PRIMARY TUMOURS OF THE SUPRARENAL GLAND AND THEIR REMOVAL BY OPERATION.

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IN connection with the cases recently published in the *Johns Hopkins Hospital Bulletin* of January-March, 1899, and in the *BRITISH MEDICAL JOURNAL* of October 21st, 1899, I would call attention to two cases which I reported in the *JOURNAL* of January 7th, 1893, of removal of tumours of the suprarenal capsule.¹

One of these cases was operated upon in 1885, and is referred to and illustrated in my book on *Surgical Diseases of the Kidney* published in that year. The other case was operated upon in March, 1892. To these I can add a third case operated upon in March, 1894. As the two former were only briefly reported in a course of lectures on the Surgery of the Kidney, and, as the third case has not been published, I propose giving a short account of each of them under their proper title, and adding a few remarks on the pathology, clinical features, and surgical treatment of adrenal tumours.

CASE I.—TUMOUR OF THE SUPRARENAL CAPSULE REMOVED THROUGH LANGENBUCH'S INCISION.

H. S., a pale, emaciated man, aged 51, was operated upon by Langenbuch's incision on April 13th, 1885, for a large tumour $\frac{6}{8}$ in. in diameter. Thirty years ago he had gravel, but none since. Two years ago slight hæmaturia in turbid urine, not since. During the last few months had rapidly lost flesh. The tumour, which had been noticed for six months and had caused pain, presented a well-defined prominence, the size of an apple, immediately below the left costal margin; this prominence looked like a tumour situated in and projecting from the parietes, with its central point in the linea semilunaris, and its inner border reaching the linea alba, and extending along it for a distance of an inch and a half; it was, however, only a part of a large tumour, completely filling the left ilio-costal space. It moved freely on manipulation, and when the patient changed from the recumbent position on to his right side it fell bodily against the anterior abdominal parietes. It also moved freely with respiration. A notable symptom in this case, which had commenced eighteen months before the tumour was detected, and had been gradually increasing with the growth of the tumour, was a large varicocele of the left side. At the operation it was seen to be directly due to distortion and distension of the spermatic vein, which with the inferior mesenteric vein curved over the front and inner side of the tumour, and was enlarged to the size of the ring-finger.²

The following account is taken from the printed records of the Middlesex Hospital for the year 1885, p. 230, where it is classified under the heading of "Sarcoma of Suprarenal." On examination, after removal, the mass was circumscribed, firm, nodulated, and about the size of a child's head; it weighed $6\frac{1}{2}$ ozs. The whole kidney had been removed; it was adherent

Fig. 1.—Tumour of adrenal, with kidney flattened out over part of its surface.

to the tumour, much wasted from pressure, and spread out like a hood over it, but not otherwise involved in the disease. The growth was situated at the upper extremity of the kidney, and had evidently originated

in the suprarenal capsule. The appearance presented on section was that of a dense quasi-fibrous structure, with large areas of exceedingly soft tissue interspersed. On microscopical examination the tumour consisted for the most part of groups of cells in columns, on the type of those of the normal suprarenal cortex embedded in an abundant fibrous stroma, infiltrated with small cells; in other parts this columnar grouping of the cells was lost, the type of the group resembling that of the medullary portion of the suprarenal capsule. Intermixed with these elements were extensive tracts of fibrous tissue, infiltrated with the spindle and small round cell. Death occurred from shock within twenty-four hours. At the post-mortem examination the intestines were distended, and coated in places with a little recently-effused lymph. The stomach was enormously distended, and measured 12 inches across. The lungs were deeply engorged; the bronchial tubes contained a large quantity of secretion; one infiltrated gland was found behind the peritoneum, but no secondary deposits in other organs. The right kidney, right suprarenal capsule, and the bladder and ureters were all normal. One-half of the tumour is preserved in the museum of the Middlesex Hospital, and the other half in the Hunterian Museum.

CASE II.—TUMOUR OF THE SUPRARENAL CAPSULE, REMOVED THROUGH LANGENBUCH'S INCISION.

Mr. C., aged 43, was sent to me by Dr. McNaught, of Walsham-le-Willows; he had had hæmaturia for two years, and following the influenza in the summer of 1891 he rapidly emaciated. In March, 1892, a tumour was detected in the right side of the abdomen, associated with great pain and suffering; and his liver began to enlarge, but without jaundice. There was a fixed hard nodule in the left temporal region, which he said followed a severe toothache in March of this year. Thus the abdominal and the temporal tumours were noticed at the same time.

The operation, after consultation with Dr. Cayley and Dr. McNaught, was undertaken to relieve the intense suffering. On opening the abdomen the liver was found to be studded with yellowish white nodules, resembling cancer; the renal tumour, which was exceedingly movable, easily shelled out of its connections. He recovered from the operation rapidly, was relieved of all his pain, and left the nursing home on June 13th, just a fortnight after the operation.

