OBSTETRICS IN UGANDA

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PREFACE

The practice of obstetrics in Uganda is very different from that experienced among the white races. With the exception of disproportion, which is a very serious problem, the most important European abnormalities are relatively uncommon, a fact which is of considerable interest as the etiology of these conditions is still controversial and incompletely understood.

It is the intention of this thesis to present work done by the author on the different aspects of this problem and to suggest that they are all due to the same factor, the African patient's defective oestrogen metabolism.

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OBSTETRICS IN UGANDA

The work which forms the basis of this thesis was done in the Buganda province of Uganda, a small East African country situated on the north western shores of Lake Victoria. The country, which is rather larger than England in size, lies on the Equator, about 500 miles from the sea and forms part of the central African tableland, the greater part having an altitude of 3,500 - 4,500 feet. Although equatorial, the climate is tempered by the altitude and, as there is little seasonal variation, it can be likened to a warm English summer all the year round. Furthermore, there is an adequate rainfall fairly evenly distributed throughout the year and the country is fertile with lush tropical vegetation.

The natives of this country are of a number of tribes of different genetic origin, mainly Bantu with a smaller proportion of Nilo-Hamitic extraction, and many of these have very different customs and environment. This work, however, concerns only the Baganda, an agricultural race of Bantu stock settled on small plots of land or "Shambas". All the patients studied, therefore, are of very similar environment and dietary habits.

The diet is primarily vegetarian, rich in carbo-

hydrates but poor in protein and fats, animal protein being particularily deficient. Women and children rarely consume whole milk, and then only in negligible quantities, and, to a very large extent the cooking banana is the staple food. As a result protein deficiency is widespread and Kwashiorkor, with its resulting liver damage, is very common.

Many chronic debilitating diseases are common, the most frequent being chronic malaria, which is almost general, and hookworm infestation, which is almost equally widespread. Rickets and cases of vitamin deficiency, however, are rarely seen.

OBSTETRICAL CHARACTERISTICS

As already stated, the practice of obstetrics in Uganda shows some striking features. By far the greatest problem is disproportion and, in its moderate and severe forms, it is found in the majority of cases in labour. Very few primigravidae have the foetal head engaged before the onset of labour and, in the majority, the head does not engage until the late first stage or even the second stage when it has undergone considerable moulding with strong contractions. This results in a high incidence of difficult labour, and, as it is often associated with inadequate ante-natal care and delay in seeking medical aid, serious cases of obstructed labour

and ruptured uterus are all too common, with a high maternal mortality.

These patients, however, have generally efficient and well co-ordinated uterine action and there is no doubt that they have a much higher incidence of spontaneous delivery than could be expected among European women with the same degree of disproportion. Caesarean section is rarely indicated by uterine inertia or cervical dystocia, the great majority being done for gross disproportion, and even severe disproportion is often rapidly overcome, although the resultant excessive moulding of the foetal head leads to a high stillbirth rate.

Uterine prolapse, which is a common sequella of difficult labour in the white races, is rarely seen among these patients and preclampsia, which affects some ten percent of European pregnant women, is more than ten times less common in Uganda.

HISTORICAL REVIEW

The differences in obstetrical practice among civilised and primitive people's have long been well-known and generally they are similar to those described above. It is surprising, however, that so little attention has been devoted to these differences and there appears to have been no real attempt to study them. Standard textbooks explain the strong uterine action and

the rarity of preclampsia, rather vaguely, as being due to the savage's "remoteness from civilisation", and the frequency of disproportion is usually attributed to some peculiarity of the native female pelvis. There has been no attempt to explain the rarity of uterine prolapse.

DISPROPORTION

Disproportion arises when the foetal head is disproportionately large for the pelvis through which it has to pass and it may be due to pelvic contracture or, equally well, to an abnormally large foetal head. Accordingly, any study of disproportion and its etiology must consider both of these factors. Another factor of importance, which is often overlooked, is maternal height. It is reasonable to suppose that, in the absence of disease, the height of the patient bears a direct relationship to the size of the pelvis, a small woman having a small pelvis and a large woman a correspondingly roomy pelvis. Furthermore it is held that, among white women, a genetically small woman has a small baby and consequently, less difficulty than her pelvic size would lead one to expect, (Browne, 1.) This is well-known in veterinary work where different sized breeds are cross-mated, the offspring of a Clydesdale stallion and a Shetland pony mare, for example, resemble the mother in size, and it is apparently true for certain West African tribes (Perin, 2.) and the peoples of Bengal (Leicester, 3.). The most striking examples, of course, are the pygmies of the Belgian Congo, tiny women with tiny pelves and proportionately small babies. There is no doubt, therefore, that when different races are compared as regards pelvic and foetal size the average heights of the mothers concerned must be taken into consideration.

