gion in childhood. The rhabdomyosarcoma must be reckoned in this group, not only because the anomalies of embryonal formation are conspicuous, but also because the majority of these tumors contain epithelial elements in adenomatous arrangement.

They are very different in development from cancer. They occur in the earliest years of life, grow at first slowly, then later increase very rapidly to enormous tumors, and produce general symptoms by the mechanical pressure which they exert upon neighboring organs. The infrequency of the direct contiguous invasion of neighboring organs, and the relatively small disposition to metastatic deposits form a sharp contrast to cancer of the kidney of later years. These tumors fail totally to show the typical encroachment upon the healthy neighboring tissue which we see in cancer cells, but the glandular elements of these embryonal, sarcomatous adenomata show a sharp demarcation from the healthy kidney tissue, which is destroyed only by the direct pressure of the growing tumor. In these tumors there is not a complete adult formation of glandular (adenomatous) tissue, but epithelial and sarcomatous elements proliferate in a similar way, and the embryonal character of the new growth shows itself both in the immature condition of the adenomatous (glandular) tissue and in the character of the stroma with its young forms of the different elements of connective tissue (in the widest sense of this term).

The Hypernephroma (*Struma Suprarenalis Aberrans*).—As this form of renal tumor is very fully discussed in Vol. IV., we do not need to devote any space to its consideration in the present article. (See *Hypernephroma*.)

Cysts of the kidney will be spoken of farther on in the present article.

Lymphadenoma is a growth of tissue closely resembling in structure that of the lymphatic glands. This overgrowth of lymph-adenomatous tissue occasionally occurs in organs such as the kidney, liver, testis, and skin, wherein traces only of such tissue are to be found normally, as well as in the lymphatic glands themselves. It occurs in the kidney in association with the same affection in other organs. The primary seat of the disease is in many cases impossible to distinguish.

The Propagation of the Tumors.—This may happen in five different ways:

1. By direct contiguous infection of its neighborhood after perforation of the capsule.

2. By infection along the lymph channels (and glands) accompanying the blood-vessels (particularly in the case of carcinomata). The enlarged lymph glands along the renal vein may compress this and produce obstruction in the veins of the abdomen, thigh, and scrotum.

3. By the tumor directly growing into the renal vein, and even into the vena cava (observed particularly in hypernephroma and angiosarcoma).

4. By metastatic deposits in distant parts of the body, transported by way of the blood stream (in the case of sarcomata particularly).

5. By infection of the ureter and bladder through the urinary stream.

Unfortunately, in most cases there are few diagnostic points which will help us to ascertain whether there has already taken place an infiltration beyond the kidney or not, unless we except very evident cachexia and palpable changes in other organs. Neither the duration of the disease nor the size of the tumor gives us help in deciding; for hypernephromata often maintain a benign character for many years and then suddenly change to one of a malignant character. The same may be said of some sarcomata. Schede has twice removed very large malignant tumors of eight and ten years' standing, in one of which (a hypernephroma) there was no recurrence at the end of the third year, and in the other (a carcinoma) there was complete health at the end of the seventh year. Israel relates two cases of tumor of ten and eleven and one-half years' standing which at autopsy showed no metastases outside of the kidney. A symptom of great importance in helping the surgeon to decide as to the advisability or non-advisability of attempting an extirpation is the movability of the tumor, since a freely movable tumor is naturally the most favorable for operation. Extension of the disease may not, however, always lead to immobility of the kidney; nor does the extension of the disease through the capsule always lead to circumscribed nodules which can be differentiated by palpation from the kidney tumor itself; infected lymph glands are not commonly detected, nor does the thrombosis of the great veins always make itself evident by perceptible obstructive appearances in the epigastric, spermatic, or crural veins, nor are initial metastases appreciable.

Of practical diagnostic import is an inquiry into what portion of the kidney is that in which the first development of the tumor most frequently takes place, because upon this topographical relation depends their early palpability, and consequently the probable result of an operative procedure. Israel gives the following figures on this point as regards his cases: Among 38 kidney tumors, 12 times the upper half, 15 times the lower half, 11 times the middle segment was involved. Thus in about 70 per cent. of the tumors, the lower and middle zones were involved—*i.e.*, portions of the kidney which are accessible to palpation. On the other hand, 30 per cent. of the tumors developed in the upper pole—a locality in which they are not palpable unless the kidney prolapses. In addition, the topographical relations of the tumor to the kidney cross-section are of importance. Small prominences on the posterior surface, covered over by the lowest ribs and the thick back muscles, are much less easily palpable than those on the anterior surface and on the convex edge. Israel's 39 cases gave the following relations: Three cases failed to show a decided prominence on the kidney surfaces; in 17 cases the tumor showed an equal prominence in front and behind; 12 showed the tumor either exclusively or preponderatingly upon the front surface; 6 times the prominence showed itself peculiarly situated upon the convex edge; in one single case only had the growth entirely developed upon the posterior surface of the kidney. According to these figures conditions are generally favorable for palpation of the tumors.

Symptoms.—The leading symptoms characteristic of a tumor of the kidney are: (1) hæmaturia; (2) pain; (3) tumor (more or less solid). Subsidiary symptoms are: (4) modifications in the character of the urine; (5) varicocele; (6) metastases; (7) general constitutional symptoms.

