continued occult blood loss is suspected, our impression is that the quantitative measurement of faecal blood may be of use in the management, and we would reserve this technique for such cases.

Summary

The literature associated with measurement of gastro-intestinal blood loss by means of radiochromium is briefly reviewed and the validity of the method mentioned.

Twenty cases of acute gastro-intestinal bleeding were investigated by this method and the results recorded.

The conclusions are that the quantitative measurement of faecal blood loss by this method does not help in the clinical management of most cases of acute blood loss, although the investigation may well be used to exclude continued chronic bleeding if the clinical signs are not improving as expected.

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RENAL DISEASE IN UGANDA

A RETROSPECTIVE STUDY*

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In Uganda, disease of the kidney, like disease of other systems, has a pattern similar to that found in Britain, but more exaggerated in its manifestations and differing in emphasis. A study of renal disease in such a different environment is therefore not without relevance to British medicine.

Davies (1949), extracting 2,994 Mulago Hospital necropsy records for 1931–45, found 301 cases of nephritis, mostly unclassified. Raper (1953), reviewing six years' post-mortem material at Mulago, found 136 cases of nephritis.

This retrospective study, which covers the whole spectrum of renal disease as found in the post-mortem room at Mulago, was made in order to see those aspects of special interest—pyelonephritis, hypertension, and the nephrotic syndrome—in their full context. It is a review of records, and, as such, uses the work of others, notably the staff of the pathology department at Makerere. Little statistical treatment of results has been attempted, for this would be misleading because of ignorance of the number at risk. However, some idea of the relative importance of types of disease will, it is hoped, emerge. In such a study it is difficult to draw definite conclusions, but an attempt has been made to describe the problems, and in some cases to suggest an answer.

Material

Case records of 1,100 Africans dying at Mulago between August, 1959, and November, 1961, were examined for renal pathology. Deaths in the first year of life and cases of accident were excluded. Necropsy is performed on approximately 50% of adult deaths (Shaper and Shaper, 1958). The ratio of males to females in this study was 4 to 1. The chief reason for this is the greater number of men than women admitted to the hospital (5 to 2, Shaper and Shaper, 1958). Conclusions other than general on the relative sex incidence of disease are seldom justified.

The records were examined for the macroscopic and microscopical appearance of the kidneys, also for the condition of the urinary tract as a whole, in an effort to determine whether chronic pyelonephritis was associated with obstruction to the flow of urine from urethral stricture, prostatic enlargement, etc. The urethra had not been examined routinely, so that it was difficult to exclude minor degrees of stricture, especially as gonococcal infection is so common in Uganda. The bladder and ureter were, however, examined in most cases, and therefore, using bladder hypertrophy or dilatation, hydroureter, and hydronephrosis as indices of urinary obstruction, cases of chronic pyelonephritis have been divided into primary and secondary groups—those unassociated with other lesions of the urinary tract, and those associated with some obstructive lesion. Some types of disease, including chronic pyelonephritis, have been divided into two groups, symptomatic and asymptomatic, the first presenting during life (and causing death) and the second discovered only at necropsy, death being due to other causes. Kidneys with leukaemic infiltration, cellular cloudy swelling, and acute necrosis were classed as "normal" for the purpose of this study.

The condition of the heart and blood-vessels was also noted. Left ventricular hypertrophy was used as an index of hypertension, supported whenever possible by clinical records of the blood-pressure. The condition of the blood-vessels, large and small, was of special interest in cases where hypertension had been present.

The liver pathology was noted in cases of nephrotic syndrome as being relevant to changes possibly associated with protein depletion.

Lastly, the clinical records, where available, were consulted for details of history, clinical examination, and laboratory findings. Urine examination, blood urea,

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haemoglobin levels, and serum protein measurements were of special interest.

Of 1,100 necropsies, 272 had some evidence of renal disease (Table I). The remainder had normal kidneys.

TABLE I

		No. of Cases
Primary chronic pyelonephritis	Asymptomatic	84
	Symptomatic	32
Secondary chronic pyelonephritis	Asymptomatic	13
	Symptomatic	46
	Stricture 24	
	Other	24
Essential hypertension		9
Acute pyelonephritis	Asymptomatic	9
	Symptomatic	4
Chronic glomerulonephritis	Asymptomatic	1
	Symptomatic	12
Amyloid disease		5
Glomerulosclerosis		10
Tuberculosis		6
Primary neoplasm		4
Secondary neoplasm		15
Embolus		6
Polycystic disease		1
Other		9
Doubtful		4
		272

Chronic Pyelonephritis

The criteria for diagnosing this condition microscopically were dilated atrophic tubules containing casts, lymphocytic infiltration, and interstitial and periglomerular fibrosis. In many cases not all of these features were present, but dilated atrophic tubules with interstitial fibrosis were constant, and round-cell infiltration was present in most cases.