MATERNAL HEIGHT

In Masaka Hospital over the last five years all ante-natal cases have had their heights recorded. These have been measured on wall fixtures, personally checked and supervised, and every effort has been made to ensure accuracy. A series of more than 12,000 heights has been collected and, whenever possible, these have been related to the outcome of labour and, in 1,000 cases, to a clinical estimate of the diagonal conjugate. These results are summarised in Tables 1-3 and it is seen that the average ante-natal patient here is some four inches shorter than the average European woman and, correspondingly, a much larger number of very small women are found among them. A random sample of 1,000 female patients attending the general out-patients department showed similar results, indicating that the heights of the ante-natal patients are similar to those of the female population generally, (Table 4.) Furthermore, as might be expected, difficult labour is much more common among the smaller women. Thus, of women over five feet in height 95% deliver live children spontaneously, whereas the figure is reduced to 67% if the patients are under five feet. Also, of cases of severe disproportion, that is to say cases of Caesarean section, ruptured uterus and craniotomy, 95% are under four feet ten inches in height. Hitherto little atten-

tion has been paid to the height of the ante-natal patient here but, in a country where medical supervision of the district ante-natal clinics and hospital facilities for delivery are of necessity strictly limited, it should be a factor of considerable importance in the selection of cases for hospital confinement.

THE MUGANDA PELVIS

Radiological facilities at Masaka are inadequate for pelvimetry and the findings shown here are based only on clinical examinations. External pelvimetry shows markedly smaller measurements than the average European female pelvis, the intercristal and interspinous diameters averaging 8 and $7\frac{1}{2}$ inches respectively and the external conjugate 6 inches. Measurements of the diagonal conjugate, however, done manually by Smellie's method, are less markedly reduced, and, as pubic symphysis is unusually narrow in depth in these cases, these measurements of the diagonal conjugate indicate a longer true conjugate than would otherwise be the case, (Munro Kerr, 4.) These figures are shown in Table 3 and although they cannot be considered sufficiently exact for comparison with radiological measurements, they suggest that the pelves are not markedly contracted and might be considered normal considering the small stature of the patients.

Vaginal examination can yield little more than a

rough impression of the shape of the pelvic brim, unless there are markedly abnormal features, but in this series the pelvic brim seemed rounded with no instance of undue flattening or narrowing of the fore pelvis. Other features of t he pelvic shape, however, are quite evident clinically and of these the most striking is the unusual shallowness of the pelvis. This is not only apparent on vaginal examination but is often noted in gynaecological work where intra-abdominal surgery is made comparatively easy by the accessibility of the cervix and vaginal vault. Due to this shallowness of the pelvis the uterus is palpable abdominally much earlier in pregnancy, usually at the 8th week, and in labour the presenting part is well below theischial spines or even distending the vulva before the greatest diameter of the head has passed through the pelvic brim. Also, although the bituberous diameter often feels narrow, this is associated with short pubic rami and a wide pubic arch and the outlet of the pelvis is comparatively roomy.

As already stated these findings are based only on clinical examination and it is not yet possible to confirm them radiologically at Masaka. However, Sibthorpe (5), working in Kampala on patients of the same tribe and largely similar environment, has recently completed a series of Xray pelvimetries in

a group of 90 cases. Her results are very similar. She found a mean true conjugate of 9.97 cm and a mean transverse diameter of the brim of 11.2 cm. The measurements of cavity and outlet showed less reduction and she stressed the characteristic shallowness of the pelvis. She also measured the depth of the pubis which was 3 - 4 cm, as against the 4 - 6 cm which is given by Berman (6) as the average for white American women.

These measurements are slightly less than those found by Bernard (7) in a series of Scottish women under five feet in height and are considerably smaller than recent figures for t he average pelves of the white races, but t hey would not appear to be grossly contracted. In fact in European practice a few years ago they would have been considered as indicating only a minor degree of pelvic contracture.

It is of interest to note that in the only other series of measurements of the Bantu pelvis which the author has been able to find in the literature, Heynes (8), in South Africa, found slightly larger measurements, a true conjugate of 10.59 cm and a transverse diameter of 11.34 cm. Unfortunately, he does not mention the height of his patients and, as he was dealing only with the urban Bantu, it is not unlikely that nutritional and other factors are different in the two groups.

However, he found that "the lateral depth of the pelvic brim" was 8.77 cm.

As regards the shape of the pelvis it is, of course, extremely difficult to classify the shape of the pelvic brim from an Xray photograph and even the experts report very variable estimates of the incidence of the different types in similar groups of patients. This is well seen when the findings of Ince & Young (9) in urban England are compared with those of Kenny (10) and there is little similarity between the figures of Thoms (11) and Roth (12) on apparently similar groups of white Americans. However, Sibthorpe considered that the pelves in her series were mainly gynaecoid and as her measurements give a brim index of 89, very similar to those found by Ince & Young (9) and Nicholson (13) in the United Kingdom, it is unlikely that there is any great difference in the shapes of the pelvic brims in these cases. However, the shallowness of the pelvis and the divergence of its side walls which is almost a constant feature of the Buganda pelvis is the direct antithesis of the android pelvis with its characteristic funnelling and increased depth and it must be considered a most satisfactory shape from the obstetric point of view.

THE FOETAL HEAD

Measurements have been taken in 612 cases of single

infants born spontaneously. Cases were not selected other than that stillborn foetuses were excluded as usually their heads were excessively moulded. The occipito-frontal, bi-parietal and bi-temporal measurements were taken with obstetric calipers, checked against a steel tape, the points of measurement being those recommended by De Lee (14) and Williams (15), and the occipito-frontal circumference was measured as described by Ellis & Lawley (16), that is to say, from the maximum prominence of the occiput to a point immediately above the supra-orbital ridges. All measurements were taken personally by the author within 12 hours of birth and repeated on the fourth day of life. The mean occipito-frontal diameter at birth was 11.75 cm and the bi-parietal diameter 9.30 cm. These results show that the average Buganda child has a larger head at birth than children of the white races, and considerably larger than those of the American negro.