Hæmaturia.—This occurs as the first symptom in at least fifty per cent. of all cases of malignant tumor in the adult (Morris). Tumors which commence in the portions of the kidney away from the mucous membrane of the papillæ, calyces, or renal pelvis may cause a palpable enlargement before producing hæmaturia. Denaclara, in a collection of 409 instances of new growths of the kidney, of which 168 were patients of adult age, found that hæmaturia was the first symptom in 68.88 per cent. of the adult cases. Chevalier gives 26.6 per cent. of the cases as having hæmaturia as the first symptom. Seventy per cent. of all Israel's cases showed hæmaturia as the first symptom which was observed by either the patient or the physician. It must be considered very fortunate for the patient, from the standpoint of prognosis, when hæmaturia occurs early.

Guillet says that hæmaturia due to renal tumor (1) is often spontaneous; (2) is not influenced by repose or exertion; (3) occurs at any period of the disease; (4) is repeated at variable intervals; (5) is usually profuse; (6) lasts for from one to six days and may subside completely, to recur in a few hours; (7) is often preceded by pain. The blood is intimately mixed with the urine, but may be accompanied by clots.

Almost all malignant tumors of the kidney present hæmaturia. In 92.1 per cent. of Israel's 66 cases it was present.

The hæmaturia comes on usually spontaneously, without appreciable cause, in the majority of cases, although a trauma may undoubtedly produce it. It may be preceded and accompanied by pain, and even by colic; in other cases it is entirely unexpected, the patient suddenly finding that he is passing blood with his urine without

any premonitory or accompanying symptoms. It may occur in the night while the patient is quietly sleeping. It is often abundant, recurring at longer or shorter intervals, leaving the patient free in the intervals. It may in some cases cause extreme anæmia by its continuance.

Recently formed, long blood clots may be passed per urethram.

In Denaclara's statistics of 168 cases of adult kidney tumors, it appears that 109 of them had hæmaturia, and in all of these except two the hæmaturia was spontaneous both in its commencement and in its cessation. It was continuous in only seven cases. In children there was hemorrhage in 41.3 per cent. of the malignant tumors, and in 30.3 per cent. of the benign tumors.

The question presents itself, What is the cause of hæmaturia in tumors of the kidney? It is probably due to congestion, caused by the pressure of the tumor on the parenchyma in the early stages, and to congestion or to ulceration into the renal calyces or renal tubules in the later stages. Malignant tumors are soft and vascular, so that they readily break down, as the frequency of interstitial hemorrhages testifies.

Source of the Bleeding.—In any case of hæmaturia the first question to answer is, From what part of the urinary tract is the bleeding coming? In general, we may say that hemorrhages arising from the urethra usually precede the act of urination, while bleedings from the bladder either follow the passage of clear urine or else urine which is slightly blood-tinged at the beginning of urination becomes progressively darker toward the end of micturition. In bleedings which arise in the kidney, there is no difference in the color of the urine throughout the duration of the micturition, and, except a clot be passed, blood and urine as voided are equally mixed together. Israel, however, relates some cases which are exceptions to these rules.

The examination with the cystoscope gives the surest method of determining from what part of the urinary tract the bleeding is coming—*i.e.*, whether the blood is escaping from the bladder or from the ureter or the kidney, since urethral bleeding is easily diagnosed. In case one finds the bladder healthy, of necessity the bleeding must proceed from either the kidney or the ureter of one side. Often one may see blood flowing out from a ureteral opening into the bladder, and for this reason a period for the cystoscope examination should be chosen, if possible, when the bleeding is going on. This one positive result may, however, lead to errors if all other points are not carefully considered. For example, if there be present, in addition to the kidney tumor, a bladder tumor which is either of metastatic origin (as in three cases cited by Israel) or possibly with no relation to the kidney tumor (as in one of Israel's cases), then a cystoscopic examination, undertaken at the time when the kidney tumor was not bleeding, might lead to the overlooking of the chief complaint, if one considered the bladder tumor to be the single source of the bleeding. If possible, ureteral catheterizations should be performed and the urines from the two kidneys separately examined.

There are also subjective symptoms dependent upon the bleeding which may give us some information as to the possible origin of the bleeding. Temporary obstruction of the ureter or stretching of the kidney pelvis may be produced by the sudden pouring out of the blood, and these may cause either colic-like pains, or else a feeling of disagreeable pressure in the kidney region. Israel says that 50.7 per cent. of his cases gave subjective sensations from which the renal origin of the bleeding could be diagnosticated, while the diseased side could be ascertained in the same way in 45.6 per cent.

Examination of the Urine.—In addition to the hæmaturia appreciable by the naked eye, there are also as a rule, in the urine which macroscopically appears to be clear, blood elements, as well as other pathological products, that may be seen by the aid of the microscope. Eighty per cent. of all Israel's cases showed this. There are red and white cells, sometimes single large fatty-degenerated cells, which may be tumor cells, generally a trace of albumin, and a few casts, as well as peculiar epithelial cells. Very rarely there may be passed pieces of tissue which may be recognized as coming from a tumor. Most of the urinary contents, however, are those which occur in several kidney affections, *e.g.*, stone, tuberculosis, chronic or hemorrhagic nephritis, etc.

