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CANCEROUS DEGENERATION OF THE KIDNEY IN CHILDREN.

By P. M. BRAIDWOOD, M.D.

Having, within the last two years, met with four instances of cancerous degeneration of the kidney in children under two years of age, I desire thus to direct the attention of the profession to this remarkable but not very rare form of infantile disease. The diagnosis of such cases is obscure, and on this account the malady has probably been often overlooked. The symptomatology of these cases presents no distinctive sign whereby the disease can be at once recognized, and the autopsy decides often whether the abdominal enlargement in any given instance be cancerous or not. The kidney alone may be the seat of cancer, or it may be implicated along with other viscera. Walshe, Roberts, &c., accordingly, describe "primary" and "secondary" cancerous renal growths. The former variety which is the subject of these remarks, is accompanied by certain symptoms, gives rise to certain physical signs, runs a definite course, and is the cause of death.

Cancer of the kidney, especially that attacking children, is almost exclusively encephalous in character. It is therefore not circumscribed, but diffused through the viscus, infiltrating it, and producing in fact a thorough degeneration of all the renal elements. In consistence it varies somewhat in different instances, being described in one case "as soft as the milt of a fish," but more generally being of the firmness of healthy human brain. The cancerous renal mass is neither of uniform consistence throughout, nor of one colour; but exhibits cysts, yellowish firm substance, whitish more fluid matter, and blood coagula of various sizes. "Cavities containing as much as a pint or more of clotted or fluid blood, or of blood mixed with cancerous detritus, have sometimes been found within the tumour."* Cancer attacks at

* Roberts, Wm. *A Practical Treatise on Urinary and Renal Diseases.* 1865, p. 437.

first the cortical substance, and later involves the central pyramidal portion; while the fibrous covering of the kidney becomes converted into a thick membrane, readily detached, and enclosing a mass many times larger than the original organ. The degeneration—infiltration—cancerous alteration appears to me to commence, in such instances, in the connective tissue surrounding the malpighian corpuscles, and it afterwards implicates the firm fibrous tissues, while the most obstructive to its progress are the elastic tubuli uriniferi. Walshe states that the veins are sometimes plugged with cancerous masses which even extend to the vena cava; and that the lymphatic glands are often implicated.*

When, therefore, such a tumour is examined microscopically, its different portions are observed to present distinctive characteristics. The firm yellowish, and the whitish less consistent portions of a cancerous kidney are found to be composed of delicate fibres enclosing in their meshes fusiform, round, oval, or irregular cells. (Plate, fig. 1.) The fibres are observed to be extremely delicate, distributed sparsely, and enclosing cancer-cells, which are small, oval, or round, (Plate, fig. 1 *a*.) Among the fluid contents of the cysts are seen large, oval, round, or irregularly-shaped, multinuclear cancer-cells. (Plate, fig. 2 *a*.) Generally, at one part in the circumference of such a cancerous mass is to be seen a reddish edge of seemingly normal tissue, which on microscopical examination is discovered to consist of tubuli uriniferi and their malpighian terminations undergoing cancerous degeneration. (Plate, fig. 2 *b*.) The urinary tubules at such a point appear to be lined by very minute, round cancer-cells, which, on being detached or when submitted to the action of dilute acetic acid, exhibit their multinuclear character and granular contents. At certain turns in the tubules the cancer-cells are accumulated in heaps, while in the malpighian corpuscles they are large, subdivided, and contain numerous nuclei. (Plate, fig. 2 *c*.) It seems probable, then, that the connective tissue cells of the cortical and interpyramidal portions, and likewise the epithelial cells of the proper renal tissue, are transformed into or replaced by cancer-cells.

* Walshe, W. H. On the nature and treatment of Cancer. 1846.