The measurements are also greater than those of Heynes (8) who considered that the head of the South African Bantu at birth was "at least" as large as those of the white races. Some of these comparitive figures are shown in Table 5.

The occipito-frontal circumference may be considered a more accurate measurement of the foetal head,

and, when the foetal heads in this series were measured in this way, again their large size is evident. The mean occipito-frontal circumference here was 35.10 cm as compared with 33.76 cm found by Ellis & Lawley (16) in Edinburgh children, and every effort was made in this series to ensure that these measurements would be directly comparable with Ellis & Lawley's.

When the measurements at birth and after four days were compared, in 96% of these cases an increase showed in the occipito-frontal circumference and, with little variation, this amounted to 0.25 inches. In the remaining 25 cases most were unchanged and only a few showed a slight decrease. This increase is not found among European babies where, in fact, Ellis & Lawley found an almost constant decrease, and is probably due to greater moulding of the foetal heads associated with the high incidence of disproportion among these patients.

DISCUSSION

These results show that the Baganda women are small with small, well-shaped pelves, that are apparently small in proportion to their height, and abnormally large foetal heads. It is likely, therefore, that it is the size of the foetal head which is primarily responsible for the frequency of disproportion among

them. This large foetal head might indicate that the race is genetically a very tall one, grossly stunted by malnutrition, an unlikely explanation, or it may be due to prolongation of pregnancy. This latter possibility is considered in the next chapter.

It is likely that the small stature of the patients is due in some degree to their poor nutrition, as is the proportionate reduction in the size of their pelves, but in this respect, the shape of their pelves is of considerable interest. Most recent authors including Thoms (17), Allen (18), Nicholson (13) and Torpin (19) have claimed that nutrition has the most important influence on pelvic shape, and, they claim that the incidence of platypelloid and android pelves is directly proportional to the degree of malnutrition. This is certainly true for the flat pelvis if rickets is common but otherwise it is certainly not the case here. As we have seen, these malnourished patients have a pelvic shape which is the antithesis of the android pelvis. If, however, the older theory of the importance of endocrine influence on pelvic shape is accepted, and the android pelvis is accepted as being due to an androgenic influence, the Buganda pelvic shape would appear to be due to a pronounced oestrinising effect. As will be discussed later, it is possible that these patients have, in fact, this tendency to hyperoestrinism

and the influence of hormones on pelvic shape would, therefore, appear to be much more important than is now generally supposed.

LENGTH OF GESTATION

In European and American practice much interest has been aroused in recent years by the question of prolonged pregnancy and its relation to foetal loss. There is no evidence, however, that this problem has yet been considered in the coloured races where, in fact, it is still generally supposed that prematurity is the major problem. This is, of course, mainly due to the low average birth weight of coloured infants, and the consequent high proportion of underweight babies among them, and also to the inability of the African patient to remember the date of her last menstrual period.

BIRTH WEIGHT

The mean birth weight of some 6,000 Baganda children born at Masaka was 6.36 pounds, that is to say about one pound less than the recent average for English children found by Gibson & McKeown (20), and a few ounces less than Taback's (21) figures for the American negro, and Salber & Bradshaw's (22) for the South African Bantu. Among these 6,000 babies, 983 or 16% were less than $5\frac{1}{2}$ pounds weight at birth. Study of the weight charts during the first few days of life showed a normal pattern although the initial loss was slightly less and the regaining of birth

weight slightly more rapid than is the case in white children according to Naish & Edwards (23) and Wickes (24) respectively. The slight differences are probably due to more rapid establishment of lactation among these patients and the otherwise normal weight charts indicate that the low birth weight is due to a true deficiency of body tissue.

SURVIVAL RATE

It is well known that coloured premature infants have better survival rates than white infants of similar birth weights and many authors, commenting on their good results, have suggested that they are due to the warm humid climate of the tropics. Taback (21), however, found the same difference in survival rates between American white and coloured children, nursed under similar conditions, and he concluded that the negro child of 2,320 g. birth weight was comparable in survival rate to a white infant of 2,500 g. At Masaka the care of these infants is of necessity primitive and hampered by lack of equipment and specialised staff, and there is no doubt that these factors far outweigh any advantage of climate, especially when the high incidence of disproportion and its resultant cerebral damage is taken into account. Nevertheless the results here compare favourably with those obtained by Crosse (25) in a

model institution in the United Kingdom (Table 6). It is impossible to estimate the value of adequate care of the premature infant but it is undoubtedly considerable, and, when the incidence of disproportion and the fact that the premature babies born before admission here are brought in much later than would be the case in the United Kingdom are taken into account, it is obvious that the premature white infant must be equalled in physiological performance by a Buganda child of much lower birth weight. The difference, moreover, would appear to be greater than in Taback's series of American negroes.