Kidney bleedings awaken a strong suspicion that their cause is a tumor if they occur suddenly, without recognizable cause, in full strength, and at the next micturition have disappeared, or if, after long-continued duration, they suddenly cease, or if they are so profuse that they lead to coagulation in the ureter or the bladder. If the urine passed at each separate micturition be caught in separate glasses and placed beside each other, according to the order of their passage, and then compared, we may with very great probability make a diagnosis of kidney tumor if we find, without any regularity in their relation to each other, a dark red glass immediately next to one that is entirely normal in appearance, and next to the latter a third glass containing clear urine, with bloody, worm-like clots at the bottom.

Tumor.—The demonstration of the presence of a tumor by means of palpation constitutes the most important point in the diagnosis of a new growth of the kidney. In very many cases, however, the very early recognition, unfortunately, is not possible, either by the patient or by his doctor. It will depend in many cases, as we have already mentioned, in what part of the kidney the tumor develops. For example, tumors on the back surface of the kidney and in its upper half will be undiscoverable for a long time by palpation on account of their being covered up by the deep back muscles and by the ribs. An enlarged liver may also render palpation difficult.

Method of Palpation.—Bimanual palpation, with the patient lying on his back and with thighs flexed, may be used. Should this not be satisfactory, Israel's half-side position is more apt to give definite information. In this the patient lies on the healthy side half-way between full-side position and back position. In this posture the lower pole sinks somewhat downward, and the intestines also fall over toward the healthy side, which relaxes the abdominal walls and permits a deeper pushing in of the finger tips between the ribs and the front surface of the kidneys. This position, according to Israel, allows smaller tumors to be felt than is possible in any other position. The same author also recommends the following method: The examiner at the moment when inspiration changes to expiration, during the relaxation of the abdominal walls, gently presses the tips of the middle and index fingers of the hand lying on the front of the abdomen in under the edge of the ribs, while the hand behind exerts at the same time forward pressure upon the lumbar region, immediately under the edge of the last rib. With each successive expiration one should press in a little deeper, which prevents the kidney, which has descended with the inspiration, from receding back during the expiration, and thus the kidney becomes more accessible to palpation. Out of Israel's 68 cases, there were 62 in which the existence of a tumor of the kidney was demonstrated by means of palpation.

The chief points about tumors of the kidney in general are: The large intestine is in front of the tumor; the ascending colon is in front of and toward the inner side of the tumor, while on the left side the descending colon is in front of and inclines toward the outer side of the kidney below. Sometimes coils of small intestine may overlie a tumor of either the right or the left kidney. The bowel is never thus placed in front of a splenic tumor, and very rarely in front of one of the liver. Renal tumors do not project backward to any marked extent; they expand in front. Abscess and other lesions which may simulate renal tumors often cause considerable posterior projection. In tumors of the kidney the natural contour is usually retained throughout the larger part of this organ; *i.e.*, it generally presents no sharp edges. This absence of any sharp edges marks off renal from many hepatic and splenic enlargements. Of course, there are often sharp knobs and projections on the kidney sur-

face, but the whole kidney does not lose its rounded outline.

The most frequent and most characteristic result of palpation is to find, on the surface of the kidney, prominences which are irregularly spherical, hard, non-fluctuating, of unequal size. Much less frequently there is a uniform enlargement of the kidney with smooth surface. In 62 of Israel's cases, which had tumors of the parenchyma, 41 had inequalities of the surface, while only 5 had an even surface, there being 16 cases of which the records furnished no evidence as to the character of the surface as elicited by palpation.

Pain.—Morris gives pain as the first symptom in thirty-five per cent. of the adult cases. We have seen that typical attacks of colic and pressure sensations in the loin may be present, due to hemorrhage. In addition there may be symptoms, independent of the hæmaturia, which occur in periods free from hemorrhage, and which may give us a clew to the affected side. Thus, for example, the patient may complain of pain in one or the other side, and no apparent external cause for the pain may be discoverable. Then again, the abdominal bands of the clothing may become tight and cause uncomfortable sensations. The same may be produced by the drinking of beer, or by excessive bodily exertion. Israel says that sixty per cent. of the patients give some indications, by these abnormal sensations, as to the side affected. These sensations may be continuous or intermittent. In more infrequent cases there may be colicky attacks. These are probably due to sudden increase in the pressure in the kidney, which is surrounded by a hard, unyielding capsule. This increase in pressure is due to acute congestion in vascular tumors, or to hemorrhages within such tumor masses, which are not in communication with the kidney pelvis. Only about fifteen per cent. of the cases have this symptom of colicky attacks, so that it is not at all characteristic.

Varicocele.—As a symptom this is a rare occurrence. Guyon first drew attention to it. It has been explained by pressure of the tumor upon the spermatic vein of the affected side. It may also be due to secondarily enlarged lymphatic glands.

The *general symptoms* such as loss of flesh, anæmia, and cachexia may occur in cancer of the kidney as elsewhere. But these symptoms may not develop for a long time. Pressure of the tumor may cause digestive disturbances, constipation, jaundice, etc. In rare cases cachexia has been the first symptom noted.

