed entirely degenerate tissue with lack of staining and a great deal of pigment. The sections prepared from different/

different parts of the tumour showed different characters histologically. In the denser areas the character was that of an adenocarcinoma, which indicated a primary glandular tumour of renal origin. The other parts showed a loose appearance and a type of cells commonly found in adrenal tumours, while again in other parts areas of haemorrhage clot and degeneration were recognised.

Case No. 10. James C. aet 39. History of haematuria of four months' duration. The blood was sometimes passed in clots and associated with renal colic. The haematuria had been intermittent and was usually associated with epigastric pain and nausea. He had been losing weight and was getting weaker.

On admission there was a large mass in the right epigastric and hypochondriac regions, extending to the level of the umbilicus and to the mid axillary line, apparently continuous with the liver. The mass was hard and irregular. The left kidney was also enlarged and palpable.

Cystoscopic examination was carried out after an injection of indigo-carmine. The right ureter appeared normal, but the left was puckered and indrawn, and there was blood clot adhering to the orifice. There/

There was no excretion of the dye from the left ureter.

Laparotomy through right paramedian incision was made. The liver was found to be the seat of extensive secondary deposits from a primary neoplasm of the left kidney. A piece of liver tissue was removed for histological examination.

Microscopical examination showed the presence of liver tissue at the periphery, but the rest of the section consisted of tumour growth. The greater part of the tumour showed an alveolar arrangement of cells. The alveoli were divided by strands of connective tissue containing thin walled blood vessels. Section showed a great deal of haemorrhage. The cells were of the large round celled type with clear vacuolated cytoplasm. The nucleus was small in comparison to the size of the cell but deeply stained. Some of the alveoli showed spaces caused by degeneration of the central cells. At one part of section there was a tendency to the reproduction of renal tubules, and the structure was more like a papillary carcinoma with clear cells.

This case illustrates one or two unusual points. The age of the patient was 39, and yet the tumour was in an advanced stage and showed multiple secondary deposits in the liver. This was rather unusual/

unusual as the majority of the cases recorded have been nearer 50 years of age before such advanced malignancy was found, while extension to the liver in a neoplasm of the left kidney was rather unusual.

Case No. 11. Mrs.M. aet 56. There was a history of palpable tumour in right lumbar region of four months' duration. No urinary symptoms. The right kidney was removed surgically. The kidney measured 5½" x 4" x 3". On section the tumour involved the lower pole and occupied the greater part of kidney. It was composed of yellow tissue and also showed numerous cystic areas containing colloid. Distributed throughout the tumour tissue were areas of haemorrhage of varying sizes.

Microscopical examination of the tumour showed an alveolar arrangement of the cells, with stroma consisting of thin walled vessels surrounding same. In the looser parts of the section the cells were large, clear and vacuolated, and in the centre of the alveoli desquamated cells and red blood corpuscles were seen. At another part of the section one or two papilliferous processes were seen and these showed a lining of transitional epithelium. A characteristic feature of the section was the large amount of haemorrhage/

hage and a deposit of pigment.

Adjacent to the areas of haemorrhage the growth was very spongy in character and although an alveolar arrangement was seen with fatty character of the tumour cells, there was also noted the presence of mucin and cystic formation. The tubular arrangement of the cells, however, the presence of cystic spaces and the tendency to papilliform growth indicated a renal origin, viz., a carcinoma with clear cells.

One year following the operation the patient complained of severe pain on the left side and down the left leg. She was X rayed and the plate showed secondary involvement of the pelvic bones and also the vertebrae in the lower lumbar region. She died six months later. No post-mortem was held.

Case No. 12. J.D. Male, aet 58. Two and a half years ago patient had haematuria lasting a few days. A year later he had a similar attack and a month ago he had another recurrence. On admission there was a palpable tumour present in the left lumbar region.

Cystoscopic examination showed blood flowing from the left ureter. The left kidney was removed and was found to be greatly enlarged, measuring 8" x 5½" x 3½" in size. On section most of the kidney was replaced

by/

by a dense growth, measuring 5" x 6½" in size, and occupying the upper pole. It had the appearance of being definitely encapsulated. At the lower pole part of the pelvis was filled with blood clot, and around it was an area of apparently normal kidney tissue. The tumour was lobulated and presented the appearance of firm tissue of yellow colour, streaked by an occasional haemorrhage. Gross haemorrhage was not a feature of the specimen. Centrally there was a loose fibrous area with oedematous like material and areas which were fibro-myxomatous in character. The glands at the hilum were enlarged.

Microscopical examination of the tumour showed the cells arranged in an alveolar manner with a definite vascular stroma surrounding them. There were several cystic spaces in the section and a downward prolongation of the cells into the spaces showed a papilliform formation. A tubular arrangement was present in places and the cells were small and flattened in type. In some of those areas cystic dilatation was a marked feature and some of the cysts contained mucin, others showed intracystic papillomatous growth. The supporting stroma showed a definite inflammatory reaction with aggregations of round cells. The tumour was re-

garded/

garded as an adenocarcinoma of the kidney with clear cells.

Case No. 13. J.J. Male, aet 47. Patient had been losing weight for one year (3 stones) and was very anaemic from occasional attacks of severe haematuria. He required a blood transfusion after admission. A pyelogram showed an enlarged kidney shadow on the left side and cystoscopic examination showed blood clot coming from the ureter. The left kidney was removed by lumbar incision and found to be considerably enlarged and nodular. It was $5\frac{1}{2}$" x $2\frac{1}{2}$" x $4\frac{3}{4}$" in size. On section it showed externally a rim of kidney tissue but the rest of the specimen was tumour growth. The tumour was of yellow colour, but showed areas of haemorrhage, and near the lower pole was a large cyst containing colloid material.

Microscopical examination of tumour showed a large area of haemorrhage and organized fibrin, but in the more cellular part the cells were arranged in an alveolar manner. The cells were large and had a clear cytoplasm. The central areas of the alveoli had undergone degeneration but no definite lumina were noted. At another part of the section the cells were arranged in tubular fashion. They were smaller and closely/

closely packed together and had sharply defined nuclei. Another slide showed both an area of tumour and an area of kidney tissue. The tumour was sharply differentiated from the kidney by a definite fibrous capsule. The kidney tissue showed fibrosis, with presence of a few small cysts. The tumour cells were more loosely packed than in the previous section and the cells showed a tubular arrangement. There was also a fair amount of pigment in the section, but it appeared to be extracellular and scattered throughout the areas of haemorrhage. The tubular formation of cells, presence of papillae and cystic change point to a renal origin. The case was regarded as a renal carcinoma with clear cells and with severe haematuria due to involvement of the pelvis.

Case No. 14. G.S. Male, aet 42. Six months ago the patient began to loose weight and at the same time he noticed blood in his urine. He also had abdominal pain at times, but the history was rather vague. His last attack of haematuria was fourteen days prior to admission and lasted for seven hours. On admission there was a large tumour palpable in the lumbar region. The right kidney was removed surgically.

Specimen/

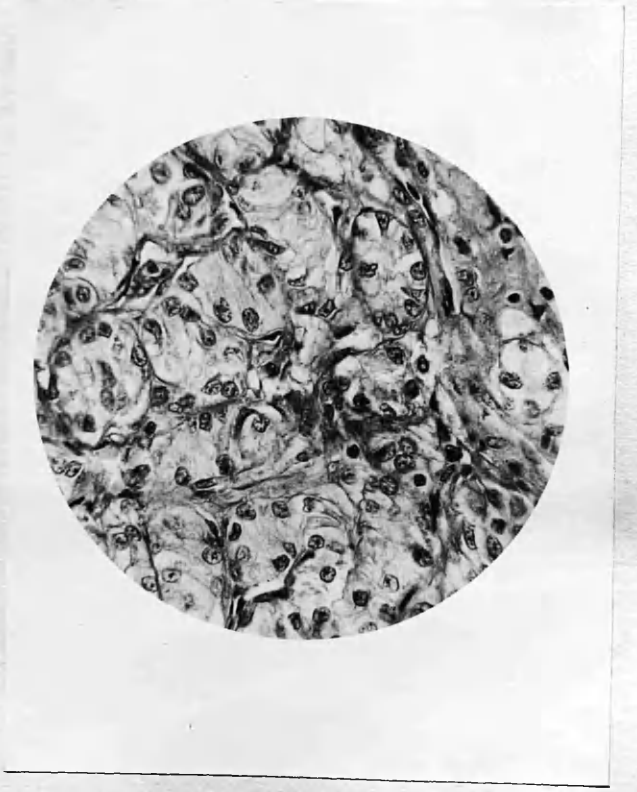

Fig. 5. G.S. Case No. 14.

Microphotograph shows the appearances of a papillary adeno-carcinoma with clear cells.

Specimen consisted of a kidney with a globular tumour at one pole. The tumour was spherical in shape and presented various features - areas of yellow tumour growth, areas of mucoid material, and areas showing slight haemorrhage. It was definitely encapsulated and there was no outplanting in the kidney tissue.

Microscopical examination of tumour showed an alveolar arrangement of cells with a delicate stroma. At one part the appearances were those of an adenocarcinoma. The cells were granular in character and the alveoli were small. At another part the stroma was more abundant and small adenomata were seen. Other parts were tubular in arrangement and in some of the alveoli central degeneration had occurred. The tubules in most parts were lined by a single layer of cells, but at some places there was a heaping up of the cells and a tendency to papilliform formation. The case was regarded as an adenocarcinoma with clear cells.

Case No. 15. A.S. Female, aet 75. This patient sustained a fracture of the left clavicle about two years ago, which had never healed properly. There had always been a swelling in that region since then and/

and lately it had been increasing greatly in size. On admission there was a large soft tumour in the region of left collar bone, arising from the bone near the sternal end. There was a palpable swelling in the left lumbar region, but no history of haematuria and no renal symptoms. Shortly after admission she sustained a pathological fracture of the right humerus, and died a few days later.

The post-mortem showed an enlarged left kidney, weighing 12 ozs. Section of the organ showed an encapsulated tumour at the lower pole. The tumour was of yellow colour but showed haemorrhagic degeneration in the centre. The glands at the hilum were involved and the pelvis was filled with tumour tissue through involvement of the renal vein. There were secondary tumour nodules in the left clavicle and ribs. The tumour of the left clavicle was the size of a hen's egg, and was involving the inner third of the bone. It was of firm consistence and showed similar characters to the kidney tumour.