Eight months after the operation the patient was alive and still going about, but his liver had increased greatly in size, and had become very irregular. The skin over the entire body contained scattered nodules the size of peas. His chief trouble was from constipation and occasional sickness; he had emaciated greatly, and was a "wretched sight to behold." He died shortly afterwards, but no post-mortem examination was allowed, nor was I successful in my attempts to obtain one or more of the cutaneous tumours for examination. The large tumour (Fig. 2) removed

Fig. 2.—An adrenal tumour removed from patient in Case II. A, flattened area of kidney; B, lower portion of kidney unaltered; C, vessels at the hilum.

resembled in structure the medullary part of the suprarenal gland. It had encroached upon, compressed, and flattened out the upper half of the right kidney, which was atrophied and stretched over part of the tumour. A branch of the ureter passed into the flattened area of the kidney, so that it appears as if the kidney had been completely divided opposite the hilum. The surfaces in contact with one another are perfectly smooth and separate, and are all covered by a thin, fibrous envelope. The figure shows a strong fibrous band passing from the tumour to the flattened surface of the kidney, and serving to hold the two together.

CASE III.—CYSTIC SARCOMA OF THE SUPRARENAL GLAND REMOVED BY LUMBAR INCISION.

A lady, aged 57, had only a few weeks previously noticed a swelling in the left hypochondrium, when I was asked to see her by Dr. Andrews, of Hampstead, on March 22nd, 1894. The tumour had grown, and was growing rapidly. It moved with freedom backwards and forwards between the two hands; it was elastic, painless, and not tender. It was resonant in front, and there was an absence of bulging in the flank. The patient was not at all emaciated, but, on the contrary, moderately fleshy, though not

actually stout. Through an incision in the loin a large cyst was seen, springing from the upper part of the kidney (Fig. 3), and connected with this was a large elastic cystic tumour, which displaced the kidney very much downwards. The cyst was filled with grumous semi-fluid and brain-like material, and some brownish-grey gelatinous tissue, looking like decolorised blood. The tumour reached high up under the diaphragm and infringed upon the spleen, and pushed forward the colon. It was entirely retroperitoneal. The kidney, which presented numerous minute cysts on its surface, was removed with as much of the wall of the tumour as possible, and the contents of this cystic tumour were thoroughly scooped out with

Fig. 3.—Cystic kidney, with large cyst at the upper end, part of the wall of which was invaded by the adrenal growth.

the fingers. The portion of the tumour wall near the diaphragm and spleen could not be peeled away without force and so were left behind. There was not much bleeding. Some iodoform was rubbed over the surface of the cavity; two large drainage tubes were introduced and the parietal wound closed. The patient recovered from the operation. The kidney on section showed a number of small cysts of various sizes. The contents of these cysts were a light yellow or brown gelatinous fluid. The larger cyst, which sprang from the upper and back part of the kidney was of the same nature as the small cysts; its walls, where they were in relation to the kidney, consisted of compressed renal cortex. The anatomical and histological characters alike confirmed its nature and origin.

On May 28th the patient died of recurrence of the disease. The recurrent growth extended from the diaphragm to the pelvis, and from the side to the median line of the abdomen. The surface of the recurrent tumour was lobulated. Pleurisy had existed for three weeks before death.

The following is Dr. Voelcker's report of the parts removed:

"The left kidney is 5 ins. long and 2.5 ins. broad. At its upper and inner end is a sac, the wall of which is continuous with the capsule of the kidney. The outer surface of the sac wall contains some perinephritic fat. The wall of the sac is incomplete. The base of the sac is situated in the upper part of the kidney, and measures 2.25 ins., and is formed by kidney substance covered over with a membranous exudation. The base of the sac shows in its lower half an oval depression measuring 1 in. by 0.75 in. across, and varying in depth from 0.3 in. to 0.4 in. The floor of this portion is formed by smooth kidney tissue. Around the upper half of the circumference of this oval depression the wall is composed of a layer of membrane firmly adherent to the underlying kidney tissue."

The capsule of the kidney is not unduly adherent, but, on removing it, numerous depressions and some yellow, firm, projecting nodules are seen on the surface. On section the nodules are circular, sharply-defined, yellow masses (cysts), of the colour and consistence of cream cheese. They have a greasy feel, can be removed from their capsule, which is quite smooth, and under the microscope show fatty debris. The largest cyst is 0.4 inch in diameter. The cysts are most numerous on the anterior and inferior portions of the kidney. (Fig. 4.)

There is some excess of fat in the pelvis of the kidney, but there is no evidence of any new growth. Portions of the cyst wall and underlying kidney were submitted, after hardening, to microscopic examination. In the kidney itself there is no evidence of any new growth. There is chronic interstitial fibrosis, with some scattered foci of inflammatory exudation, chiefly in the neighbourhood of the cyst. There are some small cysts with walls composed of fibrous tissue, but in which no epithelial lining remains. In the foci of small cells, no giant cells and no caseation can be made out. In the kidney tissue beneath the cyst wall there is considerable staining from extravasated blood. The cyst wall on its inner surface shows merely fibrous tissue and small inflammatory exudation. The outer surface of the cyst wall shows fatty tissue infiltrated with small,

round, and oval cells, and also with small branched cells. The cells are most numerous towards the peripheral portion of the section, and appear on the free surface of the section, where they resemble the cells existing in the material removed at the time of operation. A portion of the material removed from the cyst at the time of operation was hardened, embedded, and cut. The microscopic examination shows it to be composed of round and oval cells, arranged in irregular tracts. There is no intercellular substance. Here and there are seen spindle cells, forming processes, around which smaller oval cells are grouped. No epithelial cells or giant cells are present, and there is no obvious necrosis of the cells. The character of the growth is that of an oval and round-celled

Fig. 4.—Left kidney laid open the same as shown in Fig. 3. Numerous minute cysts are seen on the cut surface of the parenchyma.

sarcoma. The growth appears identical with that noticed on the outer wall of the upper part of the cyst in the kidney.