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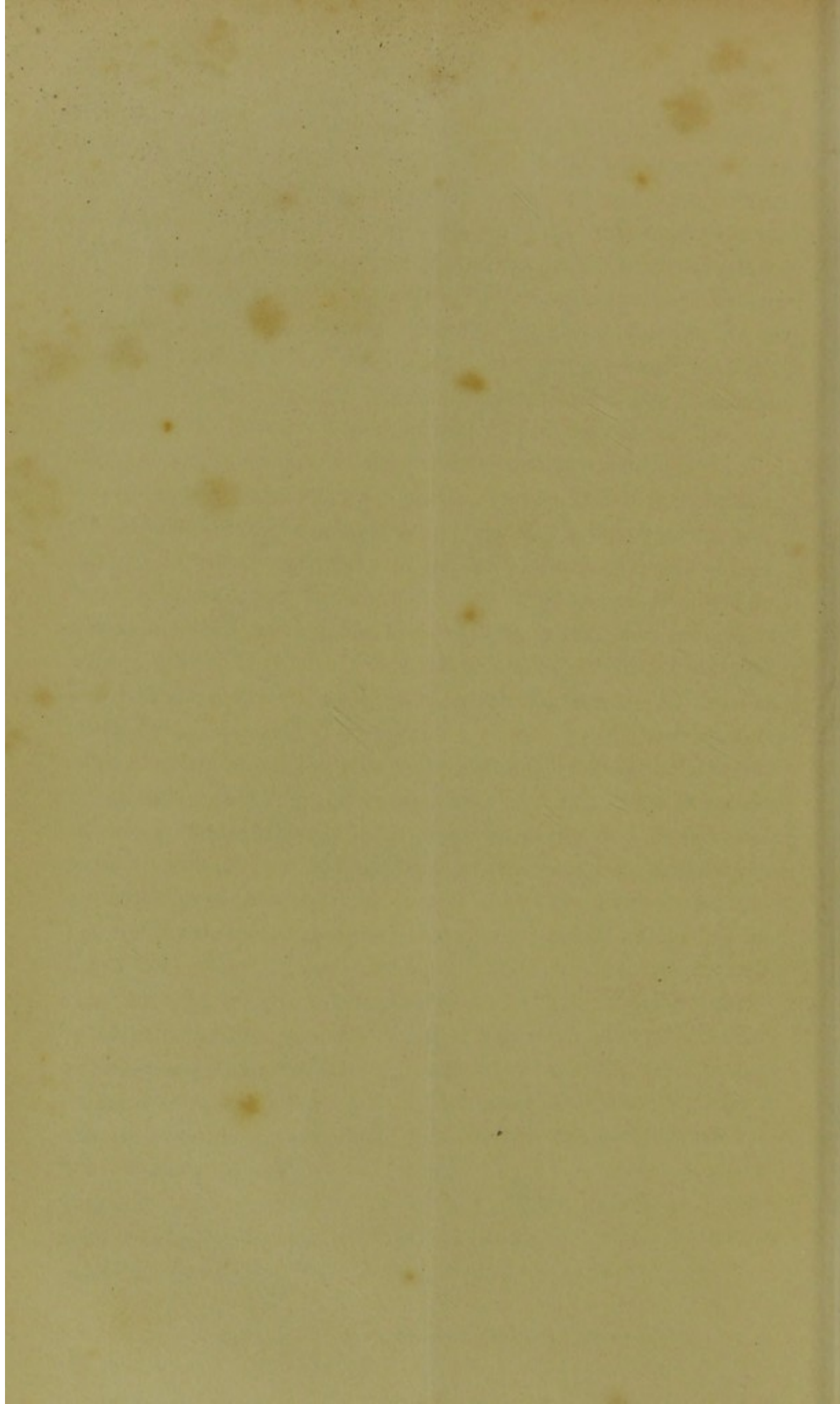


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Cancer of the kidney in children is, in my experience, met with in the infiltrated form alone. Such a mass presents externally a more or less uniform contour, with here and there nodular projections caused by the bulging outwards of cysts. These tumours are generally of large size, often presenting gigantic proportions. In ten children, the average weight of such growths was, according to Dr. Roberts, $8\frac{3}{4}$ lbs, the smallest was $2\frac{1}{4}$ lbs, and the largest 31 lbs! "In one example, recorded by Mr. Spencer Wells, a growth weighing between 16 and 17 pounds was taken from the body of a child only four years of age."* Such growths generally contract adhesions to the surrounding parts. They "may burst into the peritoneum, ulcerate into the duodenum or externally through the skin." In their rapid increase they push aside the neighbouring viscera. The colon is situated invariably in front and at the upper part, being sometimes flattened and empty, while the mesentery is stretched over the tumour and is congested. The small intestines are pushed backwards, and to the opposite side. "When the growth affects the right kidney, the liver is displaced to left, often twisted on its transverse axis so that its upper surface takes a vertical direction and applies itself to the costo-abdominal wall. When the tumour is constituted by the left kidney, the stomach is pushed to right, and the spleen carried high up into the vault of the diaphragm. The thoracic viscera are displaced upwards, more or less, according to the bulk of the tumour, and in various directions according to the side affected."†