Microscopical examination of the tumour of the kidney showed marked degeneration of tissue with lack of staining. At one part there was a mass of cells showing definite papillary formation. The cells/

cells were irregular in shape but had clear cytoplasm with fairly large nucleus. Most of the cells were desquamated from the papillae, and lying loose. Haemorrhage and degeneration were marked features of the section.

Microscopical examination of a renal gland showed an alveolar arrangement in which the central cells were desquamated and lying loose in the alveoli. The alveoli were separated by a fibrous stroma containing many congested vessels. The lining layer consisted of several layers of clear cells with dense nuclei. There was a great deal of haemorrhage present in the section.

Microscopical examination of the tumour of the clavicle showed a marked papillary structure of the tumour resembling the renal adenocarcinoma. The papillae were composed of several layers of small cells with dense nuclei and a central congested vessel. This papillary arrangement was present throughout the section and showed more definitely the structure of a renal carcinoma than did the primary tumour of the kidney itself.

The notable feature about this case was the fact that the secondary tumour of the clavicle was much/

much larger in size and had given rise to more definite symptoms than the primary kidney tumour. The fracture of the clavicle may have been pathological though there was a history of injury. The age of the patient was 75, so that the tumour must have been relatively slow growing at the beginning as its increase in size was only noticed within the few weeks prior to death.

Case No. 16. Mrs. A.W. aet 49. History of haematuria of three months' duration. The amount of blood passed in the urine was slight to begin with but latterly there had been a fair amount of blood lost and frequently large clots were passed. On admission there was a palpable moveable tumour in the region of the right kidney. Methylene blue, minims XV, was injected hypodermically and the dye was excreted for four days. The kidney was removed. It was enlarged and contained on section a lobulated tumour mass at the upper pole, which consisted of areas of yellow tissue, areas of haemorrhage and areas of muccid material.

Microscopical examination of tumour showed a cellular and haemorrhagic type of growth. The cellular areas had a fibrous tissue stroma supporting alveolar groups of cells and in definite relationship

to/

to the vessels. The cells forming the alveolar masses were of round or polygonal type with oval shaped nuclei and clear protoplasm, and having a tendency to cystic formation in places. The cellular areas were as a rule limited externally by elongated fibrous tissue cells. The character of the section would indicate a tumour pertaining to the vascular and angiomatous type of growth rather than to the adenomatous.

Microscopical examination of the more cellular part of the tumour showed an alveolar arrangement of small round cells with large nuclei. The cells were granular and in close relationship to the vascular stroma. There were a few cysts containing mucin present in the section. At one part there was a tendency to luminar formation and with papilliform ingrowth in the lumina, but this was not a marked feature of the section.

The classification of this tumour presented some difficulty as the microscopical examination showed no attempt at the production of renal tubules or marked papillary formation. Also the cellular parts of the growth showed a relatively scanty stroma but the presence of numerous cystic spaces, some of which/

which were filled with mucoid material and others with red blood corpuscles pointed to a renal rather than an adrenal origin.

Case No. 17. A.D. Male, aet 49. There was a history of tumour in the left hypochondrium of two months' duration. Lately he had slight haematuria. On admission there was a tumour palpable in the left hypochondriac and lumbar regions.

A laparotomy was done and a large tumour mass was found in the region of the left kidney. The mass could not be removed. Patient died a few days later, and a limited post-mortem was permitted. It was found that the tumour had arisen from the lower pole of the left kidney.

Microscopical examination of the tumour showed large areas of haemorrhage and fibrin formation. At one part of it there were several large cysts, the contents of which were adenomatous tissue showing evidence of malignant change. The cysts also contained areas of haemorrhage and papilliform ingrowths. The stroma consisted of vascular connective tissue lined by cubical granular epithelium, which was mostly in a single layer but in parts had undergone proliferation.

Microscopical/

Microscopical examination of kidney. The tubules showed cloudy swelling with fibrous change and signs of inflammatory reaction. Scattered throughout the kidney tissue were the same type of malignant adenomas as have been referred to previously. Some were small, others large, but all showed a tendency to papilliform formation.

A diagnosis was made of malignant cyst adenoma.

Case No. 18. J.S. Male, aet 59. This patient noticed a swelling on the left side of the abdomen a fortnight prior to admission. He had no frequency of urine or haematuria.

On admission there was a tumour present in the left hypochondrium. The left kidney was removed. It was found to be adherent to the tail of the pancreas, and was 6" x 5" x 3½" in size. On section there was a large tumour found occupying almost the entire area with only a small part of kidney tissue remaining at one pole. The tumour was yellow in colour but showed areas of haemorrhage and degeneration and cystic change. Some of the cysts were filled with blood.

Microscopical examination - the characteristic feature of the slide was the large number of cystic spaces lined by columnar cells resembling renal cells. Some/

Some of the cysts contained mucin, others were filled with red blood corpuscles. In the more cellular parts of the section the arrangement was alveolar rather than tubular, and no true lumina existed though pseudolumina were present from haemorrhage and degeneration. The origin of the growth was renal and the characters were those of a cyst adenoma.

Case No. 19. G.G. Male, aet 53. Eighteen months ago patient had a prostatectomy performed for frequency of micturition. During the last few months he had noticed a swelling in the right lumbar region and a few days ago he had haematuria.

On admission there was blood and a little pus in his urine. There was a tumour palpable in the right lumbar region which was tender to pressure. Cystoscopic examination was negative, but a pyelogram of the right kidney showed evidence of tumour formation. At the operation the kidney was found to be greatly enlarged and adherent to the perirenal tissues. Stripping of kidney was very difficult as part of the tumour had involved the pelvis and ureter.

The specimen measured 6¼" x 4" x 3¼" in size, and weighed 21 ozs. On section the greater part/

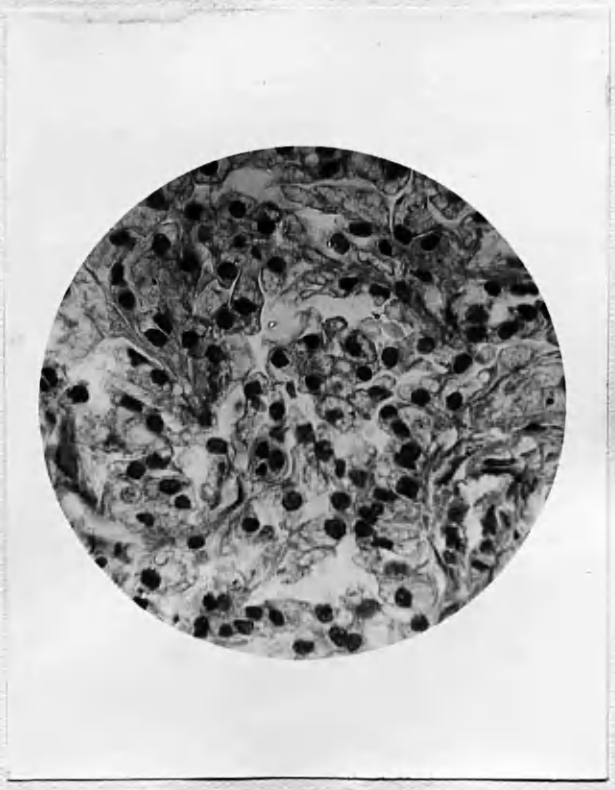

Fig. 8. G.G. Case No. 19.

Microphotograph showing appearances of a case of malignant cyst adenoma.

part of the kidney was occupied by this tumour growth centrally and at the upper pole. It varied in appearance. In parts it was firm and of pale colour, in others soft and showing areas of haemorrhage.

Microscopical examination showed the characters of a papilliferous cyst adenoma. The papillary processes had a connective tissue core containing a small blood vessel. The cells were large and clear. The marked papillary character and distinct tubular formation in parts of the section pointed to a renal origin. There were a large number of cysts filled with blood or mucus material. The histological appearance corresponded to an adenocarcinoma with clear cells but showing a tendency to cyst adenomatous change. This type is the form of renal carcinoma which bears a strong resemblance to the hypernephroma.

Papillary adenocarcinoma with granular cells.

Case No. 30. A.H. Male, aet 60. He complained of a history of pain on the left side of ten months' duration. The pain was not constant but resembled renal colic in distribution. One week prior to his admission he had an attack of pain and/

and passed clots of blood.

On admission there was a palpable tumour in the left lumbar region. At the laparotomy the tumour was found to be situated in the left kidney. It was attached posteriorly and attempt at removal was deemed inadvisable. Patient died a few days later.

Post-mortem examination - the left kidney was greatly enlarged (melon size) with adhesions to diaphragm and parietes. The capsule was firmly adherent and on section the kidney tissue was only seen in parts, being replaced by disseminated tumour growth throughout the organ. The tumour was yellow in colour and firm in consistence. One large area of tumour growth at the centre of the organ had undergone cystic change. The cyst contained colloid. The right lung contained two tumour nodules in its substance. The left lung contained a tumour nodule in the visceral pleura which also invaded the lung substance.

Microscopical examination of the tumour showed the characters of a papillary adenocarcinoma with granular cells. The cells were small and the cytoplasm was granular. The papillae also were small and/

and had no definite connective tissue core. In places the tumour showed the characters of a cyst adenoma. The tumour was divided into lobules by a connective tissue stroma which was quite dense in parts and contained numerous thin walled blood vessels. Cystic change was a marked feature of the section.

There was unfortunately no slide available of the secondary tumour in the lung.

Case No. 21. George C. Male, aet 50.

History of haematuria of one year's duration. The haematuria was intermittent but was at times excessive, lasting three days, and was associated with renal colic. Lately he had become very anaemic and had been losing weight. On admission patient was very anaemic and there was a palpable swelling in the right lumbar region. The right kidney was removed.

The specimen measured 7" x 3¾" x 2½". On section practically the whole organ was occupied by disseminated tumour nodules, subdivided into lobules, and showing small areas of kidney tissue between them. The tumour tissue was of fleshy colour and showed numerous small cysts on section.

Microscopical examination showed an alveolar arrangement/

arrangement of cells with a supporting stroma consisting of thin walled blood vessels, in close apposition to the cells. The cells were large but granular in type though some were definitely vacuolated. At one part of the section the arrangement was definitely tubular and there were a few papillary outgrowths. Numerous cystic spaces were present throughout the section. The histology of the tumour resembled the papillary adenocarcinoma with granular cells.