From the above examination, it appears that there is no new growth in the kidney itself, but that a cyst similar to, but larger than, the other cysts in the kidney, has existed at the upper end of the organ. In addition to this, there was a sarcomatous new growth originating outside the kidney proper, possibly in an adrenal.

PATHOLOGY.

Much difficulty exists in distinguishing, pathologically as well as clinically, between primary tumours of the suprarenal gland and certain tumours of the kidney, a consequence of which is that tumours of the suprarenal capsule may unknowingly have been removed with the adjacent kidney, and have been grouped with renal tumours.

Primary new growths of the adrenals, especially those which attain to a size large enough to cause an abdominal tumour, are, however, very rare. Roger Williams found only one instance of primary adrenal growth in a collection of 8,378 consecutive cases of malignant disease.

For these reasons less attention has been paid to them by surgeons, and in surgical literature than by pathologists. The only account of the adrenals from a surgical point of view which has been attempted since Le Dentu added a few pages at the end of his work on the *Surgical Affections of the Kidney and Ureters*, published in 1889, is that recently given by Tuffier. Leconte and Robert have also made valuable contributions.

The nature of the primary enlargements of the suprarenal gland may be either (1) a purely glandular proliferation (like simple parenchymatous bronchocele) which some pathologists have, not very appropriately, called "adrenal goitre"; (2) large adenoma; (3) malignant growths which many have described as carcinoma, others, as positively, as sarcoma.

The origin of certain perinephritic tumours, other than primary adrenal new growths, is in adrenal "rests" sometimes found in the tissues around the kidney or in the renal hilum.

The nature of some primary tumours of the kidney is similar to the normal adrenal tissue, but in others, "while some portions simulate suprarenal tissue, other parts closely resemble an alveolar sarcoma, and some districts have an appearance which, I believe, many would be inclined to term carcinomatous" (Kelynak). Some are identical in structure with adrenal adenomata.

Grawitz's ingenious hypothesis, first published in 1883, that certain tumours of the kidney arise from small adrenal "rests" embedded within or beneath the capsule of the kidney (called by him "*strumæ lipomatodes aberratæ renis*") has been pretty generally accepted. Indeed, as Mr. Targett suggests, it is a question whether it has not been somewhat too frequently applied, with the result that some ordinary renal carcinomata have been referred to this extraordinary class. Such a mistake is quite compatible with the opposite one suggested above, that some primary tumours of the suprarenal gland have been regarded as primary tumours of the kidney.

It is not necessary to reject Grawitz's theory in order to accept somewhat similar, though morphologically different, theories as to the origin of some of these growths. Albarran's view is that many tumours arise from aberrant renal lobules embedded in the capsule of the kidney and capable of degenerating into epithelioma. Collections of embryonic tubes have been discovered in the renal capsules of a great number of fetuses, and probably they represent aberrant formations derived from branchings of the convoluted tubules of the cortex not coming into relationship with the glomeruli of the renal parenchyma. Just as paradental epithelial *débris* in cancer of the jaw, and the tubular formations in the parovary in cancer of the ovary, so these pararenal tubules play an important rôle in the pathogenesis of cancer of the kidney.

Pilliet points out that in the process of development of the kidney in two parts, namely, the secretory portion and the collecting portion, certain areas of the secreting tissue, failing to join the calyces, become shut out, and are thus functionally isolated within the kidney. From these isolated tubules he thinks an epithelial evolution may take place at some period of the development or during the life of the individual.

In connection with these hypotheses, R. Marie's recent experiments are of interest as showing that pieces of the cortical substance of the kidney implanted beneath the renal capsule, in 2 cases out of 25, became adeno-epitheliomatous evolutions, and not grafts at all in the proper sense of the word.

It is now well known that bodies identical in structure with the suprarenal gland are found in the cortex of the kidney, in the perinephric tissue, in the mesentery, beneath the capsule of the liver (Schmorl) in the broad ligaments of a foetal uterus (Marchand and Targett), and in the inguinal canal; but they are very rare, and are seldom observed by those constantly engaged in *post-mortem* examinations.

Pathologists and practised microscopists have in many instances given totally different interpretations of the microscopical characters of the same tumour.³ What one regards as a typical renal tumour of accessory adrenal origin another speaks of as a spheroidal-celled carcinoma, another as an endothelioma, another as an epithelioma with clear cells, another as a renal adenoma, and again other observers have described them as primary angio-sarcoma, or alveolar sarcoma, or lymphadenoma.