NEO-NATAL HEAD MEASUREMENTS

It has been shown here that the average new-born Buganda child has a larger head than white children and, when the head measurements are related to birth weight and compared with similar figures for Edinburgh babies (Table 7), the difference is seen to be most marked in the lower weight groups. As the birth weight increases, the difference in head size decreases until at 8 lbs. the heads have the same occipito-frontal circumference at birth, although, if allowance is made for moulding, the African head is still appreciably larger.

The table shows that the African baby of 4 pounds birth weight has the same head size as the European

child of 5½ lbs. and, as we have already seen, it has the same physiological performance. It seems likely, then, that they are equally mature.

ESTIMATED LENGTH OF GESTATION

When this investigation was first commenced some five years ago at Masaka, only an exceptional patient had any idea of the date of her last menstrual period. In fact it was generally considered that it was a waste of time asking the patient. With continued emphasis on the menstrual histories in the ante-natal clinics, however, the patients are beginning to appreciate its importance and, in recent months, an increasing number of the ante-natal patients have been able to give a definite date for their last period. The series now to be described includes 642 cases who attended the ante-natal clinic in the first 10 weeks of pregnancy and whose menstrual history was confirmed by careful bimanual examination. Only pregnancies resulting in single live or unmacerated stillbirths were considered.

The results are compared in Table 8 with figures reported for American and British babies and show a marked tendency to postmaturity, the average length of gestation being 42 weeks. When the cases are grouped according to length of gestation and the mean birth weights compared with those of white children (Table 9)

the difference in birth weights is again seen to be most marked among the more premature children, rapidly diminishing as the babies become post-mature. This is the same tendency as that seen in Table 7 when the head size of groups of the same birth weight were compared and it can only be explained by a delayed increase in body tissue in the African foetus which does not affect its head size. In the white races, according to Scammon & Calkins (26), rate of foetal growth is greatest in the middle third of pregnancy and, thereafter, there is a slowing down of growth. The post-mature white infant, therefore, grows little after term. In the African child, on the other hand, this sequence is delayed and, as pregnancy is prolonged, it catches up more and more rapidly until some three weeks after term when head size and body weight of white and African children correspond.

In this series the $5\frac{1}{2}$ pound British baby is seen to be equalled in maturity by a Buganda infant of just under 4 pounds, a similar conclusion to that drawn in considering foetal head size and survival rate.

INDUCTION OF LABOUR

Recently at Masaka, with the increasing number of available menstrual histories already mentioned, it has been possible to select patients for induction of labour.

Induction is advised wherever possible at the 41st week of pregnancy and, in cases where the date of the last menstrual period is not known, when the baby is considered adequate in size. In a number of cases, however, the patient is post-mature when first seen. Induction consists of 2 ounces castor oil followed by a soap enema, the classical "hot bath" being omitted as no facilities are available, and, in some cases, pitocin is given in addition, 0.5 ml intramuscularily every 30 minutes for a maximum of 6 doses. Many patients refuse induction but 171 cases have so far been induced and of these 129 received oil and enema only and 42 oil, enema and pitocin. Thirty-three (25.6%) of the former group and 15 (35.7%) of the latter went into labour within 12 hours. Garrett (27) found that only 5% of European women at term and 20% after term started in labour within 24 hours of simple medical induction and, if pitocin was added, the figures were 18% and 35% respectively. The results here, therefore, are further evidence of the frequency of postmaturity.

In this series of 171 cases the 48 cases which responded to medical induction all resulted in rapid spontaneous delivery of live children, although 7 of them had had previous stillbirths, and there were not any neo-natal deaths. Of the unsuccessful cases only 3 agreed to surgical induction and again a rapid spontaneous delivery was

the outcome.

DISCUSSION

The results of these investigations suggest two important facts. In the first place, if birth weight is taken as a measure of maturity, in the coloured races the lower limit must be considerably less than the generally accepted 5½ pounds. In the Baganda, who have been considered here, 4 pounds would appear to be a reasonable equivalent. This is not only a considerable saving on bed space but, in connection with survival rates, it will give a more accurate indication of the standard of post-natal care of the premature infant. Incidentally, by this standard, the incidence of prematurity here is 3.8% or about half the incidence in Great Britain. In the second place, it is evident that prolongation of pregnancy is common, 36% of cases being 42 weeks or more in duration. Now, there is little doubt that this constitutes a major problem, not only with regard to the relative disproportion which results, but also in view of the increased foetal hazard which is now generally held to be present in cases of prolongation of pregnancy. (Bourne & Williams, 28). It might well be true that the frequency of disproportion among the patients, with the resulting high maternal death rate from obstructed labour and ruptured uterus,

and a stillbirth rate of some 120 per thousand, is largely due to this tendency to prolongation of pregnancy. Attention to this problem, with emphasis on the importance of the menstrual histories in the antenatal clinics should prove of very great benefit to these patients.

The reason for this high incidence of postmaturity is of interest. It might be argued that the smaller bulk of the uterine contents, namely the foetus, causes the delayed onset of labour but this would appear to be unlikely. There is no apparent relation between the size of the foetus and prolongation of pregnancy in the white races. The mechanism governing the onset of labour is still obscure but it has been claimed by many authors that changes in oestrogen metabolism are important factors (Cohen, Marrian & Watson, 29; Smith, Smith & Schiller, 30; Reynolds, 31). Defective oestrogen metabolism due to the damaged liver of these African patients is likely to interfere with this process and would appear to be the most likely reason for the delayed onset of labour.