Case No. 22. Mrs. C.J. aet 43. History of abdominal tumour of three months' duration. Latterly she had been losing weight. On admission there was a palpable swelling in the left lumbar region, which appeared to be continuous with the splenic dulness.

A laparotomy was performed and the mass was found to be kidney but was so adherent to the surrounding structures that it was considered inoperable. Patient died a few days later.

Post-mortem examination - the left kidney was greatly enlarged and filled the left side of the abdomen. The descending colon was adherent in front and to the left side. The capsule of the kidney was adherent./

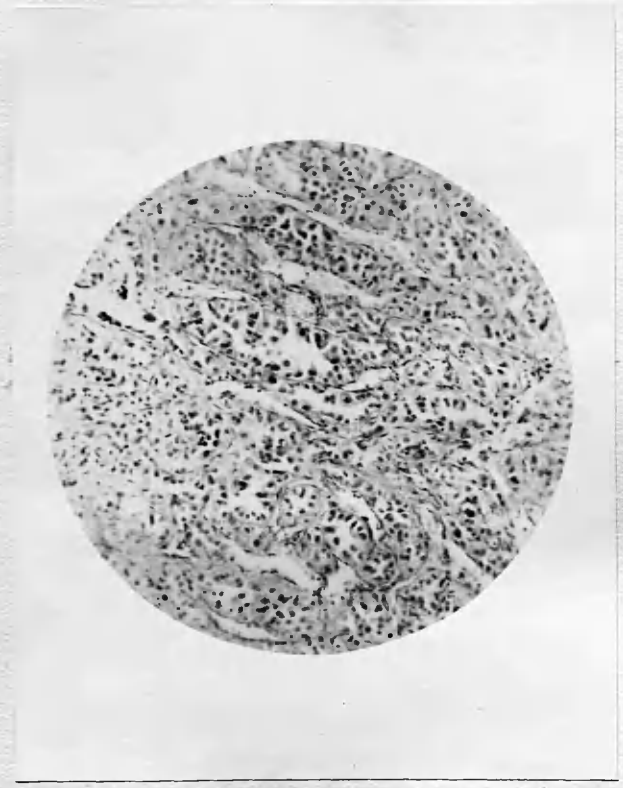

Fig. 7. Mrs. C.J. Case No. 22.

Microphotograph:- Papillary adeno-carcinoma with granular cells.

adherent. The specimen was 10" x 6" x 4" in size, and weighed 5 lbs. 12 ozs. On section it showed a complete alteration of the characters of the organ. There was replacement and infiltration with soft tumour tissue of a pale colour. The left suprarenal could not be recognised. The right kidney had undergone compensatory hypertrophy.

Microscopical examination of kidney tissue showed areas showing definite fibrosis with marked sclerosis of the blood vessels, and occasional inflammatory foci.

Microscopical examination of the tumour showed a growth of glandular character. In parts of the section there was a definite tubular arrangement with proliferation and desquamation of the lining epithelial cells. Areas of a looser or more spongy character were also present. The cells were granular in character and the supporting stroma contained thin walled blood vessels. The nature of the growth was probably that of a renal carcinoma with granular cells.

The naked eye description of the specimen also corresponded to this type of tumour. The one factor which contra-indicated a renal origin was the fact that the left suprarenal gland could not be found/

found at the post-mortem examination. To quote Ewing "When the adrenal cannot be found the renal origin of the tumour at once becomes doubtful." But in this case the macroscopical and the histological appearance of the tumour corresponded closely with the characters of a renal carcinoma.

Case No. 23. Mrs.E.McF. aet 56. Four years ago she had painless haematuria. Since then she has had attacks of haematuria at irregular intervals usually once in three months. An attack was usually preceded by dull pain in the right lumbar region, and accompanied by sickness and excessive vomiting. The haematuria usually lasted 24 hours. On admission there was tenderness on palpation in the right hypochondrium. A thorough examination was impossible as patient was very stout.

The right kidney was removed. It measured 6" x 4" x 2¾". On section there was a dilated pelvis and ureter, and three or four large cysts lined by smooth glistening epithelium. Studded throughout the organ were areas of tumour tissue which presented to the naked eye a yellow solid appearance.

Microscopical examination of tumour showed a tubular arrangement of the cells, with areas of haemorrhage./

haemorrhage. The cells were of the large clear vacuolated type with a central deeply staining nucleus. The stroma consisted of vascular connective tissue with the blood vessels markedly congested. In another part of the section the cells were arranged in an alveolar manner and were closely packed together. There were several large cysts containing mucoid material.

Case No. 24. T.D. Male, aet 43. He had a history of a left sided varicocele for the past fifteen months, which he attributed to a strain at his work. Its presence was associated with haematuria. He had been steadily losing weight. On admission there was a tumour palpable in the left lumbar region. Glands were palpable in both supraclavicular regions, also in the inguinal regions. There was impairment to percussion on the right side of the chest, both anteriorly and posteriorly. The sputum was very purulent in character.

Post-mortem examination - tumour of left kidney, tumour of bronchus with numerous nodules in the lung tissue.

The left kidney was enlarged with thickened and adherent capsule and enlarged glands at the hilum.

On/

Fig. 8. T.D. Case No. 24.

Microphotograph:- Section of kidney showing papillary adeno-carcinoma with granular cells.

Fig. 9. T.D. Case No. 24.

Microphotograph:- Section of lung. Papillary adeno-carcinoma with ~~clear~~ granular cells.

The clinical history of this case suggested a pulmonary growth rather than a renal one, and at the post-mortem the secondary tumour in the lung had the distribution of a primary lung tumour, namely, arising in a bronchus, but the sections showed the characters of a growth of renal origin.

Fig. 8. T.D. Case No. 24.

Fig. 9. T.D. Case No. 24.

On section practically the whole kidney was replaced by disseminated tumour growth, which showed no attempt at encapsulation. There was a rim of kidney substance at the lower pole. The pelvis and capsule were involved by direct extension. The tumour tissue was pale in appearance.

The microscopical examination showed the appearances of an adeno-carcinomatous growth. There was definite luminar formation and papilliform ingrowths, and the papillae showed the presence of a central vascular core. The cells were of small size with granular cytoplasm, arranged in columns with supporting stroma which contained thin walled blood vessels.

The right kidney showed two nodules present in its substance. Both suprarenals appeared normal. The left lung was adherent posteriorly. There were secondary nodules present over the surface of the lung, and on section the lower lobe showed a fair number of nodules of varying sizes. The upper lobe contained a few nodules. The bronchi showed tumour invading the lumen at the bifurcation of the main bronchus. Right lung contained numerous tumour nodules.

Microscopical/

Microscopical examination of the tumour of the left lung.- There was no normal lung tissue in the section, but areas of pigmentation and cartilage showed its pulmonary origin. The tumour tissue present resembled the primary tumour of kidney. Cells were arranged in alveoli and central degeneration had occurred giving the section a papilliferous appearance. In the more cellular part the cells were arranged in columns, but showed luminar formation and large areas of haemorrhage between the columns. The individual cells were small and granular, and contained a large dense nucleus.

Microscopical examination of the suprarenal glands showed no marked abnormality.

This tumour showed marked secondary involvement of the lung tissue, and the tumour in the lung had the distribution of a primary lung tumour, namely, arising in a bronchus; but the sections had the characters of a growth of renal origin. The age of the patient was 43, and the case may be regarded as more malignant than the majority of such growths. A noteworthy feature in the clinical history was the presence of a left sided varicocele.

Case No. 25. I.B. Female, aet 55. She had/

had a history of haematuria of three days' duration six years ago. Three years ago she noticed a swelling in her left side, which had grown larger latterly, and three days prior to admission she had haematuria associated with renal colic.

On admission there was a large mass occupying the right hypochondrium.

Cystoscopy - The bladder was normal, but the right ureter was pouting and blood was seen coming away from it. Three days after her admission she had a very bad urinary haemorrhage, and death occurred the following day.

Post-mortem examination - The right kidney was considerably enlarged. On section there was a tumour occupying almost the entire organ with a rim of kidney tissue at the upper and lower poles. The tumour area was 4¼" x 2½" x 3½" in size, definitely encapsulated, and divided into lobules showing areas of degeneration and haemorrhage. The capsule was adherent over the greater part. The left suprarenal was large, swollen, and the medulla was congested.

Microscopical examination of tumour - Most of the tissue examined was from areas of haemorrhage or haemorrhagic growth. In some of the sections no tumour/

tumour tissue was seen, but haemorrhage in various stages of formation - some recent, others organized. In the more cellular areas the characters of the sections were those of a papilliferous growth. The individual cells presented great variations in size and shape. The majority were cells of the large flattened squamous type, but intermediate forms between this and the columnar were also seen. There were a few large giant cells also present. One part of the section showed a definite tubular arrangement.

Microscopical examination of the suprarenal gland showed no change from the normal and there was no tumour growth.

Microscopical examination of the kidney tissue showed an interstitial nephritis with increased fibrous tissue, dilated tubules, and tubules showing desquamation and proliferation of the epithelium. Areas of inflammatory cells were also noted.

The origin of the tumour was renal, and the histology corresponded to a papillary adenocarcinoma with granular cells.

Case No. 26. F.McD. Female, aet 57.

History of renal colic associated with haematuria for/

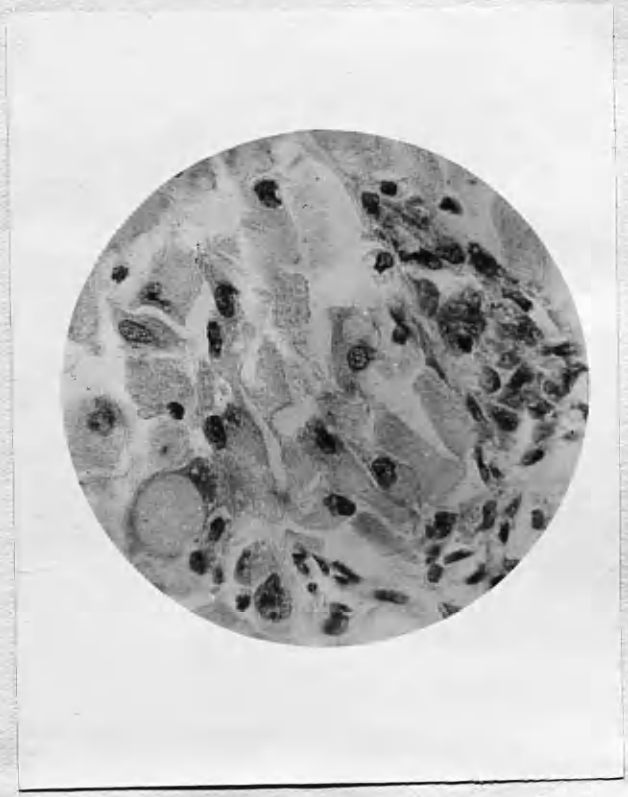

Fig. 10. F.McD. Case No. 26.