Metastases.—The entire body should be carefully examined for their presence. Metastases in bony structures are particularly frequent, and careful consideration should be given to so-called rheumatic pains and to complaints of weak feelings in the legs. In rare cases this latter symptom may be the first thing to bring the patient to the physician. Israel had two such cases.

Differential Diagnosis (taken largely from Morris).—1. The hæmaturia of renal calculus is brought on by exercise or movement, and diminishes or ceases with rest, usually in the course of a few hours, to recur under the influence of some very slight movement. There are more pain and tenderness in renal calculus than in a renal new growth, and the hæmaturia, in the former condition, usually follows an attack of colic.

2. It may be impossible to diagnose the hæmaturia of tuberculous kidney unless we find the tubercle bacilli in the urine or some other evidence of tubercles elsewhere. In renal tuberculosis, there is usually pyuria, and in the interval between the attacks of hæmaturia the urine is turbid. There may be a slight febrile rise each day. If with hæmaturia, without pyuria, there is a renal tumor, tubercle is improbable, and cancer most likely exists.

3. The hæmaturia of chronic nephritis—abundant, one-sided renal hæmaturia—may continue for days or weeks in subacute and chronic nephritis. In this latter, however, there is usually more albumin than the blood itself would explain, and there are also very numerous casts. The diagnosis is made by the fact that when the hæmaturia is absent, albumin and casts are present just the same.

4. Essential hæmaturia (angioneurotic), nephralgic hæmaturia, hæmophilia, the hemorrhage from a movable kidney (twist of the pedicle), all these must be considered in making a diagnosis.

5. From polycystic disease of the kidneys. In this disease hæmaturia is rare. In polycystic disease it is not unusual to find that both kidneys are involved, while a unilateral swelling is the rule in the case of a renal tumor. In polycystic disease the amount of urea lessens and is associated with a great increase in the amount of water, or, in some cases, with suppression of the secretion in part or entirely.

6. A large simple serous cyst of the kidney is very rare, but when it occurs the diagnosis is very difficult indeed.

7. From hydatid cysts—see article on *Kidneys, Diseases of: Parasites.*

8. From hydronephrosis, caused by a tumor of the bladder—villous papilloma or carcinoma. This may be accompanied by spontaneous, profuse, irregularly intermittent hæmaturia, having all the characters of renal tumor. Bimanual examination under ether may detect the tumor in the bladder walls, and the cystoscope should also be used.

9. As to the variety of the new growth: In the adult it is almost impossible to diagnose with any degree of certainty the nature of the tumor. Sarcomata cause hæmaturia less frequently, secondary growths more slowly. It is likewise often quite impossible to diagnose malignant from benign renal tumors, except by an exploratory incision. Even expert microscopists differ oftentimes about the nature of the same tumor.

10. Tumors of the abdominal walls are rare. Their mobility during respiration is that of the abdominal walls. They are more superficial than renal tumors and may be adherent to the skin.

11. Enlargements of the liver. Hepatic tumors rarely have intestine in front of them, as do renal tumors. There is an absence of ballottement (*i.e.*, the rocking back and forth of the tumor when grasped by both hands). Renal tumors often allow the fingers to be depressed between the edge of the costal cartilages and the upper border of the tumor. These tumors develop comparatively early an area of dulness in the lumbar region, whereas tumors of the liver and spleen do so only very late, if at all. A tongue-shaped, semi-floating lobe of the liver, or a tumor developed in the concave part of the liver is very likely to cause error in diagnosis; especially so are hydatids in the left lobe of the liver.

12. From enlargements of the spleen. The enlarged spleen has no bowel in front of it; it generally presents a sharp or well-defined edge, beneath which the fingers can be depressed, and which is often notched. There is resonance between the posterior edge of an enlarged spleen and the spinal column, and the tumor can be traced up under the ribs. A splenic tumor is movable; a renal tumor may be so, but in many cases it is fixed in the loin. A splenic tumor will not cause a varicocele, a renal tumor may.

13. Tumors of the suprarenal capsule. These are not usually of sufficient size to form an abdominal tumor; but, when they do so, it is not easy, if indeed it be possible, to distinguish them from renal tumors, nor is it of any special importance to make the distinction, since new growths of the adrenal, when of clinical importance from their dimensions, involve the kidney, and sometimes efface it.

14. Ovarian tumors. Both solid and cystic tumors of the kidney may be mistaken for ovarian tumors. In an ovarian tumor the intestines lie behind, and both loins are resonant. The tumor grows from below upward and either drags up the uterus, or can be felt as a swelling in the pelvis by vaginal or rectal examination. In the case of an ovarian tumor the subjective sensations, in the beginning at least, are referred to the pelvis.

15. Enlargements of the lymphatic glands in the near neighborhood of the kidney, when they give rise to a swelling, have relations to the colon very similar to those of a renal tumor. The independent enlargement of one or more lumbar glands not forming part of the tumor, as well as the abruptness of the outline of the swelling, may help us in making a diagnosis.

16. From fæcal accumulations in the cæcum, sigmoid flexure, or colon, renal tumors may be diagnosed by the absence of intestinal disturbances, in the latter condition, and by the general abdominal pains and colic, and by the enlargement due to flatus, which characterize overdistention of the bowel.