The large number of asymptomatic cases is striking, 84 primary and 13 secondary. The primary asymptomatic cases form 30% of the pathological group. The disease is therefore both common and insidious. The ratio of males to females is 5 to 2 in the primary cases, showing that it is common in both sexes. The 13 secondary asymptomatic cases were all males who had either urethral stricture or prostatic enlargement.

It is interesting to compare the symptomatic groups—primary chronic pyelonephritis, secondary chronic pyelonephritis, and essential hypertension—from the point of view of their clinical presentation, cause of death, and age incidence. Cases of stricture have been chosen to represent the secondary group, as being uncomplicated by other factors such as carcinoma, and also for their special interest at Mulago.

Of the primary group, 24 out of 32 died of congestive heart failure from hypertension, whereas of the 24 cases secondary to stricture only three died of congestive heart failure due to hypertension (Table II). Of the nine cases of essential hypertension, all died of congestive heart failure. Cases of hypertension form 35% of cardiological admissions to Mulago (Davies, 1961), and in these pyelonephritis is the most important aetiological factor (Williams, 1944; Davies, 1961). It is remarkable

TABLE II.—Causes of Death

Cause of Death	Primary Chronic Pyelonephritis	Secondary Chronic Pyelonephritis						Essential Hypertension
		Stricture	Prostatic Enlargement	Cancer Prostate	Cancer Bladder	Other		
Congestive cardiac failure from hypertension ..	24	3	1	0	0	0	9	
Uraemia + hypertension ..	1	8	2	2	0	1	0	
Uraemia — hypertension ..	4*	11	0	0	2	1	0	
Cerebrovascular accident ..	1	1	0	0	0	0	0	
General and other	2†	1	1	3	9	3	0	

* 4 cases of "nephrotic syndrome."

† 1 case of "nephrotic syndrome" dying of bronchopneumonia.

that there were only two cases of cerebrovascular accident—one in the primary and one in the secondary group. Deaths due to renal failure alone were much less common in the primary than in the secondary group, being 5 out of 35, of which one had evidence of hypertension. In the group secondary to stricture 19 out of 24 died of renal failure, eight having evidence of hypertension.

Blood Vessels in Hypertensive Cases.—Hypertensive changes in the small vessels were comparable with the picture associated with "benign" hypertension in Europeans—that is, hyalinization and intimal proliferation. In no case did the picture of "malignant" hypertension occur. Cases of essential hypertension were marked by extensive glomerulosclerosis. Coronary atheroma occurred in only one patient, and he died of cerebral haemorrhage. Thus ischaemic heart disease was not a factor in the heart failure of hypertensive cases.

Blood Urea.—Figures were available for 12 of the primary group. These ranged from 40 to 41 mg./100 ml., with a mean of 107 mg., being highest in those dying of uraemia alone. Those dying of congestive cardiac failure due to hypertension also had a raised blood urea, as might be expected. Figures were found for 14 out of 24 of the group secondary to stricture and ranged from 60 to 368 mg./100 ml., with a mean of 160 mg., reflecting the greater degree of renal failure associated with secondary chronic pyelonephritis.

Urine.—Proteinuria with pus cells and casts was a feature of all cases where the clinical records were available.

Haemoglobin.—Unfortunately, figures for haemoglobin levels were available in only seven of the primary cases and in none of the secondary cases. These ranged from 4.6 to 10.8 g./100 ml., with a mean of 7.1 g., indicating that anaemia may be an aggravating factor in the heart failure of the hypertensive cases. Anaemia was of multiple aetiology—hookworm, nutritional deficiency, and renal disease.

Serum Proteins and Nephrotic Syndrome in Chronic Pyelonephritis.—There were three cases with hypoproteinaemia, proteinuria, and oedema, without hypertension. Two other cases had oedema and gross proteinuria, without hypertension, but the serum protein levels were not known. These last were possible cases of nephrotic syndrome. The serum proteins in the three cases were (1) albumin 2.4, globulin 2.7; (2) albumin 2.6, globulin 2.1; (3) albumin 1.7, globulin 2.1 g./100 ml. The picture of the nephrotic syndrome in Africans is difficult to detach from the other factors which affect the serum proteins. The serum albumin is normally about 1 g./100 ml. lower in Africans (Shaper and Shaper, 1958) than in Europeans and the globulin level is usually higher. This may be a reflection of the low-protein diet of the African and of the high level of parasitic infestations. Extreme protein malnutrition is not uncommon and may contribute substantially to an abnormally low serum albumin. Further, cirrhosis of the liver is common and contributes to the picture of protein depletion.