Kelynak probably gives the true explanation of this when he says: "Although these growths may for convenience be placed in the large class of adenomatous forms of renal growth, it is clearly to be remembered that the cells of the suprarenal, although morphologically epithelial, are strictly of mesoblastic origin, and growths arising in adrenal 'rests' appear to be sarcomatous in general characters rather than carcinomatous."

Unless it can be shown that there is a distinct difference in the manner in which the kidney is encroached upon by a perirenal or a primary adrenal growth as distinct from a renal new growth originating from an adrenal "rest" or from the renal tubules themselves; or unless in any given case it is found that the suprarenal gland on the same side as the tumour is

unaltered, it will not be possible in all cases to distinguish, even after their removal from the body, the one class of tumours from the other.

The same tumour is regarded by some as a pararenal tumour primarily of the suprarenal capsule, by others as a renal tumour contained entirely within the fibrous capsule of the kidney; and the confusion reaches its height when a tumour is described as a primary tumour of the suprarenal gland, and yet is stated to have "the capsule of the kidney continued over the surface of the tumour," as in the account of the specimen removed by Mr. Knowsley Thornton, and now in the Hunterian Collection, No. 3,597.⁴ Thus we see that differences of opinion are entertained not only as to the pathogenesis of renal tumours, but also as to the manner in which a malignant tumour originating in the suprarenal gland can, as it grows, involve the kidney. Does it invade the kidney and cause its destruction, or does it merely flatten the adjacent part of the kidney as a simple mechanical effect of pressure whilst the two organs remain definitely separated by the fibrous capsule of the kidney? It is probable that it may do either.

The relations, or apparent relations, of the capsule to the various tumours in and around the kidney are not reliable as a guide to their morbid anatomy. The isolation from the renal parenchyma of a tumour situated immediately beneath the renal capsule is far from being decisive in favour of Grawitz's theory; neither is the argument that the capsule of the kidney seems to be continued over the tumour a decisive proof that the tumour originated in the kidney and not outside it.

A primary tumour of the suprarenal gland, like an encapsuled renal tumour, may stretch the kidney substance like a hood over part of its surface, and as the tumour increases in size the stretching of its own capsule, the thinning by compression of the capsule of the kidney, and the addition of a certain amount of connecting fibrous tissue may give it an appearance indistinguishable from that presented by a renal growth springing from an embedded accessory adrenal. Such newly-formed fibrous tissue is seen as a band in Fig. 2. In other cases it might develop into a more or less complete capsule. Again, as a tumour developing from an adrenal "rest" grows, little gaps may form in the capsule on its deep aspect, and little offshoots of the tissue may spread into the parenchyma of the kidney, whilst a few convoluted tubes may be seen on section in the tumour itself. There is equal reason to believe that as a primary adrenal grows downwards it may invade and cause the destruction of the kidney tissue, just as in Affleck's case a tumour, primarily of the right kidney, was found to have grown upwards and invaded and destroyed part of the liver.

It would also seem that incomplete development of the capsules of the kidney and suprarenal gland may allow of mutual interpenetration of part of each organ into the other. In one of these ways could be reconciled a description such as that given by Eve and Targett of Thornton's case, and which otherwise appears irreconcilable—namely, that the renal capsule was continued over what was considered to be a primary tumour of the suprarenal gland. Ricker has described a case in which the kidney and suprarenal gland were thus firmly united, the tissue of each extending into the other.

There is another condition which may account for the same appearance. In a case recorded by Eurich a nearly spherical tumour having adrenal structure was found in a space between the apparently normal suprarenal gland and a very small ill-developed kidney. This tumour had not encroached upon either suprarenal gland or kidney, either by invasion or compression, but had, so to speak, merely served to "fill a gap." The fibrous capsule of the suprarenal gland, however, "was prolonged at the lower pole of the tumour to form a short but broad pedicle, by which it was continuous with the capsule of the kidney."⁵

SYMPTOMS.

No wonder when the anatomical and microscopical characters are insufficient to distinguish a perirenal from a renal new growth—a primary adrenal from a primary renal tumour of accessory renal origin—that little or nothing which is distinctive can be stated as to the symptomatology of adrenal tumours.

In fact the diagnosis in some cases is not only difficult, it is impossible; and this is not surprising, considering the proximity of the two organs, the similarity of their position behind the peritoneum, the not infrequent absence of hæmaturia in renal tumours (50 per cent.), and its occasional presence in primary adrenal tumours. Hence it has happened that the cases recorded in Otto Ramsay's paper of Excision of Primary Tumours of the Suprarenal Gland, Knowsley Thornton's case, Mr. Ward's case published in the BRITISH MEDICAL JOURNAL on October 21st by Mayo Robson; and the three cases reported above, were all diagnosed and operated upon as renal tumours.

The symptoms given by Ramsay from an analysis of 37 out of a total of 67 cases, in which the reports were full enough for the purpose, were the following:

1. The most frequent symptom, seen in 22 patients, was a marked and steadily increasing loss of strength, accompanied in many cases by extreme languor and debility.

2. Emaciation, varying greatly in degree, was noted in 20 cases; in few only of these was the loss of flesh extremely marked.