17. Fæcal abscess, appendicitis, will be distinguished by the marked febrile disturbance, the tenderness, and the lower position of the swelling, which is in the iliac rather than the renal region of the abdomen.

18. Malignant growths of the large intestine. Morris remarks the close resemblance between a malignant growth of the ascending or descending colon and a renal tumor. He has seen the two diagnoses confused in six cases. Cancer of the large gut rarely has the form of the kidney. It should be suspected if, as is very likely to be the case, it is associated with diarrhœa, or possibly with loose, blood-stained movements, or with other intestinal symptoms. The peristaltic action of the intestines may sometimes be marked. More or less obstruction may be present. But this also may be caused by the pressure of a renal tumor. An exploratory incision may be necessary to determine the situation of the growth.

19. Tumors of the mesentery are more median, nearer the navel, and the anterior parietes, and are more movable, especially in a lateral direction. They have a zone of resonance all around them, due to their relation to the small intestine.

20. Tumors of the pancreas, whether cystic or cancerous, are more median in position, while their chief mobility is vertical. They may cause obstruction of the pancreatic and bile ducts; they fluctuate and often show a variation in their size from day to day. The colon, in pancreatic cyst, is not in front of the tumor, nor does the cyst project down so far into the lower part of the abdomen as do renal tumors.

Prognosis.—When once the disease has set in, the growth advances steadily. The usual causes of death are exhaustion, hemorrhage, or uræmia. Rarer causes are ulceration into the peritoneum, or into the lung with secondary pulmonary abscess, or secondary new growths develop in the brain, vertebral column, spinal cord, stomach, or intestine. The duration of the tumor, between the discovery of the first symptom and the date of death, when no operation has been performed, is from three to four years for carcinoma, and from five to six years for sarcoma (Morris).

Treatment.—Since death is the inevitable result of every malignant renal growth when left to itself, it seems justifiable to adopt very radical measures for the relief of the condition, especially in view of the fact that a fair minority may be cured, and notwithstanding the fact that death may be hastened by operation in some cases. The results of operation will be quoted later.

In general, we may say that nephrectomy is the proper treatment for renal growths. Only in a certain few cases of benign growths is a resection of the tumor alone allowable.

It goes without saying that all those cases are to be excluded from operation in which the growth has exceeded the territory of the kidney itself, *i.e.*, has extended into the fatty capsule, or in which the growth has advanced into the vena cava, or has infected the lymph glands. The difficulty, however, is to recognize these conditions before operation. In many cases it is impossible to do so and the hopelessness of the situation is only ascertained on the operating table. As the consideration of all these questions, as well as the discussion of the proper method of operating and of the results which may be expected from operative treatment, is doubtless provided for by the writer on the surgery of the kidney, the reader is referred to the article entitled *Kidneys, Surgical Affections of the,* for further information on the subject.

Cysts of the Kidney.—For cysts due to parasites, see under heading *Kidneys, Diseases of: Parasites.*

(*a*) Simple or serous cysts are not very frequent. Brackel having collected twenty-one cases out of the whole literature, from the year 1865 to 1899. They are observed only in adults between the ages of eighteen and sixty-five. They are usually solitary and may grow to large size. They cause no symptoms except those due to pressure. They arise in the cortex and project from its surface, the remainder of the kidney being healthy and functionating actively. Their contents are various: thin, clear, bloody, or colloid. Women seem to be more often affected than men, in the proportion of about fourteen women to six men. Their exact mode of origin is uncertain. The diagnosis is very difficult, as they may be mistaken for a number of other kidney conditions. Treatment consists in tapping them when they become so large as to cause discomfort. If they refill they may be laid open and the edges of the cyst stitched to those of the wound. This course, however, involves a greater loss of time before healing is completed than if the plan is adopted of totally removing the cyst and its wall, the cavity of which may then be immediately obliterated by sutures.

(*b*) General cystic degeneration of the adult kidney. In this condition the whole kidney is converted into a vast number of conglomerate cysts of varying size. There is scarcely any portion of the glandular structure which is left unchanged, and the bulk of the organ is very much increased, while retaining its renal shape. The cysts do not communicate with each other nor with the pelvis or calyces. They probably owe their origin to expansions of parts of the uriniferous tubules and atrophy of the interstitial tissue. Small portions of the renal tissue between the cysts may remain unchanged. An important fact seems to be that the disease is often an hereditary one. It does not usually develop before the fortieth year. There are instances, however, in which the disease has been observed in children. In these cases both kidneys have usually been affected. Cystic liver has often been observed as a complication, so that this seems almost like an integral part of the disease.

Symptoms.—The clinical history is much like that of Bright's disease. Israel divides the cases into four groups, as regards symptoms:

1. A not inconsiderable number of cases have uræmia as the first symptom to call attention to the kidneys.

2. Another class has symptoms referable to the urinary apparatus, such as polyuria, sometimes hæmaturia, perhaps slight vesical tenesmus, thirst and dryness of the mouth, in a few cases œdema.

3. Others have pronounced circulatory disturbances, such as palpitation, cardiac dyspnœa, due to hypertrophy and dilatation of the left ventricle, or dizzy attacks due to arteriosclerosis.