Microphotograph:- Squamous celled carcinoma of the pelvis.

The type of cell present varied between the flattened cell found in the upper layers, and the polygonal cell found in the deeper layers with all intervening types, but there were no cell nests.

for the past five years. During the last three months prior to admission she had had a constant dull pain in the left lumbar region, and occasionally had a trace of blood in her urine. Lately she had been losing weight. On admission the left kidney was enlarged and palpable. It was removed through a rectal incision.

On section almost the entire organ was replaced by tumour growth, but there was some healthy kidney tissue at the lower pole and between the lobules of the tumour. The growth was encapsulated but divided into lobules, and the pelvis was occluded by its presence. The greater part of the tumour was at the upper pole, and was of a solid fleshy consistence, but showed one or two small cysts and in the centre the growth had undergone mucoid degeneration. On the surface of the organ there were several large cysts filled with blood. The glands at the hilum showed marked involvement with the same type of tumour.

Microscopical examination of the tumour showed the characters of a squamous celled carcinoma. The type of cell present varied between the flattened cell found in the stratified layers of squamous epithelium/

epithelium and the large round or polygonal cell found in the deepest layers, and all intervening types were present in the section. The cells were loosely arranged and no cell nests were found in the section. The stroma consisted of fibrous tissue, and scattered throughout the tumour tissue were a few renal tubules and an occasional glomerulus.

The tumour had probably arisen from the squamous epithelium of the pelvis of the kidney.

Case No. 27. Grace C. aet 30. Eighteen months prior to admission she fell on her right hip and since then she has had pain in the region of the right kidney. Two months ago the pain became more severe, and she noticed a lump on her right side. She has had slight haematuria and has lost one stone in weight since her fall.

On admission there was found a large palpable tumour occupying the right kidney region. Operation was performed and the right kidney removed. The kidney was enlarged with a globular tumour growth at the lower pole, which had the appearance of a solid tumour of firm consistence and pale colour; and with areas of mucoid material and a few haemorrhages/

Fig. 11. G.C. Case No. 27.

Tubular adeno-carcinoma of kidney. A large white globular swelling at the lower pole and pelvis region of kidney.

Fig. 12. G.C. Case No. 27.

Microphotograph - tubular adeno-carcinoma of the kidney. The slides show a very cellular tumour growth of glandular character.

Fig. 11. G.C. Case No. 27.

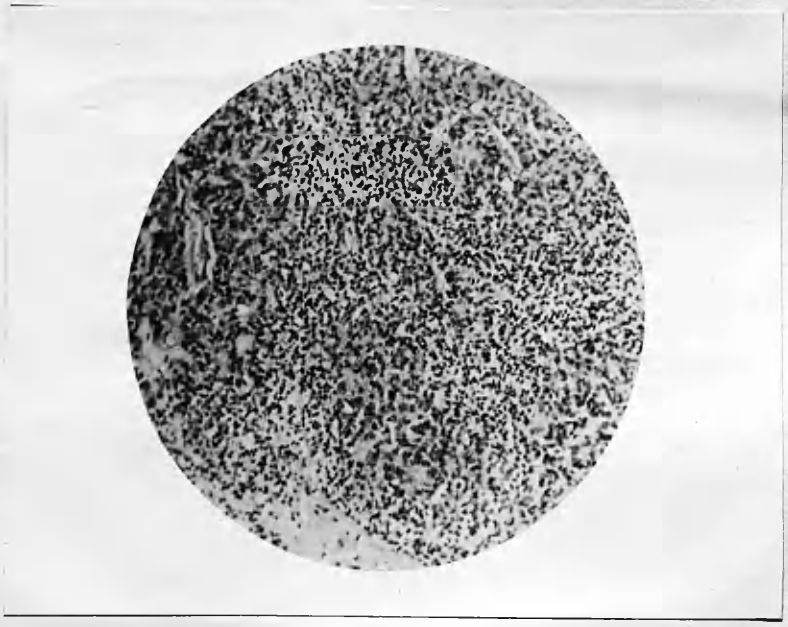

Fig. 12. G.C. Case No. 27.

hages distributed through same. The area of kidney tissue at the upper pole was equivalent to half the size of a normal kidney.

Microscopical examination of the tumour showed a very cellular growth with evidence of a tubular or glandular character. The lining cells were secretory in type. Another part of the section showed a papillomatous structure and the processes had a definite supporting core. There was a definite inflammatory reaction in the stroma and at one part a few giant cells were noticed.

Microscopical examination of a portion from a less cellular area showed great variation in structure and type of cell. There were areas of glandular appearance with definite lumina, areas of mucoid character with cells loosely distributed in a fine fibrous stroma. The cells were spheroidal, polygonal and squamous in type, and some had double nuclei. Adjacent to this were areas showing definite papillomatous change.

This tumour conformed to the tubular or alveolar adenocarcinoma supposed to arise in adult cortical tubules though such an origin has not been proved.

Case/

Case No. 28. Mrs.G. aet 51. There was a history of tumour on right side of five months' duration. No history of haematuria or renal symptoms. The right kidney was removed. It was enlarged and showed a tumour growth at the upper pole, $3\frac{3}{4}$" x $3\frac{1}{2}$" x 3" in size. It presented a variable appearance, areas of yellow tumour tissue, areas of haemorrhage and areas of fibro-myxomatous change in the centre of the growth, with a more cellular peripheral portion were recognised.

Microscopical examination of the tumour showed a considerable variety of appearances. Areas which had the appearance of organized fibrin, areas of haemorrhage, and areas of loosely cellular tissue without alveolar formation but containing numerous congested capillaries were recognised. In one part there was a loss of staining of the cells and at the margin of these areas large ganglionic nerve cells were seen. Connected with this was an area of denser fibrous like tissue in which the cells were of spheroidal or spindle shape. The tumour had the appearance of a fibro-sarcoma. The cells were of spindle shape and had more abundant chromatin in the nucleus.

Fig. 13. Mrs. G. Case No. 28.

Microphotograph of section showing presence of ganglionic nerve cells.

Fig. 14. Mrs. G. Case No. 28.

Microphotograph - adrenal tumour.

The tumour showed a variety of appearances histologically. Areas of loosely cellular tissue without alveolar formation, and with a few ganglionic cells, areas of haemorrhage and deposit of pigment, and more cellular areas in which the cells were of spheroidal or spindle shape.

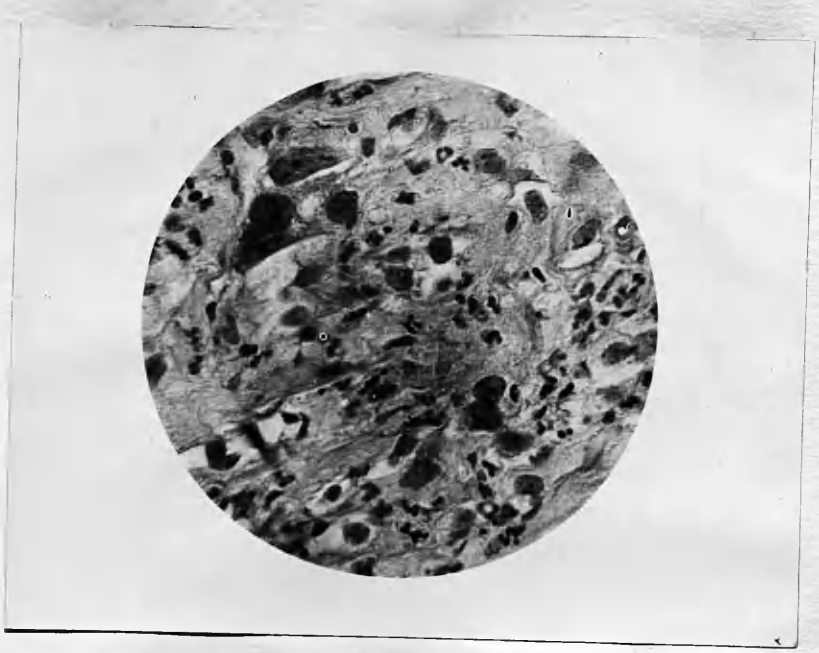

Fig. 13. Mrs. G. Case No. 28.

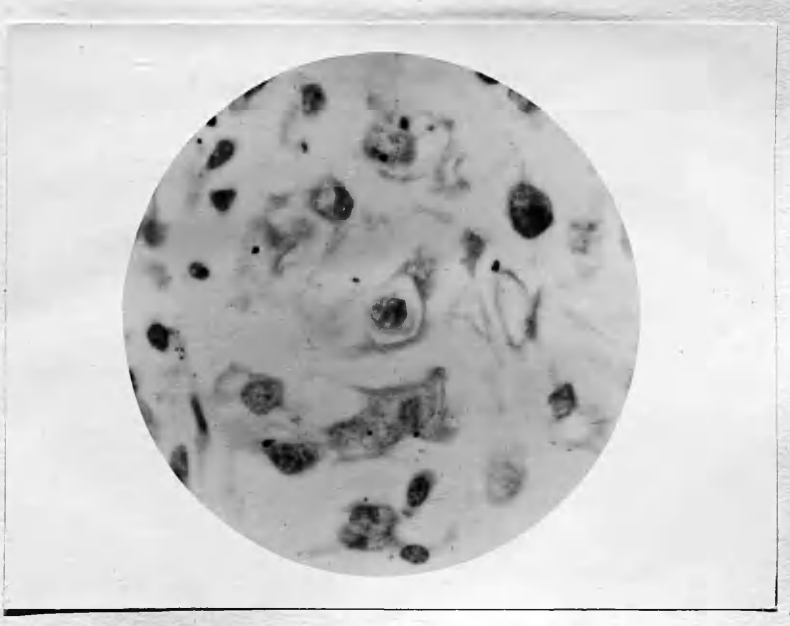

Fig. 14. Mrs. G. Case No. 28.