3. Gastro-intestinal symptoms were the next most frequent. Twelve out of 37 complained of nausea and vomiting, 9 of loss of appetite, 5 of constipation, and 4 of diarrhoea.

4. Pain in different parts of the body was complained of in 25 cases. The pain was referred variously in different cases to the renal region, to the whole length of the back, to the epigastrium, one or the other of the hypochondriac regions, or to the knee or ankle-joints. In several there was tenderness or pressure in the epigastrium or over the tumour. The pain was generally intermittent, but in some continuous.

5. The circulatory system in the case of adrenal tumour, as compared to that of Addison's disease, was rarely involved; palpitation or anæmia was a symptom in 11 cases, and œdema of the legs in 6. In most cases the œdema was due to renal changes, and not to the tumour; and it is a remarkable fact that in four or five cases in which there was extension of the growth into the vena cava and thrombosis the patients had no œdema.

6. The skin changes were not marked, only 3 out of the 37 showed distinct bronzing; but in 9 there was some change in the colour or texture of the skin, which was described as a "brownish discoloration," "muddy looking," or "of a yellowish colour." In 2 there was a peculiar profuse growth of hair. Both of these cases (Cayley's and Fox's) were in young children. Other writers, however, describe the same symptom in adults also. A marked cretinoid appearance, with abundant growth of hair over the whole or greater part of the body has been described by Fox and Ogle in children with adrenal sarcoma. Targett, in an adult female, the subject of primary sarcoma of the suprarenal body, met with hypertrichosis. In a female, aged 36, from whom Thornton removed a tumour, which Targett and Eve examined and considered a tumour of the suprarenal gland, the whole body, including the chin and upper lip, was thickly covered with long, dark, soft hair. This grew so rapidly that, though the abdomen was shaved for the operation, the hair quickly reappeared, and was a source of much trouble during the after-treatment of the wound.

7. Hæmaturia was noticed twice, and, as Ramsay remarks, this is important, because it makes the differential diagnosis between renal and suprarenal tumours still more difficult. In both these cases, however, it should be noticed that the hæmorrhage was really due to associated renal conditions (a cauliflower growth in the renal pelvis in one, and cystic changes in the kidney in the other).

8. An abdominal tumour was noted in a good many cases, but how often during life as distinct from *post-mortem* discoveries could not be deduced from the reports.

9. In 13 cases out of the 67 the new growth in the suprarenal capsule caused no symptoms whatever referable to that body. In 5 of these the symptoms were entirely confined to the respiratory tract—pneumonia, gangrene of the lung, extensive metastatic growths in the lung (2 cases), and intense bronchitis and weakness were the causes of death in these 5 cases.

As a rule in adrenal growths there is an absence of any marked urinary symptoms, but if the growth spreads through its capsule (like some of the aberrant adrenals spread through

gaps in the deep aspect of their capsules) and invades the kidney, the urine may present the same changes as primary renal tumours are known to do.

The adrenal tumour may displace the kidney either downwards or outwards, and the kidney may give rise to a distinct prominence upon some part of the surface of the tumour, as it did in No. 1 of the above cases. In Case II the kidney, much altered and misshapen, was pushed below the tumour.

In a case recorded by Cohn a distinct transverse groove marked the junction between the tumour and the kidney. In one of Thornton's cases the kidney lay in a cleft of the tumour, and in the other it was pushed down almost into the iliac fossa, and was mistaken for a lobule of new growth. In one of Kelly's cases (reported by Ramsay) there was a kidney-shaped prominence on the surface of the tumour. Pawlik has noted this feature in the tumour as an aid to diagnosis, but even where it is present it is very difficult to be sure that the prominence is due to the kidney and not to a projecting lobule of the tumour.

Extreme mobility of the tumour will, I believe, be found to be in some instances a notable symptom; it was so in Cases I and II. When the patient sat up or turned to one side, it fell downwards, forwards, or inwards, by its own weight, moving more freely than a very movable kidney. This makes the enucleation of the tumour so easy in certain cases, and is doubtless due to the large quantity of loose areolar tissue which surrounds it, and to its early subjection to movements of the diaphragm. In other cases, if the growth becomes adherent to the diaphragm, liver, or spleen, it will not have this character, but, on the contrary, may become dangerously fixed.

The rapidity of growth and the greater frequency of metastases would seem to be in favour of adrenal as opposed to renal new growths. Rapidity of growth was a marked feature of Case III. The numerous metastases which occurred in Case II are of special interest as bringing adrenal tumours into strong resemblance with the remarkable cases such as that which I reported to the Pathological Society in 1880 of "general thyroidal malignancy" in which multiple tumours with the microscopic characters of thyroid gland tissue occur in the bones of the skull and of the extremities, and in the viscera, as secondary to enlargement of the thyroid gland.

Roger Williams found that of 36 collected cases of malignant tumours of the suprarenal gland, more than one-third occurred in infancy and childhood, some being even met with at birth. It has been thought that in children primary adrenal tumours are less frequently bilateral than primary renal new growths, but this point is not satisfactorily established as yet. There is a tendency for adrenal tumours to invade the diaphragm and spread into the chest. This, there is no doubt, occurred in Case III.