4. A fourth class complains of enlargement of the abdomen with pressure symptoms, anorexia, vomiting, abdominal pains, etc.

The character of the urine may also help in making the diagnosis, as it is like that which is observed in the cases of granular or contracted kidney. It is pale, abundant, of low specific gravity, albuminous, occasionally containing blood cells and coagula, often granular casts.

By palpation in well-marked cases we find that there are enlargements of both kidneys, and that on their surfaces are different-sized prominences, which are always regularly spherical, scarcely elastic, seldom fluctuating. The tumors are movable and have respiratory movements.

Treatment is based upon the same principles as those which govern the treatment of acute nephritis.

Paranephritic cysts do not have their origin in the kidneys but encroach on the kidneys from without. Such cases should be treated by excision.

B. Primary New Growths of the Kidney Pelvis.—These are not frequently observed. Only two out of Israel's 70 cases of kidney tumor arose from the kidney pelvis. J. Albarran has lately published the most that is

known about them. These new growths are either of epithelial character, or else they originate in the connective tissue. The epithelial new growths are either papillomata or epithelial carcinomata. Albarran found eighteen of the former and thirteen of the latter. The papillomata develop mostly at the base of the pelvis and project toward the ureter. They are similar to those which develop in the bladder, and are usually mutiple. The epithelial cancers naturally tend to infiltrate the kidney itself. From obstruction of the ureter we may get hydro-, pyo-, or hæmatonephrosis. The non-epithelial new growths develop either toward the outer surface of the kidney pelvis, or else they grow into its cavity or into the ureter. Albarran found among 7 cases, 4 rhabdomyoma, 1 myxoma, 1 angiosarcoma, and 1 endothelioma. The symptoms of these new growths are not only those of hæmaturia, pain, and tumor formation, but in addition a prominent symptom is that of retention of either blood or urine in the renal pelvis. Tumor cells may be discovered in the urine obtained from the ureter of the affected side by ureteral catheterization; or, by the cystoscope, tumor villi may possibly be seen projecting out of the ureteral opening into the bladder. Simple pedunculated papillomata should be excised, while malignant tumors require a nephrectomy with removal of the greater part of that ureter.

C. Tumors of the Kidney Capsule.—Paranephritic tumors are divided into three groups: 1. Tumors of the connective-tissue type; 2. Tumors of the adrenal; 3. Paranephritic cysts.

1. Tumors of the connective-tissue type are very various, and we may find lipoma, fibroma, myxoma, sarcoma, etc. A separate description of these is hardly necessary. As to their symptoms we may say that they grow insidiously and without pain, and the first thing noticed is an abdominal swelling. The non-malignant tumors are often very movable. The sarcomata tend to contract very firm adhesions. Only after they attain very large size do we get pain, due to pressure upon the lumbo-sacral nerves. Changes in the urine do not occur till pressure takes place, and hæmaturia is very rare. In fifteen per cent. a history of gastro-intestinal disturbances has been noted; these disturbances are due to pressure. Puncture of the growth furnishes negative results. Emaciation is extreme when the tumor reaches a large size. Extirpation constitutes the only available treatment.

2. Tumors of the adrenal. These are very hard to distinguish from those of the kidney, not only pathologically but clinically. The primary new growths of the adrenal, large enough to cause an abdominal tumor, are rare. They consist of three varieties: (*a*) A purely glandular proliferation. (*b*) Large adenoma. (*c*) Malignant growths, cancer, sarcoma.

Symptoms.—The most frequent is marked loss of flesh and strength; then next in order come gastro-intestinal disturbances and pain in various parts of the body (Mayo Robson says particularly in "shoulder tip"). The circulatory system and skin are not usually involved as in Addison's disease. Hæmaturia is not present, nor are any urinary symptoms, till the kidney itself becomes involved. The growths increase rapidly and produce metastases early.

Treatment consists in extirpation, provided exploration shows that an extension of the disease has not taken place.

3. Paranephritic cysts. The recorded cases are very few, but have been classified as follows: (1) Serous cysts; (2) blood cysts; (3) hydatid cysts.

Clarence Arthur McWilliams.

References.

Israel: Chir. Klinik der Nierenkrankheiten, 1901. Handbuch der praktischen Chirurgie, 1901.
Henry Morris: Surgical Diseases of the Kidney and Ureter, 1901.
Wyss: Beiträge zur klin. Chir., Bd. xxxii., 1901.
Schede: Deutsche Zeit. für Chir., Bd. lxii., January, 1902.
Riedel: Archiv für klin. Chir., Bd. lxvi., 1902.
Manasse: Virchow's Archiv, Bd. 142, 143, 145.
Grawitz: Deutsche Gesellsch. für Chir., 1884, S. 28.
Albarran: Ann. des mal. des org. gén.-urin., 1900, Nos. 7, 9, 11.