One of the three cases of "nephrotic syndrome" mentioned above had cirrhosis of the liver and one had amyloid disease in addition to pyelonephritis. The association between pyelonephritis and the nephrotic syndrome, which occurs in a number of patients on the wards, cannot be proved by necropsy study such

as this. It has been suggested that cases of chronic pyelonephritis which manifest as the nephrotic syndrome might be cases where an underlying glomerulonephritis has been obscured. Another explanation is that other factors affecting the serum proteins may play a greater part in the clinical picture than does proteinuria. Clinical and biopsy studies now in progress (Somers, White, and Kibukamasoke, 1962, unpublished) may throw light on this obscure problem.

Age-and-Sex Incidence.—It is often impossible to assign an accurate age to an African, and therefore no attempt has been made to do more than place the age to a decade. In cases of primary chronic pyelonephritis death occurs in a younger age-group than in cases secondary to stricture. Cases where disease is secondary to other causes, as in carcinoma of the bladder, fall in an even older group. Deaths due to essential hypertension also occur in a late age-group. A comparative diagram is shown. In the primary group there were 17 males to 15 females, showing that the disease is common in both sexes, which were evenly represented so far as mode of death was concerned. There were only two females in the whole secondary group. Among the cases of essential hypertension there were six males and three females.

Acute Pyelonephritis

There were 13 cases where infection was acute, but where there was no evidence of previous attacks. Of these, four died of renal failure and overwhelming infection, and nine died of other causes with acute pyelonephritis as an incidental finding.

Glomerulonephritis

Acute nephritis is not represented in this series. It does, however, occur in Mulago. In 1957, three cases were admitted during the year (Shaper and Shaper, 1958). There were four cases over six years in Raper's (1953) necropsy study. Cases of chronic glomerulonephritis were difficult to classify in all but a few of the 13 cases in this series, as the disease was often far advanced. There was one asymptomatic case, and of the remaining 12, 7 died of congestive cardiac failure

Age distribution at death. A, Chronic glomerulonephritis (12 cases). B, Essential hypertension (9 cases). C, Symptomatic chronic pyelonephritis secondary to stricture (24 cases). D, Symptomatic primary chronic pyelonephritis (32 cases).

and hypertension (one had endomyocardial fibrosis in addition). Two died of uraemia, of whom one had hypertension, and three others presented as the nephrotic syndrome, two dying of renal failure and one of bronchopneumonia. Most of the deaths occurred in a young age-group (see Diagram). There were 10 males and 3 females. Figures for blood urea in six cases ranged from 90 to 150 mg./100 ml., with a mean of 125 mg.

Amyloid Disease

Five cases occurred in this series, all except one patient being under 40 years old. Only one, aged 16 years, had no other associated disease and could therefore strictly be termed primary amyloid. Of the remainder, three had tuberculosis and one had skin cancer. Wright (1961) has reviewed the necropsy records for amyloid disease over the past 10 years. He found 44 cases and pointed out that the distribution of amyloid disease in Africans "does not differ significantly between the primary and secondary groups, both groups resembling classical secondary amyloid more than primary amyloidosis." Of this series, 85% were below the age of 40. Of the five cases in the present study none had the nephrotic syndrome. However, there was one case, classified under chronic pyelonephritis, which had early amyloid disease and which presented as the nephrotic syndrome. This is in contrast to Raper's (1953) finding that most of the 18 cases in his series had the nephrotic syndrome. It is probable that amyloid disease is under-represented in this series, which covers only two years.

Glomerulosclerosis

This group of 10 cases corresponds to the focal sclerosis group in Raper's (1953) series. There was more than just the occasional sclerosed glomeruli which are found commonly in kidneys of elderly people. This series is too small to detect any association between sickle-cell disease and this type of histological picture (Raper, 1953). Shaper and Shaper (1958) have suggested that the condition is an early form of pyelonephritis.

Other Groups

These have been included in the series for the sake of completeness. Tuberculosis is almost certainly under-represented. The "embolic" group were mostly cases of bacterial endocarditis. The nine cases classified as "other" (Table I) include such conditions as absence of one kidney, double ureter, poisoning, etc. Of the four cases in the "doubtful" group the kidneys were so damaged that no diagnosis was possible.

Further Discussion

This study bears out Raper's (1953) conclusion that at Mulago "by far the commonest form of Bright's disease is chronic pyelonephritis." He regarded urethral stricture as being a common aetiological factor, but, as Shaper and Shaper (1958) have pointed out, "were stricture to be such an important aetiological factor, one would expect a greater proportion of males to be affected, whereas the sex incidence is approximately equal." Raper (1953) also defined a group of cases of chronic pyelonephritis which he termed "the hypoplastic sclerotic kidney" and which had no associated obstructive lesion of the urinary tract. From this study, if the criteria for distinguishing primary from secondary chronic pyelonephritis are valid, it would seem that the primary group is the more important and that the two groups present different clinical problems. This

difference cannot be considered proved in a retrospective study such as this, but clinical studies at present going forward (J. A. Tulloch, 1962, unpublished) should elucidate the problem.