Little is known of the factors influencing birth weight. It is generally held that maternal nutrition can have little effect (People's League of Health, 32.) and even in gross malnutrition the weight loss amounts to only some 6 - 7 ounces (Dean, 33). The apparent

weight loss at term in this series is some 1½ pounds and some factor other than diet, maternal age or parity must be involved. The administration of thyroid extract is said to reduce birth weight (Arnold, 34) and Hammond (35) suggests that some other internal secretion may be the limiting factor. Again we see the probable involvement of the endocrine system and it is not unlikely that the same factors regulating the onset of labour control the bulk of the foetus and in some way defective liver metabolism in these patients delays the increase in foetal body tissue and the onset of labour. In any case, it is important to note that the reduction in birth weight does not affect the size of the foetal head, a fact which may have been overlooked by the advocates of foetal weight reduction in the management of contracted pelvis.

UTERINE ACTION

There is no doubt that the Bantu, in common with other negroid and oriental races have comparitively efficient uteri. No less than 85% of the obstetric cases at Masaka Hospital deliver spontaneously in spite of a high incidence of disproportion. It is, of course, not possible to compare exactly different series of cases of disproportion, as its estimation depends very much on the personal judgement of the obstetrician, but it is rare to find a primiparous patient here with the foetal head engaged or which can be made to engage before the onset of labour and, in the author's experience, 60% of primigravida present with the "overlapping head at term. There is no doubt that the great majority of these patients would be considered as cases of "trial labour" in European practice and it is likely that the degree of disproportion among them is not less than, for example, in the series of Hawkesworth (36) or McClure Browne (37), where a Caesarean Section rate of 41% was considered not unduly high. The high Caesarean Section rate in European practice, however, is at least partly due to delay in the first stage of labour, that is to say inadequate uterine action, rather than any insuperable obstruction or sudden foetal distress, and these are the cases which are rare at Masaka, only 18

cases in the last 8,000 deliveries.

Furthermore, in 357 cases of primigravidae where the length of labour could be estimated accurately, not a very common occurrence in the African patient, with their generally vague idea of time, the average was 12 hours, rather shorter than the 13 hours which is the average for even normal European women (Greenhill, 38), and prolonged labour, that is to say labour lasting 48 hours or more, is ten times less common than among Europeans. When delay occurs it is usually in the second stage and, in fact, most of the cases of prolonged labour here are due to gross neglect, for example cases who are admitted 24 hours or more after the onset of the second stage, and it must be accepted that delayed labour due to abnormal uterine action is very rare indeed. In addition, it would seem that the average African uterus generally works more efficiently than the uterus of the normal European patient.

With a view to investigating the nature of uterine action among these patients, a number of cases have been studied by the method described by Williams & Stallworthy (39). This method, whereby a polythene tube is introduced into the amniotic sac via a Drewe Smythe's catheter and pressures read by measuring the height to which liquor rises in the tube above the pubic symphysis, is certainly the simplest and most convenient method of measuring

intra-uterine pressure and it has been widely acclaimed as accurate and satisfactory. This procedure has been carried out on 23 Baganda patients in labour during the last 7 years, the small number being due to the reluctance of the average African patient to consent to the necessary manipulation. All patients had a rapid dilation of the cervix in the first stage of labour and, apart from two cases where there was obstruction after full dilation, a rapid spontaneous delivery. During the first stage of labour the average basal pressure in the series was 20 cm of liquor, twice the average found by Williams & Stallworthy in European women, and the lowest in the range was 16 cm. Contraction pressures in the first stage ranged from 30 to 70 cm with an average of 44 cm. Williams & Stallworthy's readings ranged from 50 - 90 during first stage contractions. During the second stage, contraction pressures rose sharply to 130 - 180 cm of water, due to powerful voluntary expulsive efforts of the patients but with two exceptions the basal pressures remained unchanged. The two exceptions were the cases where labour became obstructed and after about one hour in the second stage the uterine tone started to increase rapidly, reaching 55 and 60 cm respectively, before labour was terminated.

The number of cases in this series, and, indeed, in William's and Stallworthy's series also, are too small

to allow any direct comparisons to be made, especially as a number of factors have to be considered, the incidence of disproportion and postmaturity, for example, being probably very different in the two series, but it is nevertheless striking that the rapid dilation of the cervix in these African patients is associated with a high basal uterine tone and only moderate contraction pressures. It is, in fact, just the opposite state of affairs to that generally believed to be the most satisfactory in European practice, a strongly contracting uterus which relaxes well.

It was, unfortunately, not possible to obtain a recording apparatus to take a tracing of the uterine contractions but these did not seem to be unduly prolonged and it was considered unlikely that the shape of the contractions differed markedly from that found by Williams. Nor did the contractions appear to be unduly frequent. It follows that, unless the high basal tone of the uterus itself can be held to have any dilating effect on the cervix, dilation in these cases is effected by a comparatively small amount of work on the part of the uterine fundus and the ease and rapidity of the first stage must be due to a softer more easily dilatable cervix.