KIDNEYS, DISEASES OF: NEPHRITIS.—(Synonym: *Bright's Disease.*)—Although Aëtius (died 367 A.D.), Avicenna (980–1036), and Van Helmont (1577–1644) attributed certain cases of dropsy to disease of the kidneys, and although Cotunnius (1736–1822), in 1770, discovered that the urine of dropsical patients is coagulable by heating, our first insight into the true nature of the non-suppurative diseases of the kidneys dates from the memorable publications by Richard Bright (1789–1858), in 1827 and subsequently. It is true that Wells (1757–1817), in 1806, Blackall (1771–1860), in 1813, and Alison (1790–1859), in 1820, anticipated somewhat the observations of Bright, but the reports of these writers were fragmentary and their reasoning was in large part erroneous. Bright, however, demonstrated the dependence of dropsy and albuminuria upon disease of the kidneys; he recognized the relationship of the symptoms to the disease, and he described accurately the lesions in the kidneys. Indeed, such were the profoundness of his knowledge and the accuracy of his observations that many of his statements have withstood the searching inquiries of more recent times. Bright recognized that although albuminuria and dropsy are the characteristic symptoms of certain diseases of the kidneys, in some cases the amount of albumin may be small and the dropsy slight or altogether absent; he described many of the associated phenomena, such as uræmia and the cardio-vascular changes, and many of the complications, such as blindness, apoplexy, inflammation of the serous membranes, etc. Thus it excites little wonder that the acute and chronic non-suppurative diseases of the kidneys, usually but not always associated with albuminuria and dropsy, and frequently attended by characteristic lesions in certain other organs, notably the cardio-vascular apparatus, have come to be known as Bright's disease.

The original observations of Bright soon received abundant confirmation in different parts of the world, and diseases of the kidney became the subject of much study and discussion. The most noteworthy of the early contributions to the subject are those by Christison (1829), Gregory (1831), Osborne (1834), Rayer (1839), and Rokitansky, the last-named writer describing the amyloid kidney in 1842. The earliest investigations of the minute anatomy of the changes in the kidneys in nephritis were made by Henle (1847), and subsequently by Reinhardt (1859), Frerichs (1851), Johnson (1852), Virchow (1852), Vogel (1852), Wilks (1852), Traube (1856), Dickinson (1860), Rosenstein (1860), and Grainger Stewart (1868),—Johnson, in particular, directing attention to the changes in the blood-vessels. In 1872, Gull and Sutton, studying anew the changes in the blood-vessels, described their now well-known arterio-capillary fibrosis and emphasized the importance of alterations in the blood-vessels in the production of cirrhosis and atrophy of the kidneys. Later, Kelsh (1874), Bartels (1876), Bamberger (1879), Mahomed (1879), Aufrecht (1879), Weigert (1879), and others contributed important articles on the subject. The literature is now voluminous. Among the most important contributions during the last two decenniums are those by Wagner, Rosenstein, Stewart, Saundby, Ziegler, von Kahlden, Dickinson, Delafield, Tyson, Councilman, Senator, Tirard, and many others.

Now, although most writers are agreed as to what constitutes Bright's disease, there is no unanimity of opinion as regards the classification of the different forms of Bright's disease—the basis of different classifications being etiological, anatomical, or clinical factors, or a combination of two or all three of these factors. The following classification is believed to be comprehensive, to accord with the anatomical findings and with the clinical course of the disease, and, in so far as is possible and desirable at the present time, it takes cognizance of etiological factors:

I. Acute nephritis.
  (*a*) Acute toxic or degenerative nephritis. (Cloudy swelling or parenchymatous degeneration of the kidney.)
  (*b*) Acute diffuse nephritis. (Acute parenchymatous, exudative, catarrhal, desquamative, glomerular, tubular, or hemorrhagic nephritis.)
  (*c*) Acute interstitial non-suppurative nephritis.
  (*d*) The kidney of pregnancy.

II. Chronic nephritis.
  (*a*) Chronic diffuse non-indurative nephritis. (Subacute and chronic parenchymatous, exudative, catarrhal, desquamative, glomerular, tubular, or hemorrhagic nephritis; the large white kidney; the large red, mottled, or variegated kidney.)
  (*b*) Chronic diffuse indurative nephritis. (Sclerosis of the kidney.)
    1. Secondary chronic indurative (or interstitial) nephritis. (Late stage of chronic parenchymatous nephritis; the small white kidney; the white granular kidney; the secondarily contracted kidney.)
    2. Primary chronic indurative (or interstitial) nephritis. (The red granular kidney, the gouty kidney, the primarily contracted kidney, the genuine contracted kidney.)
    3. Arterio-sclerotic nephritis. (The senile kidney.)

I. Acute Nephritis.

Etiology and Pathogenesis.—Acute nephritis may occur at any age, though it is more common before than after the age of forty years. Aside from the kidney of pregnancy, males are more frequently affected than are females. Exposure to the inclemencies of the weather is still looked upon, by some clinicians, as an important etiological factor. The clinical association cannot be denied, though its importance has been much overestimated and its mode of operation is still unknown. With more or less reason, it has been said to act by favoring the retention of certain excrementitious products, by causing a reflex congestion of the kidneys, by giving rise to certain alterations in the albuminous constituents of the blood in consequence of which they become non-assimilable and irritating, and by producing hæmolysis analogous to that which occurs in some cases of paroxysmal hæmoglobinuria. Aside from (and possibly including) such exposure to the inclemencies of the weather, acute nephritis is due to autogenous or exogenous intoxication or infection of the kidneys—the different forms of acute nephritis being the result of differences in the amount, nature (virulence), and duration of action of the toxic or infective agent on the one hand, and of the reaction of the kidneys on the other hand. The most important of these etiological factors are the febrile infective diseases—all of which are capable of giving rise to the different forms of acute nephritis. Doubtless almost all cases of infective disease are attended by more or less decided alterations in the kidneys—alterations the consequence of the elimination of toxins by the kidneys, but alterations in some cases so slight as to give rise to no clinical manifestations. The mildest cases that are recognizable clinically are cases known usually as cases of *febrile albuminuria*.