The cells were very loosely arranged and the stroma was scanty but in one part there was an alveolar arrangement of the cells with degeneration of those in the central area. Most of the cells were small and granular, but in the looser parts of section they were vacuolated, and some contained several nuclei. The characteristic feature was the large amount of haemorrhage and the deposit of pigment. The tumour tissue adjacent to this haemorrhage was very spongy in character. No tubular structure was recognised, no indications of glomeruli. The appearance was suggestive of an adrenal tumour of the kidney.

This tumour is probably an adrenal rest tumour in which both medulla and cortex are represented. The points in favour of such an opinion are -

(1) Broad sheets of cells without alveolar arrangement. No evidence of tubular structure and the absence of true lumina or papilliform formation.

(2) Presence of pigment cells.

(3) Presence of definite nerve cells.

Case No. 29. A.C. Male, aet 57. He complained/

complained of abdominal swelling of fourteen months' duration. This had been associated with frequency of micturition but no haematuria. On admission there was a nodular mass in the left hypochondrium and the left lumbar regions. There were enlarged glands present in both axillae and both groins. The left kidney was removed.

It was greatly enlarged. Externally it showed a lobulated appearance with the capsule adherent in parts. On section the pelvis and ureter were dilated and thickened. The kidney was almost entirely replaced by tumour growth. At the upper pole a large necrotic area was present, of gelatinous appearance.

Microscopical examination of the tumour showed a considerable variety of appearances with almost no evidence of kidney tissue. There were areas of dense tumour tissue not unlike a spindle celled sarcoma; and areas of looser character with large round vacuolated cells with central dense nucleus were noted.

The section showed also a great deal of haemorrhage and a considerable amount of pigment was present. At another part there was a trabecular arrangement/

Fig. 15. A.C. Case No. 29.

Microphotograph:- Adrenal tumour.

The section shows a trabecular arrangement of the cells which appear in broad anastomosing sheets.

Fig. 16. A.F. Case No. 30.

Microphotograph:- Adrenal tumour.

The section shows the characters of a fibro-sarcoma.

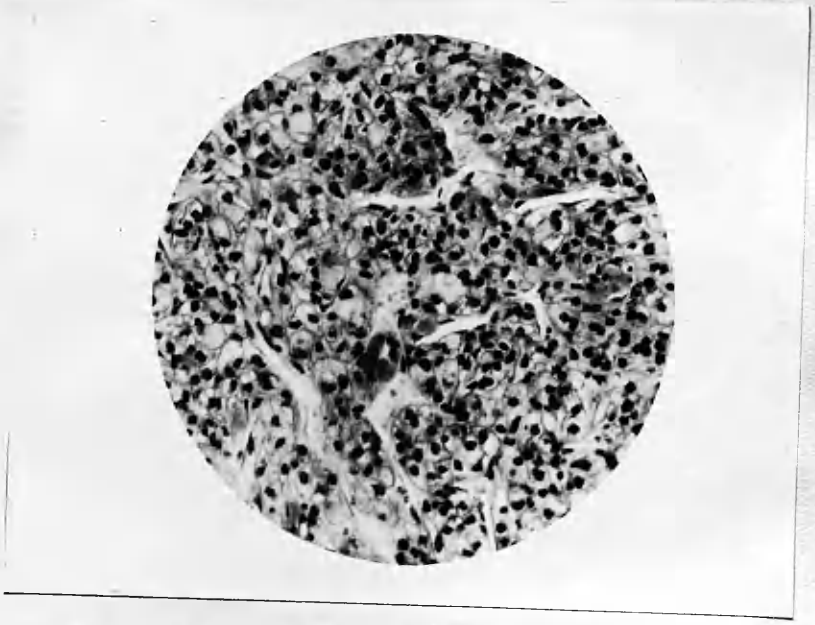

Fig. 15. A.C. Case No. 29.

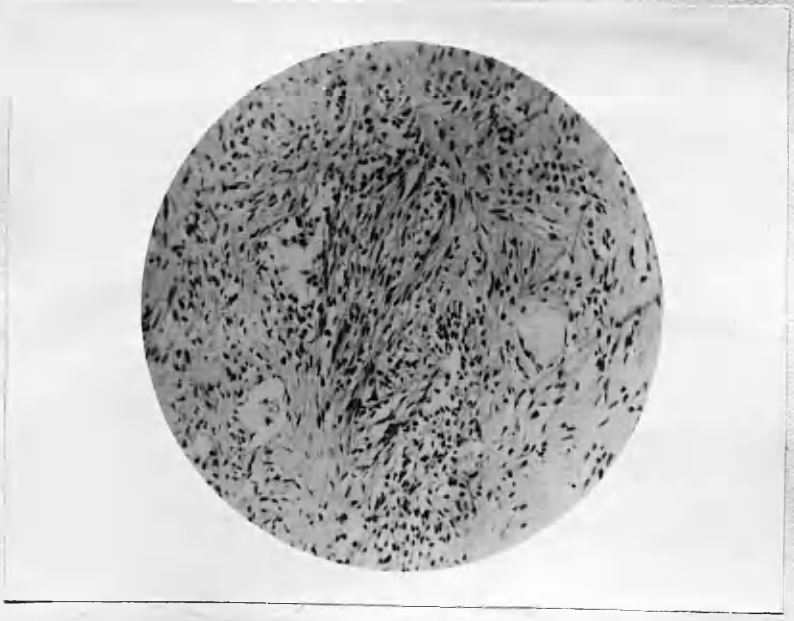

Fig. 16. A.F. Case No. 30.

arrangement of the cells which appeared in broad anastomising sheets supported by a vascular stroma. There were no lumina nor papillae, and the cells were small and granular in character. There was no definite alveolar or tubular arrangement and though the majority of the cells were round there were also spindle cells present. Section also showed a few cystic spaces. The origin of the tumour was adrenal.

Case No. 30. A.F. Male, aet 56. Patient was admitted as a case of acute pleurisy. No history was given in the chart. At the post-mortem a tumour of the kidney was discovered with secondary involvement of the pleura.

The right kidney was enlarged and contained a circumscribed tumour at the upper pole which was 3½" x 2½" in size. On section it showed areas of solid yellow tissue and areas of haemorrhage. The tumour was definitely encapsulated and the remaining kidney tissue was about one third of the size of a normal kidney, and situated at the lower pole. The left kidney was normal in size and appearance. Both suprarenals were normal. A number of the prevertebral and mesenteric glands

were/

were enlarged and showed malignant change.

The right pleural sac contained two and a half pints of blood stained fluid. Left pleural sac was filled with blood stained fluid, and the lung tissue was collapsed. The pleura was studded with metastatic nodules of small size but no tumour was present in the lung tissue itself.

Microscopical examination of the kidney showed marked cloudy swelling with loss of nuclear staining and slight fibrosis. The vessels showed arterio-sclerotic change.

Microscopical examination of the tumour showed a loose stroma supporting large clear vacuolated cells arranged in large alveolar masses. Adjacent to this was a more cellular area where the cells were more closely packed together and numerous small spaces were seen which resembled fat. The tumour cells had the appearance of a fibro-sarcoma. The clear cells had disappeared and the cells forming this part of the tumour were elongated and spindle shaped with more abundant chromatin in their nuclei. The feature of this spindle cell tissue was the tendency to the formation of small cyst like spaces, some having the

appearance/

appearance of glandular lumina.

The sections of the tumour showed no true lumina nor papillae, except where caused by degeneration of the central cells in the alveoli. In one small part of the section the appearances suggested an adeno-carcinoma of the kidney but the greater part of section showed the characters of a fibro-sarcoma. It is very rare in epithelial tumours of the kidney to find spindle cells and the features of a fibro-sarcoma, this is more common in adrenal growths, hence the reason for regarding the case as most probably of adrenal origin.

Case No. 31. W.I. Male, aet 61. Adrenal tumour. He complained of pain radiating downwards from the left shoulder to the hand of several months' duration, also twitching of the left side of face and tremors of left arm and leg, and frontal headache of a few weeks' duration. On admission there was jerking noticed in the left arm and leg, and slight paresis of the left side of the face. The urine contained a cloud of albumen, Esbach 5, but no blood, sugar, or pus. His physical condition gradually became worse from time of admission and he died six weeks later.

The/

The post-mortem examination showed that both lungs were affected by malignant tumour nodules varying in size from that of a pea to a tangerine. There was a nodule in the wall of the left ventricle of the heart near the bundle region.

The liver was enlarged and showed the presence of secondaries in the right lobe. The right kidney and the right suprarenal were normal. The left kidney was enlarged and had an irregular nodular surface. On section it contained a large tumour which had destroyed all the normal tissue except for a small area at the lower pole. The growth was haemorrhagic.

The body of the pancreas was involved by tumour growth and an adherent gland at this part was enlarged and involved by tumour.

The brain showed a flattening of the convolutions over the right temporal lobe. On section the cerebrum showed a tumour of walnut size in the post Rolandic area of the right side near the vertex, which extended downwards and backwards towards the temporal lobe. The centre had undergone necrosis. Another nodule smaller in size was present in the left/

left temporal lobe.

Histological investigation:- Microscopical examination of the suprarenal gland showed a small tumour nodule situated in the cortex. It showed the characters of a hyperplasia of the cortical tissue, but the arrangement of the cells was atypical, and irregular lumina were seen in places, which suggested a malignant change rather than a simple adenoma.

Microscopical examination of the left kidney showed a granular change. The glomeruli were small and fibrosed and there were inflammatory foci around the tubules.

The tumour was sharply demarcated from the unaffected kidney tissue by a definite fibrous capsule, which showed inflammatory reaction, congestion of the blood vessels and round cell infiltration. It had a loose trabecular arrangement of its cells in broad sheets with no definite supporting stroma. The cells were of fairly large size with a granular cytoplasm, and varied in shape from small round cells to spindle shaped cells, while at the periphery of the growth, where the tumour was very cellular, there was a preponderance of spindle cells,/

cells, giving the appearance of a spindle cell sarcoma. There was no suspicion of a papillary or alveolar formation. Another part of the tumour was very vascular and showed large spaces filled with blood.

The secondary brain tumour was not clearly defined from the brain tissue, but around the area of growth there was a zone of congested cerebral vessels. The want of definition was unusual in the case of a metastatic cerebral growth. It showed the same microscopical characteristics as the original tumour of the kidney, but the spindle cells were not such a predominant factor. The cells were arranged in broad sheets and showed no definite relation to the stroma. The blood vessels were markedly congested.