The factors influencing uterine action have always been of great interest to the obstetrician and much attention has been devoted to them, especially in recent years.

Nevertheless, it must be admitted that they are still incompletely understood and it is of interest, therefore, to consider these factors in relation to the patients studied here.

EMOTIONAL FACTORS

In the past it has been generally considered that the emotions exert considerable influence on the first stage of labour, a relaxed confident frame of mind leading to relaxation of the cervix. Recently, however, their importance has been discounted, Nixon (40), for example, showing that his relaxation patients, while they may stand up to labour better, do not, in fact, have shorter or easier labours than his other patients. The advocates of "natural childbirth", on the other hand, often point to the primitive races as examples of easy painless childbirth where the mother is confident and devoid of fear. Nothing could be further from the truth at least in so far as the Baganda are concerned. It is true that the African patient has a more fatalistic outlook than the European, and they are less likely to seek medical aid. Many of them feel that everything depends on their own efforts and that they must deliver the baby spontaneously or die. There is no doubt that this makes them better patients in adversity but, as we have seen, these patients have a high incidence of disproportion.

The second stage of labour is often long and painful and there are frequent maternal deaths. The Buganda woman approaches her confinement expecting it to be difficult. Even the multipara will probably have memories of previous difficult deliveries. She has heard of many women who have died in childbirth and some of these may even have been her friends or relatives. When, in addition, it is remembered that these patients in hospital are in a very strange environment, with, because of the language difficulty, little in the way of consolation or reassurance, it is not surprising that hysteria and loss of control are not uncommon during labour and tenseness and anxiety are the rule rather than the exception. Certainly not the state of mind most calculated to aid in dilation of the cervix.

MECHANICAL FACTORS

Mechanical factors such as occipito-posterior position, breech presentation, delayed engagement of the foetal head and a long hard cervix are generally held to influence uterine contractions and even to be capable of inducing true inertia (Bourne, 41). This does not appear to be the case here where the occipito-posterior position with delayed engagement of the foetal head is so common, and it is probable that these mechanical factors have less influence on uterine action than

is generally supposed. It is now known that the pattern of uterine action is laid down during pregnancy some time before the onset of labour and it is claimed that incoordinate action can be recognised at this time (Murphy, 42). It would seem reasonable to suppose, then, that these abnormalities are more likely to be the result of incoordinate uterine action which is already established rather than themselves the cause of incoordinate action during labour. The high "free" head in the European being due, possibly, to a delayed taking up of the cervix or delayed formation of t he lower segment, whereas, in the African case, it is nearly always due to disproportion.

Another mechanical factor peculiar to these patients must be considered. Theoretically, the shallowness of the pelvis may lead to early pressure on the pelvic floor with reflex stimulation of expulsive efforts by the patient, and, certainly, these patients do tend to bear down prematurely unless they are carefully supervised. It is unlikely, however, that this can have much effect on the dilation of the cervix.

"NATIVE MEDICINE"

The majority of these patients take "native medicine" early in labour. Usually this is taken orally, in liquid form, although sometimes it is introduced vaginally as a paste mixed with animal manure. In the first instance it

is a powerful gastro-intestinal irritant with toxic and occasionally even fatal effects. In the second, as might be expected, it may lead to severe puerperal sepsis. It is difficult to obtain samples of this "medicine" as patients and even African midwives are reluctant to discuss it with Europeans, but several workers have done so, and on analysis, these have failed to show any oxytocic or spasmolytic effect. In any case, the pattern of uterine action shown here is not suggestive of any strong oxytocic drug having been taken.

ENDOCRINE FACTORS

It is now generally accepted that uterine action is largely under endocrine control and that oestrogen metabolism plays a dominant role. An enormous literature has been built up over the last 25 years since Reynolds (43) showed that oestrogen increased the acetylcholine content of the uterus and it is now held to exert its action by the synthesis of actomysin (Bourne, 44). However the process is extremely complicated and still incompletely understood. Jeffcoate (45) found that oestrogens were sometimes of value in cases of uterine inertia but results were often disappointing. Certainly it is not simply the level of circulating oestrogen which is the important factor but rather the mechanism of oestrogen metabolism. As we

have seen in this series, the rapidity of the first stage depends mainly on the softness and elasticity of the cervix, conditions which are very likely to be under oestrogenic control, and again it appears likely that the peculiarities of oestrogen metabolism in the African patient is the solution to the problem.

TOXAEMIA OF PREGNANCY

Toxaemia of pregnancy is uncommon among the natives of Uganda although it is not so rare as it was formerly supposed. Severe cases of eclampsia are seen each year at Masaka, a total of 14 cases in the last 9,000 deliveries. These are always non-booked cases who have had no ante-natal care and who are admitted usually after numerous fits at home and the mortality rate is accordingly high. At first sight this might seem a fairly high incidence of eclampsia by modern standards, but there is no doubt that it would be much higher in England if similar conditions prevailed, malnutrition, continued hard labour throughout pregnancy and inadequate ante-natal care. A study of the patients attending the ante-natal clinic gives a truer picture. In a series of 14,000 ante-natal cases where the blood pressure was taken personally by the author, the systotic pressure was less than 140 mm of mercury and the diastolic less than 90 mm of mercury in all but 104 cases, an incidence of hypertension of 0.7%. The urine contained albumen in 63 cases (0.5%). Oedema, on the other hand, is commonly seen and the weight increase during pregnancy, although irregularity of attendance makes it difficult to obtain accurate data, seems rather greater than that found by Cummings (46). This oedema can sometimes be extremely severe but, although its nature