Infective diseases, such as varicella, measles, rubella, and epidemic parotitis, may provoke acute nephritis, but it is more common and more severe in the infective anginas, influenza, typhoid fever, typhus fever, diphtheria, pneumonia, erysipelas, septicæmia, acute or infective endocarditis, smallpox, rheumatic fever, relapsing fever, cerebro-spinal meningitis, plague, dysentery, acute infective jaundice (Weil's disease), tuberculosis; in certain erythematous and purpuric affections; in impetigo, pustular eczema, etc. It is especially common in scarlet fever, yellow fever, and cholera, and it may occur in vaccinia, malaria, syphilis, etc. In most of these diseases the kidney lesions are the result of the action of a toxin elaborated by the provoking bacteria and eliminated by the kidneys. In some cases, however, cases in which bacteræmia occurs, the kidney lesions are the result also of the direct action of bacteria which, circulating in the blood, are brought into direct contact with, and are eliminated by, the kidneys—in some cases in exceedingly large numbers, as, for instance, in from twenty-five to fifty per cent. of all cases of typhoid fever. In cases in which the pyogenic bacteria are the offending agents suppurative lesions (which will be discussed elsewhere) may be produced. In addition to these bacterial poisons, acute nephritis may be caused by certain metabolic poisons, such as leucomaïns; by certain more or less imperfectly understood toxic products of perverted metabolism, such, for instance, as are associated with gout, diabetes, jaundice, hæmoglobinæmia, extensive burns, etc.; by certain chemical substances (non-biological poisons), such as spices, ether, chloroform, alcohol, turpentine, corrosive sublimate, arsenic, phosphorus, cantharides, sulphuric acid, nitric acid, hydrochloric acid, oxalic acid, carbolic acid, salicylic acid, petroleum, potassium chlorate, the chromates, etc., many of which act by inducing hæmolysis; by anæmia—primary and secondary and that following hemorrhage; and by pregnancy. In general, the toxic agents and anæmia give rise to degenerative lesions, whereas the infective agents give rise to both degenerative and inflammatory lesions. In addition, some of the toxins appear to possess a selective action in that one will implicate especially the epithelium of the glomeruli, another the epithelium of the tubules, whereas in other cases the connective tissue appears to be especially the object of attack.

Pathological Anatomy.—The kidney in acute nephritis exhibits all gradations from the mildest degenerative lesions to intense widespread inflammatory and degenerative lesions; from the slight lesions of short duration to the severe lesions that permanently damage the organ. In consequence the kidney presents quite different aspects in different cases. In the mild cases, cases presenting the slightest degenerative lesions—*acute toxic or degenerative nephritis*, the kidney may be scarcely increased in size, and it may present no noteworthy deviations from the normal. In the more severe cases, cases of moderate severity, the kidney is somewhat enlarged, more or less congested, and the cortex slightly swollen, pale grayish-red in color, and opaque. In the extremely severe cases—*acute diffuse nephritis*—the kidney may be twice its natural size, weighing 250 gm. or more. The capsule usually is tense and thinned; it strips readily and leaves a smooth surface that varies much in color. In the severe and very acute cases it is dark reddish-brown in color (hyperæmic or hemorrhagic kidney); in the less severe forms and in the later stages of the severer forms it is pale grayish or grayish-red in color (anæmic kidney); in other cases it presents a combination of these (mottled or variegated kidney). In addition to markedly congested stellate veins, the surface of the kidney usually presents certain dark red spots or streaks referable to foci of hemorrhage. On section, the kidney, if enlarged, is softer than normally, somewhat opaque (as though cooked), œdematous, and friable; if the lesions be very acute the organ drips blood. The cortex is swollen and increased in thickness, the normal striations are obscured, and the color corresponds with the color of the surface. The glomeruli may or may not be distinct. In some cases, especially in scarlatinal nephritis, they are very distinct (*glomerulo-nephritis*), appearing as minute pale grayish or dark reddish (hemorrhagic) points. Contrasting with the frequently pale cortex the pyramids are usually congested. In some cases, however, the pyramids are pale, only the boundary zone being congested.

Pathological Histology.—Microscopically the lesions in acute nephritis usually affect all the structures of the kidney—*acute diffuse nephritis*. In some cases, however, the lesions are wholly or almost wholly confined to the parenchyma—*acute toxic or degenerative nephritis*, which fact suggests that the first changes in the kidney in nephritis are in the epithelium. In other cases the lesions are especially conspicuous in the interstitial tissue—*acute interstitial non-suppurative nephritis*.

(*a*) Acute Toxic or Degenerative Nephritis.—In this form of nephritis, aside from slight changes in the blood-vessels and the interstitial tissue present in some