These last four cases showed tumours arising in the kidney tissue. The situation was in all compatible with an adrenal rest origin. In addition they all showed in one part at least an area of diffuse growth resembling a spindle cell sarcoma, which Ewing maintains is more common in adrenal than renal growths. In A.F. Case No. 30, one of the sections showed the characters of a spindle/

spindle cell sarcoma and if the other sections had not been examined the tumour would have been diagnosed as such. Case No. 29, Mrs. G., was a tumour of the kidney which was definitely encapsulated and on histological examination showed the characters of a hypernephroma, but in addition definite nerve cells were seen which seems to indicate an adrenal origin where the medulla as well as the cortex was represented in the growth.

Tumours of the suprarenal gland.

Case No. 32. A.McL. Male, aet 48.

Three weeks prior to admission patient experienced a tight feeling in the upper abdomen. This feeling persisted for fourteen days. He also had pain radiating between the shoulder blades. On admission there was a mass present in the right hypochondriac and lumbar regions. A laparotomy was performed and the mass was found to be a tumour of the suprarenal of melon size.

The specimen was a tumour measuring 9" x 6" x 2¾" in size. It showed the characters of a malignant growth. It was of yellow colour and showed friable tumour tissue with haemorrhagic foci.

Microscopical/

Microscopical examination of the tumour showed the characters of a neuroblastoma. The section showed large masses of cells loosely arranged with very little evidence of supporting stroma. The cell which featured mainly was a large round or oval cell with several nuclei and a clear pink protoplasm. They were very numerous in the section and suggested the type of embryonic nerve cell. They were arranged in groups or clusters throughout the section, but the typical rosette appearance of the neuroblastoma was not observed. Some more fully developed ones showed dendrites and axis cylinder processes, but Nissl's granules were not present, though the nucleus in some places showed a granular appearance.

Section 2 - the cells were arranged in adenomatous fashion like an adenocarcinoma, but in another part of section they were loosely distributed through a fibrous stroma where spindle cells were also seen. The cells varied in size but all had a deeply staining round nucleus.

Section 3 - showed characters of an adenocarcinoma of the adrenal gland. The tumour cells were arranged in groups showing an alveolar arrangement/

Fig. 17. A.McL. Case No. 32.

Microphotograph:- Neuroblastoma.

The section shows the presence of embryonic nerve cells.

Fig. 18. J.S. Case No. 33.

Microphotograph:- Neuroblastoma.

The section shows the typical rosette-like appearance seen in such cases.

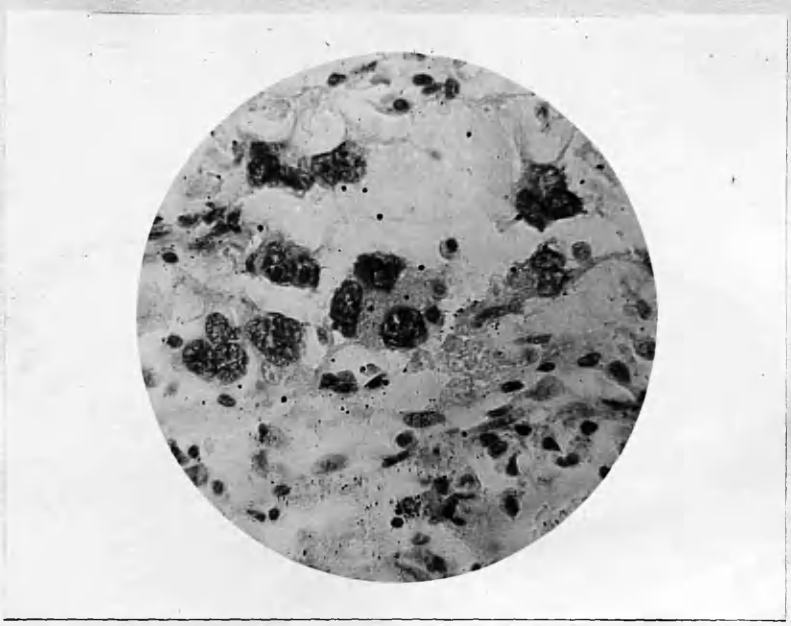

Fig. 17. A.McL. Case No. 32.

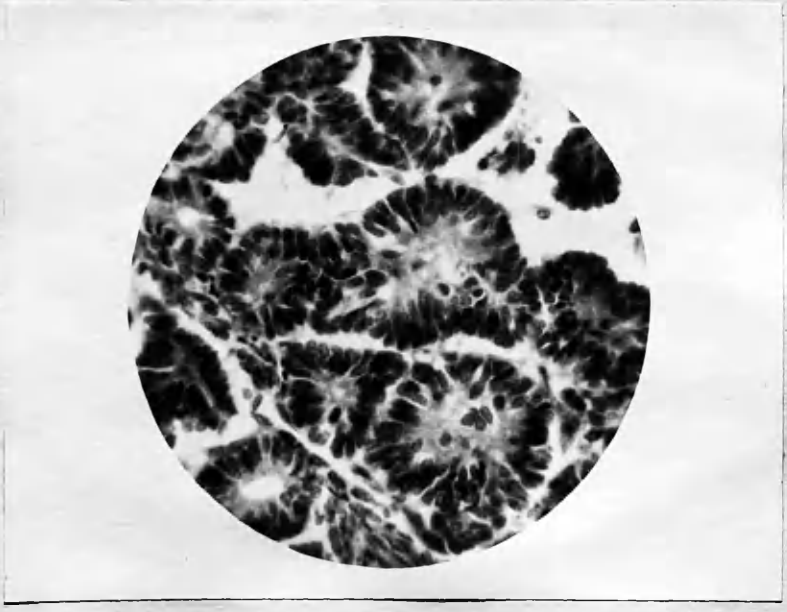

Fig. 18. J.S. Case No. 33.

ment and each part of the tumour was separated by a thin fibrous capsule containing a few blood vessels. The individual cells varied in size and type. The majority were columnar but some were round or polygonal and others almost spindle shaped. There were a few pigment cells present. The presence of the embryonic nerve cells in one section suggests a neuroblastoma, though this growth is usually found in the young adult or children.

Case No. 33. J.S. Female, aet 13. She had a painless swelling in upper abdomen of six months' duration. No disturbance of appetite, sleep, micturition or defaecation. On admission there was a large round tumour in the left loin extending into the umbilical, epigastric and left hypochondriac regions.

The left kidney was removed. The specimen consisted of the upper pole of left kidney which had a tumour growth attached to it. The tumour consisted of soft homogenous material.

Microscopical examination of the tumour showed a peculiar and characteristic structure. The tissue was composed of small round cells with central darkly staining nucleus and almost no protoplasm, and these cells were accompanied by a varying amount of fibrillar/

fibrillar material. In some areas there was a definite ring of small cells surrounding a few fibrils giving the rosette appearance which is characteristic of a neuroblastoma. In other areas the tissue was very cellular and the fibrils diminished in amount and the appearance might have passed for a round celled sarcoma.

Only a small piece of the tumour was available for microscopical examination, but the history obtained was that the tumour was attached to the upper pole of the left kidney.

Patient was discharged recovered, but re-admitted three months later with swelling of left leg and ascites. Died a few days later. No post-mortem was held.

Blastocytoma.

Case No. 34. D.McI. Male, aet 7. A large swelling was noticed on the left side one month prior to admission. No symptoms of hydro-nephrosis, but the swelling had been increasing rapidly in size. The left kidney was removed.

It had a very vascular capsule, and was enlarged with a tumour at one pole, measuring 6" x 4" x 3½" in size. It had a uniform fleshy appearance and an area/

area of bone was present in one part of the growth.

Microscopical examination of sections showed a tumour of glandular type and presenting the characters of a malignant adenoma arising in the tubular structure of the kidney. The age of the patient and the rapid increase in size of the tumour suggested an embryonal origin. This was also supported by the presence of bone in the gross specimen. The only section available showed the characters of a malignant adenoma of a very cellular type with scanty stroma.

Case No. 35. J.B. Female aet 4½.

Eight months ago the child became pale and thin and lost her appetite. At Montreal Children's Hospital a large tumour was removed from her splenic region. Latterly a swelling appeared on the left side of her abdomen.

On admission the abdomen was distended and a large swelling was present on the left side. Palpation showed a cystic swelling coming down below the costal margin and occupying left hypochondriac, lumbar and part of the left iliac regions. There was a separate swelling in the left iliac region and also one in the right iliac region.

At laparotomy the abdomen contained some clear fluid. The largest tumour was found to be densely adherent and immovable. The small tumour in left iliac region was removed. The child gradually became worse and died a few days later.

At the post-mortem examination a tumour was found occupying the left lumbar and umbilical regions, which was cystic in character. The area corresponding to the left kidney was occupied by a tumour of soft friable character, and no normal kidney was found, but the presence of the ureter attached to the growth and the suprarenal gland adherent to it pointed to kidney as the origin of the tumour. There was also a tumour nodule in the abdominal wall. The spleen was normal in size. Both suprarenals were normal, uterus and ovaries were normal.

Microscopical examination of the tumour showed large areas of degeneration containing many dilated vessels, also sinusoids packed with red blood corpuscles. Adjacent to this there was a cellular area consisting of round cells and spindle cells and scattered throughout this were islands of cartilage. Throughout this stroma there were also isolated/

isolated tubules, with definite lumina, the cells were of tall cylindrical shape with large nucleus. The stroma contained numerous small spaces suggestive of globules of fat.

Section 2 - this section was much more cellular and consisted largely of groups of small round cells with spindle cells scattered throughout. There were also groups of the tubular elements described above, but they were much more numerous and resembled the tubular adenocarcinoma of the kidney. No cartilage was seen in this section.

The structure of the tumour, large size and rapid growth combined with age of the patient corresponded with an embryonal tumour of the kidney - an adenosarcoma or blastocytoma.

Fig. 19. J.B. Case No. 35.

Tumour of the embryonic type showing in parts islands of cartilage, and a spindle cell stroma.

Fig. 20. J.B. Case No. 35.

Tumour of embryonic type showing tubular structure.

Fig. 19. J.B. Case No. 35.