A symptom which was present in Case I is noteworthy, namely, varicocele on the side of the tumour. I drew attention to this in connection with left-sided renal tumours in my book in 1885, and at that time I did not know that Guyon had specially remarked upon it as an occasional symptom in renal tumours of either side. I have since met with it in a case of right renal sarcoma. The varicocele comes on after the commencement of the growth but possibly before the appearance of a tumour, increases with the tumour, and rapidly disappears after removal of the tumour. Its occurrence in Case I shows that it may occur in primary adrenal as well as in renal tumours.

DIAGNOSIS.

Granted that in any given case there is the following group of symptoms, the diagnosis of a primary adrenal new growth should be made, and will most probably be correct.

1. A tumour in the suprarenal or renal region with a kidney-shaped prominence on the surface of the tumour.
2. An unusual degree of mobility of the tumour, so that it falls away from the loin on the patient rising or turning on to the opposite side.
3. Rapidity of growth of the tumour, and secondary growths in the skin, liver, or the temporal region.
4. Marked emaciation and rapid loss of strength.
5. Absence of any change in the urine, and of any alteration of the normal temperature.
6. The presence of some pigmentation of the skin, or of marked or rapid growth of hair over the body.

7. Some gastro-intestinal symptom, such as nausea, vomiting, diarrhoea, or constipation.

8. Pain, deep seated in some part of the abdomen; or an ill-defined, unexplained pain in some joint or distant part of the body.

It is, however, the exception to find the whole, or even the majority, of these symptoms present in any given case. If several of them are absent, and most especially if there is no tumour, a positive diagnosis is quite impossible.

Tumours of the suprarenal gland might have to be diagnosed from other conditions of that organ, such as tuberculosis and blood cysts. Tuberculosis rarely gives rise to a palpable tumour; besides, the general state of the health, the temperature, and the presence of tubercle in some other organ or part of the body would assist the diagnosis. A. F. Jonas published a case of a patient who had a palpable tumour due to tuberculous disease with symptoms pointing to a suprarenal new growth. He did an exploratory operation and successfully removed the suprarenal mass.

Blood cysts of the suprarenal gland are rare. Drouboix and Ramsay have studied them. They seem to be due to a necrosis and a subsequent hæmorrhage into the centre of a new growth, usually an adenoma. The cyst wall may be thickened, but otherwise is normal and composed of unchanged suprarenal tissue. The symptoms in some of the cases have been exactly like those of a malignant adrenal tumour, and a differential diagnosis has been quite impossible.

The difficulty of diagnosis is evident from the fact that in all the recorded cases of operation—except 2, which were mistaken for hepatic or gall bladder tumours—as well as in many cases not submitted to operation, the growths were taken to be renal tumours. It is more than doubtful if even a close attention to Piorry's description of the adrenal dulness or special experience in the use of the phonendoscope of Bianchi would enable us to distinguish the renal from the adrenal new growths. Early or profuse intermittent hæmaturia, with a tumour in the renal region and pain taking the course of the ureter, would point very strongly indeed to renal in distinction to suprarenal new growth. The absence of all symptoms referable to the urinary organs is the rule in primary adrenal tumours, but we must bear in mind the exceptions as regards hæmaturia. It is well to remember also that though hæmaturia occurs as the earliest symptom in 41 per cent. of malignant tumours in the adult, it is observed in only 5 per cent. of malignant renal tumours in children under 5 years of age (Heresco).

Tumours of the suprarenal gland have also been mistaken for enlargements or tumour of the liver. In some instances the liver has been actually enlarged, as in Case II. In Cohn's case⁷ the liver was thought to be considerably enlarged, but at the necropsy it was found to be normal in size but displaced downwards by the adrenal tumour. The absence of jaundice, the characters of the enlargement, the presence of resonance in front of the tumour, and extreme mobility instead of a comparative fixation of the swelling would tend to exclude the liver. As Ramsay remarks, "careful consideration of the symptoms, and a painstaking physical examination would, in most cases at least, serve to distinguish the two."

Between tumours of the adrenal and enlargement of the gall bladder mistakes in diagnosis ought seldom to occur. If an adrenal growth is seen before it has attained too great a size to simulate the gall bladder in position or form it will be found presenting below the costal margin, more to the right and more posteriorly than the gall bladder does, and there will probably be resonance in front of it. Movable—and possibly excessively movable—it is not pivoted beneath the liver as an enlarged gall bladder is. An enlarged gall bladder being so pivoted moves mostly towards the median line, and in the arc of a circle, whose centre is beneath the notch of the liver.

With the fingers dipped below the free border of the liver the tumour will be felt behind it, and by pressure can be made to recede backwards and upwards from it. There will also be an entire absence of any history or symptom suggestive of biliary colic. Further, great depression, weakness, and emaciation, in the absence of jaundice, would also incline one to think of new growth of the adrenal. Lastly, should

it be impossible to exclude hepatic or cystic disease, the diagnosis will be cleared up by an abdominal exploration through the linea semilunaris, an incision along which is the one best suited for the removal of adrenal growths.

A pancreatic cyst may closely simulate an adrenal tumour in general symptoms—emaciation, weakness, nausea, vomiting, and epigastric discomfort or pain—but the position in which the tumour first appears, and its mode of increase, are very different in the two cases.