is rather obscure, it is most likely nutritional in origin. It is always associated with low plasma proteins and a moderately severe anaemia. Admittedly very low plasma protein levels occur without oedema and the very gross anaemias associated with hookworm infestation, which are not uncommon, also show little tendency to oedema. However, these oedematous cases respond slowly to a high protein diet and vitamin B administration and as they show no tendency to develop hypertension or albuminuria later in pregnancy, there is little doubt that they are non-toxaemic in origin. On the basis of the blood pressure estimations already mentioned it would appear likely that toxaemia of pregnancy is more than ten times less common than among European patients.

Preclampsia is probably the most important obstetrical problem in European practice at the present time. It is an important cause of foetal loss and chronic ill-health and, with the possible exception of shock and haemorrhage, it accounts for t he majority of the maternal deaths among Europeans. The etiology of this condition, however, in spite of many years of intense and widespread study, is still unknown. The apparent resistance of these patients to preclampsia is, therefore, of very great interest. Chronic malaria, ankylostomiasis and other chronic debilitating diseases, conditions which are generally held to predispose to preclampsia , are rife

among them and, of course, malnutrition with marked protein deficiency is widespread, again generally considered an important predisposing factor (Brews, 47). Even the climate of Uganda would be considered by Dieckman (48) as most favourable to the incidence of eclampsia.

Various theories have been advanced to explain the etiology of preclampsia and these still have their supporters, the whole question being highly controversial. It is not intended to discuss these in detail here but it has been shown that the endocrine system is at least involved and the important work of the Smiths (49) has established that oestrogen metabolism is at least an important link in the chain of events leading to the development of preclampsia. It is not unlikely that the comparative inability of the liver of these patients to metabolise oestrogen in some way breaks the chain and prevents the development of preclampsia. The whole mechanism is extremely complex and, as yet, incompletely understood but it would seem likely that a study of these patients, particularily with regard to their endocrine balance, when the necessary facilities are available in East Africa, would do much to cast light on this problem of toxaemia of pregnancy in Europeans.

UTERINE PROLAPSE

This is another condition which is very common in Europeans but rarely seen among natives of Uganda. In the past seven years the author has seen only 9 cases of chronic procidentia and 3 of cystocoele. In the same time, however, he has dealt with more than 100 cases of vesico-vaginal fistulae and cases of complete perineal tear and severe perineal trauma are quite common. These patients are often anxious for operation only because the vaginal introitus is lax, and there is no doubt that if cases of prolapse occurred they would attend the hospital. Chronic prolapse of the uterus, therefore, is rare in Uganda and, in comparison with the incidence among Europeans, it is very rare indeed. All the factors which are generally held to predispose to prolapse, however, are very common. These women are undernourished and suffer many chronic debilitating conditions. It is usual for them to return to heavy manual labour in the "shamba" within a day or two of their confinement and many women have numerous children. Labour is frequently difficult, the patients are very liable to bear down on an undilated cervix, and severe perineal trauma are common. Even if the patient refuses to have her perineal tear repaired, as is not uncommon, uterine prolapse does not follow.

It is another surprising fact that, although chronic

prolapse is rarely seen, acute procidentia is not uncommon. The author has seen no less than 54 of these cases where third degree prolapse occurs immediately following the birth of the baby; it is certainly a much rarer occurrence among the white races. At first sight these cases are alarming, sometimes being admitted as cases of inversion of t he uterus, but there are no ill effects and within a few days the uterus returns to its normal position, involutes well, and on vaginal examination a week after delivery, nothing abnormal can be found.

With the exception of cases of vesico-vaginal fistulae which often show gross scarring, these patients show no evidence of cicatricial contraction. The vagina is lax and smooth and the uterus freely mobile. The rarity of prolapse, therefore, cannot be explained by the African's tendency to excessive fibrous tissue formation.

It is obvious, then, that the accepted predisposing factors to uterine prolapse are of less importance than is generally supposed and there must be some other important etiological factor which has not yet been considered.

For some reason the intra-pelvic supports of the uterus are not damaged in spite of the excessive stretching which often occurs in these patients. This can only be explained by pronounced softness and elasticity of the tissues, a similar condition to that found in the cervix

in the investigation of uterine action, and, one which is almost certainly under endocrine control. Possibly Relaxin, the new ovarian hormone, is largely responsible. It seems reasonable to suppose, therefore, that inadequate hormonal stimulus is an important factor in the etiology of uterine prolapse and these patients do not get prolapse because their inefficient oestrogen metabolism maintains the hormonal stimulus.