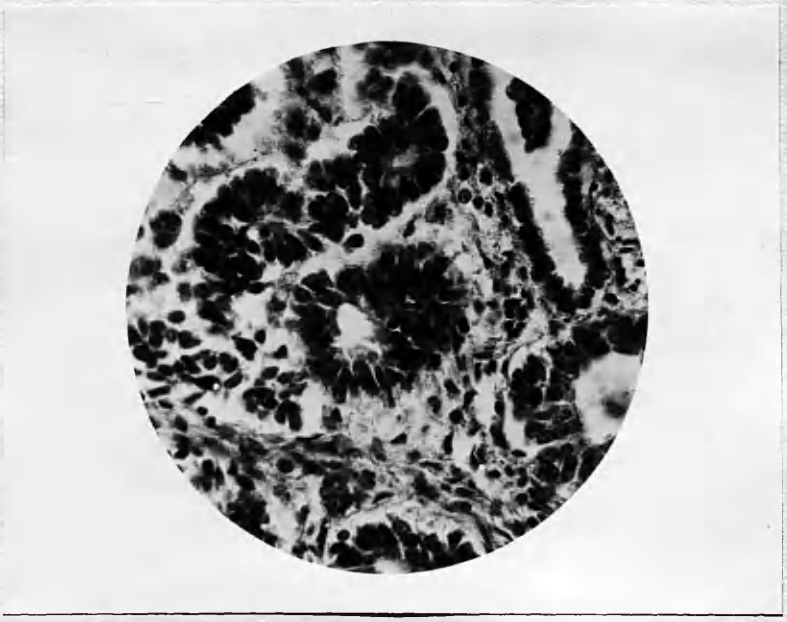

Fig. 20. J.B. Case No. 35.

Discussion.

The clinical study of the cases showed that the diagnosis of tumours of the kidney is simple if the two cardinal symptoms, haematuria and swelling in the loin, are present. Haematuria, however, is not a constant feature and is only present in 50 to 60 per cent of all cases. The presence of a swelling in the loin depends on the size of the tumour, and in the early stages, or in an obese patient it may not be demonstrable. Diagnosis has been greatly aided in recent years by the use of the cystoscope, which demonstrates the escape of blood from the ureter of the affected kidney. X ray examination may reveal an enlarged kidney shadow, but it is often negative. The pyelogram generally shows some abnormality in the pelvis of the kidney or the ureter.

The pathological study showed that the commonest type of tumour in the series is the renal carcinoma, which often resembles the naked eye appearance of the hypernephroma. Ewing's argument that many so called hypernephromata are in reality renal carcinomata has many points in its favour, and this view has been established in my study. Histologically the commonest type of carcinoma is the papillary adenocarcinoma/

adenocarcinoma found in adults.

In regard to the hypernephroma and the controversy as to the nature of such growths, which has occasioned so much discussion in the past, I have considered the question carefully and agree with those writers who maintain that renal carcinoma is the commonest form of malignant disease of the kidney, but I have found sufficient evidence amongst the cases studied to prove that adrenal rests found in the kidney may give rise to tumour formation, and that such tumours differ histologically from the renal carcinomata, with which they are very frequently confused.

The facts in favour of a renal origin for the majority of tumours of the kidney cannot be overlooked, in spite of Grawitz's original statement with regard to their origin. The Grawitz opinion was based on the resemblance of the individual cells to those of the suprarenal gland, and their marked difference from renal cells, without taking into consideration the fact that renal epithelium underwent fatty changes identical or approximating to those seen in the hypernephroma.

Though the large majority of these growths which were formerly classified as hypernephroma are in/

in reality renal carcinoma, yet there is a small but well defined group of tumours found in the kidney which arise from adrenal tissue and can be distinguished histologically from the hypernephroma. In most cases the tumour arises in an adrenal rest which has been found lying under the capsule of the kidney, but in some it originates in the adrenal gland and invades the kidney. Grawitz emphasized the fact that in the early stages these tumours show a central fibrous area which can be distinguished from the more cellular cortical portion. They are generally encapsulated growths, and I have found in addition that the histology of the cases is a reliable guide to their diagnosis. In my series of cases the adrenal tumours show a typical structure histologically, which differs markedly from the renal carcinoma.

The cells are generally arranged in broad sheets having a trabecular arrangement, or the arrangement may be more diffuse and the cells scattered loosely, but with no relation to the stroma. In this type a sarcomatoid structure is often met with, and there is no attempt at a definite papillary, alveolar or tubular arrangement as is found in the renal carcinoma. Tumours of the suprarenal gland frequently/

frequently show some evidence of embryonic nerve cells.

In Case No. 28, Mrs. G., the microscopic examination revealed numerous large cells resembling ganglionic nerve cells. Such a tumour might be regarded purely as an adrenal tumour growth, arising probably in a suprarenal rest, though as a rule such accessory suprarenals do not contain medullary tissue. The sections stained with toluidin blue showed ganglionic nerve cells with a ground work of fibrillar material.

Of great importance in the consideration of such tumours are the arguments put forward by Stoerk, who drew attention tc the absence of such growths from the suprarenal gland itself. Boyd in his "Surgical Pathology", describes a tumour of the adrenal gland which he classifies as an adrenal carcinoma or hypernephroma, and maintains that it is the commonest variety of adrenal tumour. It usually occurs about middle life and may attain a large size, is soft in consistence, of a yellow colour, and prone to haemorrhage. Microscopically the cells may attempt to reproduce the acini of the Zona glomerulosa or the columns of the Zona fasciculata./

fasciculata. In other cases the arrangement is wild, and no adrenal structure can be recognised, and the cells may show a decided perivascular arrangement. Thus we have a description of a tumour which corresponds to the adrenal rest tumour.

Stoerk also pointed out the increased frequency of papillary adenoma in the kidney with advancing age, due he believed to their association with granular change in the kidney. This statement has been proved in my series of cases. In the six cases of papillary adenoma I have studied, the ages ranged from 28 to 77 years. The man aged 28 was diagnosed early as there was a tuberculous infection superimposed. The others, J.M. aged 49, showed granular change; R.O. aged 77, showed advanced sclerosis of the kidney; M.R. aged 55, showed inflammatory change; S.A. aged 36, had a congenital cystic kidney, and Mrs. D. aged 52, had practically no healthy kidney tissue left.

Zebhe pointed out the relationship of carcinoma to sclerosis of the kidney. This is also in accordance with my findings. The table of cases illustrates the fact that there was found a granular change in the kidney associated with carcinomatous tumour/

tumour growth.

Bulloch and Sequeiro, Glynn and others laid stress on the absence of the altered secondary sex characteristics in the case of hypernephroma, and which are commonly present in adrenal gland tumours. One of the characteristic features of a suprarenal growth is the alteration of the sex characters of the patient, but this is not a constant feature as it is never found in the Hutcheson type of tumour which arises in children in the suprarenal gland, and which gives rise to secondaries in the brain and frequently in the eyeball. In addition the two tumours of the suprarenal gland, which I have described, showed no alteration in the sex characteristics.- Case No. 32, male, aged 48, and the other a girl, Case No. 33, aged 13, both of which were neuroblastoma.

Boyd makes the definite statement that the peculiar sex changes so characteristic of growths of the adrenal, never occur in adrenal rest tumours, but this statement was disproved by Bovin's tumour, which arose in an accessory suprarenal in the broad ligament of a woman aged 28, who for 9 years had suffered from suprarenal virilism, which improved after removal of the tumour.

The/

The embryonic tumours of the kidney generally resemble the early stages of development of the kidney. The histology invariably shows irregular masses of round cells whose nuclei tend to be arranged in rosettes around small areas of cytoplasm. Later stages show a definite epithelial arrangement and are more or less tubular in type. The cells may become elongated and spindle shaped, and form the stroma of the tumour. This is seen in Case No. 35, J.B. The gross specimen generally shows some evidence of embryonic tissue such as muscle, bone, or cartilage. The rapidity of the growth is also a noteworthy feature.

his kindly advice and helpful criticism during the
of the work.

Conclusions.

1. Haematuria and palpable tumour are the cardinal signs of renal tumour growth.

2. Adenocarcinoma is the commonest form of malignant growth in the kidney.

3. Adrenal rests may give rise to tumour formation in the kidney. Such tumours resemble the renal carcinoma, but differ from them histologically.

4. There is a definite relationship between sclerosis and carcinoma of the kidney.

I wish to thank the Muirhead Trustees for the scholarship which enabled me to undertake this study, the Governors of the Victoria Infirmary for the facilities of the Clinical Laboratory, and Dr. John Anderson for the supply of material, and for his kindly advice and helpful criticism during the progress of the work.

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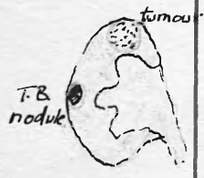
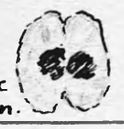
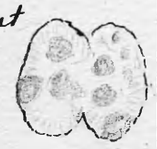
CLASSIFICATION	Case No.	Age and Sex.	Duration in Years	Urine	Clinical Features.	Source of Material	MORBID ANATOMY.	Condition of Kidney	Condition of Suprarenal	Microscopy.	Metastasis.
ADENOMA WITH TENDENCY TO MALIGNANT CHANGE	1. J.M.	49 M.	10/12.	Haematuria	Clots of blood passed. Cystoscope:- blood from L. ureter. Pyelogram - Negative.	OP.	Globular mass at lower pole left kidney. pale in colour. 	Granular.	—	Adenoma with tendency to adenocarcinomatous change.	None.
	2. W.MCE.	28 M.	?	T.B. in urine from L. ureter.	Pain in Left Iliac fossa. Renal colic Cystoscope:- blood from L. ureter.	OP.	Small nodule in cortex. 	T.B.	—	Adenoma with tendency to adeno carcinomatous change.	
	3. R.O.	74 M.	3/12.	Haematuria	Haematuria following an accident. Cystoscope:- bladder wall hypertrophied. Blood from L. ureter.	OP.	Tumour in central area of kidney. Showing haemorrhagic degeneration. 	Granular.	—	Adenoma showing haemorrhage and degeneration.	
	4. MrsD.	52 F.	?	No urinary Symptoms.	Abdominal discomfort from presence of tumour.	OP.	Large tumour upper pole. 	Practically no kidney tissue left. Other kidney hypertrophied	—	Adenoma showing tendency to malignant change.	
	5. M.R.	55 M.	1/12.	Haematuria	Cystoscope:- blood from L. ureter. Pyelogram:- Pelvis of right kidney Small and abnormal.	OP.	Small tumour 1" in size in central area kidney. 	Congested. Cloudy swelling of tubules.	—	Adenoma.	
	6. S.A.	36 F.	6/12.	No urinary Symptoms.	Pain and discomfort on left side.	OP.	Congenital cystic kidney with small tumour nodule. 	Cystic	—	Adenoma.	