PROGNOSIS.

The prognosis of adrenal tumours is very unfavourable owing to the rapidity of growth, the tendency to metastases, and the frequency with which both glands are affected. The immediate risk of an operation when any portion of the tumour is left behind is very great, and if the patient recovers recurrence follows with terrible rapidity (Case III).

The prognosis is more serious even than in malignant renal tumours. Whereas the average duration of life in sarcoma of the kidney is five to six years, and of carcinoma three to four years, Otto Ramsay points out that the average duration from the onset of the first symptom to death was from 6.7 to 10.6 months, the shortest duration being six weeks and the longest thirty-six months. The mortality of operation for tumours of adrenal origin is a little higher, and the prognosis after a successful operation is about the same as after nephrectomy for malignant renal tumours.

Heresco amongst 165 cases of nephrectomy for malignant disease, performed between 1890-1898, found 17 cases of operations for tumours described as "struma-suprarenalis." How many of these 17 were primary adrenal tumours and how many renal tumours arising from embedded adrenal "rests" is not clear.

The following figures taken from this collection show the immediate and remote effects of nephrectomy for the different classes of cases as follows:

68 sarcoma of all forms, 14 died—that is, 20.0 per cent.

53 carcinoma of all kinds, 12 died—that is, 22.56 per cent.

14 adenoma, all successful.

17 struma-suprarenalis, 5 died—that is, 29.4 per cent.

Of the patients alive two years after nephrectomy, and still free of recurrence, the percentages were: 25.9 for sarcoma, 25.0 for struma-suprarenalis, 9.7 for carcinoma.

Of the survivors after nephrectomy who had recurrence within one year there were 33 per cent. of the sarcoma, 25 per cent. of the struma-suprarenalis, and 9.7 per cent. of the carcinoma.

TREATMENT.

Operation gives the only hope of life. It should be done as early as possible, because the probability of metastases, and of adhesions forming which will make the operation difficult, increases as time goes on. It should be undertaken by way of an exploratory operation, and removal should not be attempted unless it can be completely effected. When the tumour is adherent to liver or spleen, the risk of hæmorrhage proving fatal is very formidable; when adherent to the diaphragm, the pleural cavity or pericardium might be opened. When metastases are found in the viscera, it is only with the view of relieving intense suffering that removal should be attempted, and then only when the tumour is very freely movable, so that its enucleation can be done without risk or difficulty, as in Case II.

The method of operation should in some cases be the transperitoneal by an incision through the linea semilunaris, in others the lumbar, and in others again the combined lumbar and transperitoneal method, which I have for many years adopted in cases of nephrectomy when the kidney is much enlarged.

1. If the tumour is large and very freely movable, as in Cases I and II, the transperitoneal route answers best. The incision in the linea semilunaris may be joined if requisite by a short one at right angles to it, carried either forwards or backwards, as best suits the individual case.

2. When the tumour is situated well back in the loin, and is cystic or not very large, the lumbar method is to be preferred. If the space between the last rib and the crest of the ilium is contracted, the last rib, or even the last two ribs, should be excised, and the lumbar incision carried freely forwards. When this space is roomy, the ordinary oblique incision

amply suffices for the enucleation and delivery of a tumour of moderate size, or one which is collapsible by tapping.

3. When the diagnosis is uncertain or the tumour is large and fixed, or but slightly movable, the exploration should be first made through the incision along the linea semilunaris. Before, however, any attempt at enucleation is begun in front, an oblique lumbar incision of moderate length should be made, and through this all the posterior outer, upper, and lower connections should be severed. This wound should then be plugged with a sponge or with gauze, and the enucleation completed and the vessels ligatured from the front. The delivery of the tumour through the anterior wound is very greatly facilitated by the fingers of one hand in the posterior wound.

There are many advantages in the combined method in cases of large and adherent tumours which I will not dwell upon here, but will merely strongly recommend it to surgeons who have not tried it.

Ramsay says if the tumour is removed it is wise to remove the corresponding kidney because of the frequency of metastases; but I cannot accept this judgment as decisive. On the contrary, if, after close inspection and careful palpation it is found unaffected, the kidney ought not in my opinion to be removed. In some cases partial nephrectomy should be performed, as in Robson's second case. Partial nephrectomy has been practised in some 5 or 6 cases of malignant tumour of the kidney itself, but the surgeons were all under the impression that the new growths were benign. In 3 of these cases, however, the patients were well several months after the operation, one died of hæmorrhage, and one subsequently underwent total nephrectomy for recurrence of the disease, and died five months later.

The friability of the tumour and the great hæmorrhage which occurs when its texture becomes broken into are the chief risks attached to the operation. Should the tumour have grown into the spleen or liver, as in Affleck's case, and an attempt is made to detach it, the loss of blood would probably be fatal.

NOTE AND REFERENCES.