HORMONAL IMBALANCE

It is well-known that the Bantu male exhibits many features suggestive of hyperoestrinism, the comparitive lack of facial hair, female distribution of body fat, narrow sloping shoulders, and a high incidence of gynaecomastia. Davies (50) suggests that this is due to widespread liver cirrhosis among these patients, the damaged liver being comparatively unable to metabolise oestrogen. Some degree of liver cirrohis is almost universal among these patients and is probably due to severe protein deficiency in infancy and childhood. It has been shown that protein deficient diets produce liver cirrhosis in experimental animals (Cecil & Loeb, 52), and a similar syndrome of hyperoestrinism has been reported in cases of cirrhosis of the liver in Europeans (Glass et al, 51).

In the female, however, and particularily during pregnancy, this interference with oestrogen metabolism is likely to have much wider effects and, as we have already discussed, it is the most likely explanation of the findings in each one of the various problems we have studied here. There would seem to be therefore, strong theoretical and clinical grounds for assuming that the obstetrical peculiarities of the Baganda are, in fact, due to abnormal oestrogen metabolism.

SUMMARY

This thesis presents a study of the obstetric characteristics of the Baganda, a Bantu race with a low protein diet and evidence of disordered oestrogen metabolism.

Disproportion, the most important obstetrical problem among these patients, has been investigated and evidence is shown that it is mainly due to prolongation of pregnancy, a condition which, when recognised, can effectively be dealt with as described with considerable reduction in foetal and maternal death rates. The work described also throws some light on the factors controlling pelvic shape, the onset of labour and foetal growth.

The rarity of incoordinate uterine action, toxaemia of pregnancy and uterine prolapse among these patients has also been investigated and the probability that this is related to their oestrogen metabolism discussed.

A strong plea is made for endocrine investigations, which have yet to be undertaken in East Africa. Apart from being of obvious benefit to the African patient, these might well elucidate some of the most important etiological and prophylactic problems among the white races at the present time.

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APPENDIX

Table 1

12,000 ante-natal cases according to height.

Average height 4 feet 11.8 inches.

Height	- 4'4"	- 4'8"	- 5'	- 5'4"	5'4" -
No. of cases	45	1236	5479	4879	361

Table 2

Relation of spontaneous delivery to height of patients.

Height	- 4'4"	- 4'8"	- 5'	5' -	Total
No. of cases	13	350	1565	1517	3445
Spontaneous delivery	7	232	1252	1440	2931

Table 3

Diagonal conjugate according to maternal height.

Height	- 4'4"	- 4'8"	- 5'	- 5'4"	5'4" -
No. of cases	4	102	456	410	28
Average Diagonal Conjugate	3½"	3½"	4"	4½"	- *

* In most cases promontory was not reached.

Table 4

Heights of 1,000 female patients at the General Outpatient Clinics.

Height	- 4'4"	- 4'8"	- 5'	- 5'4"	5'4" -
No. of cases	4	98	441	425	32

Table 5

Comparative foetal head measurements.

	Occipito-frontal diameter	Bi-parietal diameter
Masaka	11.75	9.30
American White (Riggs, 1904)	11.71	9.25
American Negro (Riggs, 1904)	11.26	9.05
South African Bantu (Heynes, 1946)	11.30	9.22

Table 6

Survival rates of premature babies.

Birth weight (pounds)	2 - 3	3 - 4	4 - 5	5 - 5½	Total
No. of cases	39	84	174	178	480
N.N. Death rate	64.1%	42.9%	6.3%	3.1%	16.3%
Cases born in hospital	24	49	140	154	370
N.N. Death rate	41.7%	36.7%	4.3%	2.6%	10.3%

Table 7

Occipito-frontal circumference according to birth weight.

Birth Weight	4	4½	5	5½	6	6½	7	7½	8	8½	Total
No. of cases	8	10	31	55	118	114	116	88	42	30	612
Average O-f.C. (inches)	12.3	12.7	13.1	13.4	13.5	13.8	13.9	14.1	14.2	14.4	13.7
Average O-f.C. of British children (Ellis & Lawley, 1951)	-	-	11.8	12.2	12.6	13.0	13.4	13.8	14.2	14.7	13.3

Table 8

Distribution of cases according to length of gestation.

Length of Gestation (weeks)	- 34	35	36	37	38	39	40	41	42	43	44 -
Number of cases	10	7	12	17	18	66	108	162	155	68	19
Percentage of total cases	1.6	1.1	1.9	2.6	2.8	10.3	16.8	25.3	24.1	10.6	2.9
Percentage of American Births (Taback, 1951)	2.9	1.1	2.4	4.0	8.2	18.6	23.2	20.1	9.3	4.6	5.6
Percentage of British Births (Gibson & McKeown, 1951)	1.6	1.5	2.6	4.5	8.8	20.4	28.9	18.4	8.2	3.0	2.1

Table 9

Average Birth Weight according to Length of Gestation.

Length of Gestation (weeks)	- 33	34	35	36	37	38	39	40	41	42	43 -
Number of cases	5	5	7	12	17	18	66	108	162	155	87
Average Birth Weight (pounds)	3.21	3.70	4.10	4.60	5.14	5.20	6.10	6.40	6.93	7.40	7.68
Average Birth Weight (American) (Taback, 1951)	5.51	6.06	6.38	6.55	6.78	6.94	7.34	7.30	7.72	7.44	7.61
Average Birth Weight (British) (Gibson & McKeown, 1951)	4.43	5.47	6.25	6.67	6.79	7.09	7.40	7.63	7.77	7.83	7.83