Classification	Case No.	Age and sex	Duration in years.	Urine	Clinical Features.	Source of Material	Morbid Anatomy.	Condition of Kidney.	Condition of Suprarenal	Microscopy.	Metastasis.
Papillary Adenocarcinoma with Clear Cells	7. Mr W.	62. M.	2.	Haematuria.	Intermittent haematuria. Pencil shaped clots passed. Cystoscope:- blood from L. ureter. Pyelogram:- tumour L. Kidney.	OP.	Large tumour upper pole left kidney. 	Granular.	—	Papillary adeno carcinoma with clear cells.	
	8. John C.	58 M.	6/12.	Haematuria	Pain in right loin. Palpable tumour right side. Cystoscope:- blood from right ureter.	OP.	Large tumour occupying almost entire right kidney. Small area Kidney at upper pole. 	Normal.	—	Papillary Adenocarcinoma with clear cells.	
	9. Mrs L.	62. F.	1.	Frequency.	Frequency of micturition. Loss of weight.	Op.	Greatly enlarged left kidney. Large tumour at lower pole. 	No record.	—	Papillary adeno carcinoma with clear cells.	
	10. James C.	39 M.	4/12.	Haematuria	Loss of weight. History of renal colic. Cystoscope:- left ureter indrawn. and blood clot adhering at orifice.	Op.	Tumour left Kidney.	No record.	—	Papillary Adenocarcinoma with clear cells.	Metastasis in liver. A piece of which was removed for histological examination.
	11. Mrs M.	56 F.	A few months	No urinary symptoms.	Palpable tumour left side. Died 5 years later with secondaries in lumbar vertebrae.	Op.	Large tumour occupying Lower pole left kidney. 	No record.	—	Papillary Adeno carcinoma with clear cells.	Patient died 5 years after operation with secondaries in lumbar vertebrae and pelvic bones.

CLASSIFICATION.	Case No.	Age and sex.	Duration in years.	Urine	Clinical Features.	Source of Material.	MORBID ANATOMY.	Condition of Kidney.	Condition of Suprarenal.	Microscopy.	Metastasis.
PAPILLARY ADENOCARCINOMA WITH CLEAR CELLS.	12. J.D.	58 M.	2½.	Haematuria	Mass in the left lumbar region. Cystoscope:- blood from L. ureter.	Op.	Large tumour occupying upper pole left Kidney. Pelvis filled with blood clot. 	Normal.	—	Papillary adenocarcinoma with clear cells.	
	13. J.J.	47 M.	1.	Haematuria.	Severe haematuria requiring blood transfusion. Pyelogram:- enlarged kidney shadow L. side. Cystoscope:- blood from L. ureter.	Op.	Left kidney showed tumour occupying almost entire Kidney. Large cyst at lower pole. 	Granular and cystic.	—	Papillary Adenocarcinoma with clear cells.	
	14. G.S.	42. M.	6/12.	Haematuria	Tumour palpable in right lumbar region.	Op.	Encapsulated tumour growth at the upper pole. 	Normal.	—	Papillary Adeno carcinoma with clear cells.	
	15. A.S.	45 F.	2.	No urinary Symptoms.	Fracture of clavicle 2 years ago. Never healed properly. Large swelling noticed in same region.	P.M.	Encapsulated tumour at upper pole left kidney. Pelvis filled with tumour tissue. 	NORMAL.	Normal.	Papillary Adeno carcinoma with clear cells.	Secondary tumour nodules in left clavicle and ribs.
	16. Mrs A.W.	49. F.	3/12.	Haematuria	Palpable tomour in region right Kidney. Renal colic associated with haematuria. Meth. Blue. m. XV. given hypodermically. Dye secreted for 3 days.	Op.	Lobulated tumour mass at the upper pole right kidney. Degeneration in centre. Numerous cystic spaces present. 	Granular.	—	Papillary Adeno carcinoma with clear cells.	

Classification.	Case No.	Age and sex.	Duration in years.	Urine	Clinical Features.	Source of Material.	Morbid Anatomy.	Condition of Kidney.	Condition of Suprarenal.	Microscopy.	Metastasis.
Malignant Cyst–Adenoma.	17. A.D.	49. M.	2/12.	Haematuria.	Palpable swelling left side of abdomen.	P.M.	Large tumour growing from the lower pole left kidney.	Granular.	—	Malignant Cyst– Adenoma.	
	18 J.S.	59 M.	2/52.	No urinary Symptoms.	Tumour mass in left hypochondrium.	OP.	Large tumour at the lower pole. Small area of kidney tissue at upper pole. 	—	—	Malignant Cyst– Adenoma.	
	19. G.G.	53 M.	18/12.	Haematuria and frequency.	Gnawing pain in the left Lumbar region.	OP.	Large tumour at the upper pole showing marked degeneration. Pelvis filled with tumour tissue. 	—	—	Malignant Cyst Adenoma.	
Adenocarcinoma with Granular Cells.	20. A.H.	60. M.	10/12.	Haematuria	Palpable tumour in the left lumbar region. Renal Colic.	P.M.	Greatly enlarged left kidney. Section showed 2 large cysts, and tumour nodules throughout. 	Granular.	Normal.	Adeno carcinoma with granular cells.	Secondaries in Lungs.
	21. G.C.	50. M.	1.	Haematuria	Palpable tumour in the right lumbar region. Haematuria with renal colic.	OP.	Greatly enlarged right kidney. Disseminated tumour nodules scattered throughout organ. 	—	—	Adenocarcinoma with granular cells.	

CLASSIFICATION.	Case No.	Age and sex.	Duration in years.	Urine	Clinical Features.	Source of Material.	Morbid Anatomy.	Condition of Kidney.	Condition of Suprarenal.	Microscopy.	Metastasis.
ADENOCARCINOMA WITH GRANULAR CELLS.	22. M^rC.S.	43. F.	3/12.	No Urinary Symptoms.	Palpable tumour in the left lumbar region. Loss of weight.	P.M.	Practically whole organ replaced by tumour. 	Granular.	Absent.	Adenocarcinoma with granular cells.	
	23. M^rE.F.	56. F.	4.	Haematuria	Haematuria associated with nausea and vomiting.	Op.	Large tumour at upper pole. numerous small cysts present. 	—	—	Adenocarcinoma with granular cells.	
	24. T.D.	43. M.	15/12.	Haematuria	Palpable tumour left lumbar region. Purulent sputum. Left sided varicocoele.	P.M.	Tumour nodules disseminated throughout kidney. 	Granular	Normal.	Adeno carcinoma with granular cells.	Tumour of bronchus with numerous nodules in the lung tissue.
	25. I.B.	55. F.	6.	Haematuria	Palpable tumour in the left lumbar region. Renal colic. Cystoscope: blood from right ureter.	P.M.	Tumour occupied almost entire kidney, with areas of kidney tissue between. 	Interstitial nephritis.	Normal. Medulla Congested.	Adenocarcinoma with granular cells.	
SQUAMOUS CELLED CARCINOMA.	26. F.M^cD.	57. F.	5.	Haematuria	Palpable tumour left lumbar region. Haematuria and renal colic. Loss of weight.	OP.	Almost entire kidney and pelvis occupied with tumour growth. 	—	—	Squamous Celled Carcinoma.	Renal Glands.
TUBULAR ADENOCARCINOMA.	27. G.C.	30 F.	18/12.	Haematuria	Palpable tumour on right side. Loss of weight.	OP.	Pale globular swelling at lower pole. Tumour divided into lobules. 	—	—	Tubular Adenocarcinoma.	

Classification.	Case No.	Age and Sex.	Duration in Years	Urine.	Clinical Features.	Source of Material.	Morbid Anatomy.	Condition of Kidney.	Condition of Suprarenal.	Microscopy.	Metastasis.
Adrenal Tumours.	28. Mrs G.	51. F.	5/12.	No urinary Symptoms.	Palpable tumour on right side.	O.P.	Encapsulated tumour at the upper pole right kidney. Haemorrhage and degeneration in centre. 	—	—	Adrenal Tumour.	
	29. A.C.	57. M.	11/12.	Frequency.	Palpable tumour in the right hypochondrium.	O.P.	Greatly enlarged kidney with lobulated appearance. Area of degeneration at the upper pole. 	No healthy tissue left.	—	Adrenal Tumour.	Glands in axillae and groins.
	30. A.F.	56 M.	?	No urinary Symptoms.	History of acute pleurisy.	P.M.	Circumscribed tumour at the upper pole. right kidney. 	—	Normal.	Adrenal Tumour.	Metastatic nodules in pleura and glands.
	31. W.I.	61. M.	9/12	Albumin but no blood.	Symptoms of brain tumour. Frontal headache, twitching left side of face, tremors of left arm and leg.	P.M.	Large tumour upper pole of left kidney. 	Granular.	Small nodule present.	Adrenal Tumour.	Metastatic nodules in brain, heart, pancreas, lungs and left suprarenal.

CLASSIFICATION	Case No.	Age and sex.	Duration in Years.	Urine.	Clinical Features.	Source of Material	MORBID ANATOMY	Condition of Kidney.	Condition of Suprarenal.	Microscopy.	Metastasis.
NEUROBLASTOMA	32. A.McL.	48 M.	3/52.	No urinary Symptoms.	Mass in right hypochondriac region.	P.M.	Tumour of right suprarenal gland. 	—	Tumour.	Neuroblastoma.	
	33. J.S.	13 F.	6/12.	No urinary Symptoms.	Large tumour left loin.	OP.	Tumour of left Suprarenal. gland. Pale in Colour. 	—	Tumour.	Neuroblastoma.	Died three months later with ascites and swelling left leg. No P.M. held.
BLASTOCYTOMA.	34. D.McI.	M. M.	1/12.	No urinary Symptoms.	Large tumour on the left side, increasing rapidly in size.	OP.	Large tumour at the upper pole. Area of bone present in the specimen.	—	—	Blastocytoma.	
	35. J.B.	4½ F.	8/12.	No urinary Symptoms	Large tumour in the left hypochondriac region. Two smaller tumours in the right and left iliac regions.	P.M.	Tumour on the left side was kidney which was completely replaced by tumour tissue.	—	Normal.	Blastocytoma.	Tumour nodule in abdominal wall. Tumour previously removed from splenic region.