Summary

Among 1,100 necropsy records, from August, 1959, to November, 1961, reviewed, 273 cases of renal disease were found.

Chronic pyelonephritis was the most common disease encountered. An attempt has been made to divide this into a primary and a secondary group and to show the difference in clinical presentation and mode of death.

The nephrotic syndrome in Africans is discussed, and especially its relation to chronic pyelonephritis.

Other types of renal disease encountered, notably chronic glomerulonephritis and amyloid disease, are discussed briefly.

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Medical Memoranda

Rupture of the Rectus Abdominis Muscle

This uncommon condition presents some difficulty in diagnosis. It is not always thought of in the differential diagnosis of abdominal pain, and has been mistaken for almost every variety of abdominal catastrophe. Of 101 cases reviewed by Schafer (1953), only 22 were diagnosed correctly.

The aetiology is well recognized. The condition is commonest in the elderly, particularly when debilitated or suffering from infectious disease. In these conditions the muscle ruptures when subjected to normal strain, such as coughing or sitting up. It also occurs in the late months of pregnancy and occasionally in young subjects owing to direct or indirect violence.

Rupture of the muscle is usually in the lower half. There may be an associated tearing of the inferior epigastric artery or vein, producing a vast haematoma. The posterior rectus sheath is absent in the lower part, and the haematoma lying on the transversalis fascia and deep to the abdominal musculature spreads laterally, medially, and downwards behind the pubis. It is not restricted to the confines of the rectus sheath. If the muscle rupture damages only smaller vessels, the haematoma may not be palpable.

Pain is always present, often severe, and there may be nausea and vomiting. A history of injury, sudden muscular effort, severe cough, or debility may be obtained. The abdomen is extremely tender over the site of the rupture and a mass may be palpable. The picture is one of intra-abdominal catastrophe. It is commonly confused with acute appendicitis, appendix

abscess, or twisted ovarian cyst. It has been diagnosed as most other forms of acute abdomen, including strangulated hernia, and is indistinguishable from a strangulated Spigelian hernia.

The useful test of sitting the patient up to tense the abdominal muscles is often not possible owing to pain. Also the haematoma, being posterior to the abdominal musculature and not confined by rectus sheath, is movable from side to side, but not in a vertical plane. Ecchymosis below the umbilicus on the affected side occurs only in late cases. The right rectus abdominis ruptures more frequently than the left.

If there is no palpable swelling, conservative treatment with rest and local heat is said to lead to resolution. However, it is in just such cases that the diagnosis may be in doubt and it is usually safer to incise over the affected rectus.

CASE HISTORY

On February 22, 1959, a woman aged 74 was admitted to hospital complaining of lower abdominal pain. For some weeks she had had discomfort in the lower abdomen. Two days before admission this became worse, with pain on coughing, and a swelling appeared in the lower abdomen. Bowels and micturition were normal and there was no history of vaginal bleeding or discharge. She suffered from chronic bronchitis, and on admission had a severe cough.

On examination she was in pain and had signs of chronic bronchitis. In the abdomen there was a mass 12 cm. in diameter rising up out of the pelvis to the left of the midline. It was firm and tender with easily discernible borders above and on either side. Below, however, it appeared to pass behind the pubis into the pelvis. It was mobile laterally but not vertically. Rectal examination revealed nothing abnormal.

A diagnosis of twisted ovarian cyst was made and the patient was prepared for laparotomy. A left lower paramedian incision showed some bruising in the subcutaneous fat and the sheath of the left rectus muscle had a bluish tinge. On opening the sheath dark blood clot emerged; 12 oz. (340 ml.) of clot was evacuated. The muscle was found to be ruptured 2 in. (5 cm.) above the pubis. The haematoma had passed downwards behind the pubis, pushing the peritoneum back. No large bleeding-point was found. The incision was closed with drainage.

Post-operatively the patient did well at first, but on the fifth day had a myocardial infarct. This was followed by left lower lobe collapse and heart failure. She died on the fourteenth post-operative day.

Post-mortem examination confirmed myocardial infarction. Histology on the ruptured muscle showed chronic inflammatory changes. There was extensive recent necrosis of muscle with haemorrhage into the area. No disease of muscle was found and the blood vessels appeared normal.

COMMENT

The above case is typical of the condition. The predisposing factors were old age and severe cough due to chronic bronchitis. The main rupture occurred with sudden pain during a bout of coughing two days before admission. The swelling was not confined to the rectus sheath but extended well beyond it to either side and below. The misdiagnosis of twisted ovarian cyst is well known. If a ruptured rectus abdominis muscle is borne in mind the abdominal incision may be placed accordingly.

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