¹ See also *Hunterian Lectures on the Origin and Progress of Renal Surgery*, Table IX, Nos. 7 and 11. ² *Surgical Diseases of the Kidney*, 1885, p. 488, plate II, fig. 2, p. 273. ³ See an excellent account of Kidney Tumours derived from Suprarenal "Rests" by Dr. McWeeney of Dublin, *BRITISH MEDICAL JOURNAL*, February 8th, 1896, p. 323. ⁴ *Harveian Lectures*, 1889, pp. 75, 76. ⁵ Kelynack, p. 143. ⁶ *Trans. Path. Soc. Lond.*, vol. xxxi, p. 259. ⁷ *Berl. Klin. Woch.*, 1894, No. 11. ⁸ These figures as given by foreign writers are much more favourable than those quoted by Kelynack from various English authors.

MEDICAL MISMANAGEMENT IN MADAGASCAR.—Dr. Reynaud, Physician-in-Chief to the Colonies of the French Republic, has prepared an essay on sanitary considerations on the Madagascar expedition and on certain other French and English colonial campaigns. This treatise has been offered by its author for the Prix Larrey of the Académie de Médecine. According to the abstract in the *Bulletin* of that Academy, Reynaud is most enthusiastic about British military hygiene in the tropics, and very indignant about the carelessness of his countrymen in such matters. He declares that the expedition of Madagascar in 1894-5 will remain a historical example of the calamities to which an expedition is exposed in hot and malarious lands when there is neglect of rules which after long experience have afforded to the British such brilliant results. The climate was well known, the expedition of 1883-85 had been duly reported upon, and it was recognised that paludism was the only dangerous enemy that would have to be faced. Yet every error in the management of troops in malarious districts was deliberately committed. Regiments were camped on the shore, and then employed in digging up swampy ground for road making. In the engineers the mortality rose to 64.5 per cent. The European men were much too young and were all overworked. The 200th Foot, entirely made up from other line regiments, lost 39 per cent. of its men. The mortality of the colonial regiment—creoles from Réunion, the West Coast of Africa, and French ports in Madagascar—was but 15.4 per cent. The total mortality of the French army in this terrible expedition was sixteen times higher than that of the British force in Ashantee twenty-two years earlier. We have heard much ill already of the expedition, but each new report makes it out worse and worse.

SIXTY-SEVENTH ANNUAL MEETING

OF THE

BRITISH MEDICAL ASSOCIATION.

Held at PORTSMOUTH, August 1st, 2nd, 3rd, and 4th, 1899.

PROCEEDINGS OF SECTIONS.

SECTION OF PATHOLOGY.

J. F. PAYNE, M.D., President.

THE PATHOLOGY OF MILK.

By G. LESLIE EASTES, M.B., B.Sc.
London.

I DESIRE to place on record the results of the examination of 186 samples of milk by microscopical and bacteriological methods. These samples of milk were obtained from all parts of the kingdom, from medical officers of health, public institutions, and from private sources. The primary object of the investigation was to establish the presence or absence of the B. tuberculosis by microscopical means.

The points in the microscopical preparations observed were: (1) The character of any cells present; (2) the presence or absence of pus; (3) tubercle bacilli; (4) other micro-organisms.

In normal milk there is always a slight leucocytosis. The leucocytes correspond to the polymorphonuclear neutrophiles of human blood. The leucocytes may be marked during the first week of lactation, especially after the first pregnancy; after that period they decrease in number till their number becomes so small that there may be no more than a dozen or so in the smear preparation from the deposit. During the first week of lactation the leucocytes are accompanied by colostrum corpuscles. In the fresh milk these may be known by their size, granulation, and contents, which consist either of separate and minute fat globules, or of one large fat globule resulting from the enlargement and coalescence of smaller ones.

In any milk, therefore, in which the leucocytosis is marked it is essential to examine it for colostrum corpuscles. These are present in largest number in the cream, as, containing fat, they rise to the surface during centrifugalising. If, however, they are absent, then some other cause for the leucocytosis must be sought, and in such cases the leucocytes are very frequently associated with so-called "mucous" threads which retain the methylene blue stain of the Ziehl-Neelsen method, and are easily recognised. In hardly any case are these mucous threads present unaccompanied by pus cells, and the presence of such threads may usually be taken as corroborative proof that the leucocytosis is due to some inflammatory lesion. That, however, the material is not true mucin is fairly certain, as true mucous cells are absent from the ducts and acini of the udder. The chemical composition of the material is doubtful, but it is probably of the nature of a nucleo-albumen. The presence of an excess of leucocytes and this mucin-like substance constitutes "muco"-pus, and is a sign of the existence of an inflammatory lesion of the ducts of the udder, for it is in such lesions that the "mucous" material is excreted, and not from abscess cavities in the substance of the gland. Of 124 samples in which an excess of leucocytes amounting to pus was found, however, 47 were unaccompanied by this mucin-like material. In such cases there is, however, another indication of the nature of the leucocytosis, and this is the presence of streptococci. Not that streptococci cannot be found in normal milk. By cultivation it is possible to prove that some samples of otherwise apparently normal milk do contain the streptococcus, but in normal milk its presence is the exception, and, when present, in but very small numbers. When pus is present, however, it is far otherwise so far as the streptococcus is concerned; there is no need to proceed to cultivation. Chains of cocci are found in the stained deposit, often in very large numbers, and frequently closely associated with the individual pus