In the "primary" form of cancer of the kidney, or, more correctly speaking, in cancerous degeneration of the kidney, met with among children, this viscus is alone the seat of the disease; and it generally manifests itself in patients of very tender years. Dr. Roberts has collected nineteen instances of this affection in children under ten years of age; as is seen in the following table:—

0—1 yr.	1—2 yrs.	2—3 yrs.	3—4 yrs.	7—8 yrs.	10 yrs.	
1	4	6	5	2	1	= 19

* Roberts. *Ibid.*, p. 439. † *Ibid.*, p. 439.

It attacks boys more frequently than girls. The origin of this disease is unknown, though frequently the exciting cause is believed to be a fall or blow. Of the four examples of this affection I have met with, one occurred in my own practice, and was examined after death; I was present at the autopsy of a second (through the kindness of Mr. Bickersteth, of Liverpool, whose case it was); and received the notes of the third case from Dr. Oxley, Physician to the Liverpool Children's Infirmary. The fourth occurred in a patient of Mr. Bickersteth's. This patient I saw during life, and had no doubt as to the diagnosis, although this was not confirmed by an autopsy.

The following narrative of the case which occurred in my practice, exemplifies well the symptomatology and course of this malady, and may therefore be appropriately quoted here:—

The mother of a boy, aged nineteen months, while washing him one evening, observed a little hard lump, of the size of a walnut, situated about midway between the false ribs and crista ilii of the left side. The child's health was good. Medical advice was at once sought, and tincture of iodine was ordered as a counter-irritant, while the internal as well as external use of cod liver oil was recommended. This treatment was persevered in till the date (three months later) of his being brought to me. The tumour meantime increased rapidly, and the child's health was becoming affected. Excepting the presence of the swelling, and its very rapid growth, no special symptoms existed until about a fortnight before I saw the patient, when he passed a smaller amount of urine than usual, and his left leg and foot became œdematous. The following measurements, made three weeks before I saw him (for which I am indebted to his mother), at the time when I first examined him, and after he had been three weeks under my care, illustrate well the hasty strides made by the disease.

First measurement: three weeks before I saw him.

Round the iliac crests (<i>i. e.</i> lower part of abdomen)	18½	inches.
Immediately above the iliac crests.....	20	„
„ below the false ribs	21¼	„
„ above the umbilicus	22	„

Second measurement: when I first saw him.

Round the iliac crests	22	inches.
Immediately above the iliac crests.....	23 $\frac{1}{2}$	„
„ below the false ribs	24	„
„ above the umbilicus	24 $\frac{1}{2}$	„

Third measurement: 3 weeks after the last date.

Round the iliac crests	20	inches.
Immediately below the umbilicus	25 $\frac{1}{2}$	„
„ above „	27	„

These measurements illustrate further the direction in which such tumours grow. Discovered at first in the lateral lumbar region, generally between the lower ribs and the cresta ilii and rather anteriorly, the growth increases upwards, but is most observed as it spreads downwards towards the pubes, and in front towards the umbilicus. If situated on the left side, such a tumour may, from its mode of increase, be readily mistaken for an enlarged spleen. As it grows, the abdominal wall becomes more and more stretched over it, and dilated veins ramify on its surface.

When I first saw this patient, his abdomen was greatly enlarged, and presented large superficial veins. The tumour felt uniform on the surface, and here and there it gave an impression of fluctuation. The stomach and intestines were pushed upwards and to the right side. The urine revealed nothing abnormal when examined chemically and microscopically.

The tumour increased rapidly, respiration became affected, the body wasted, and the features were pinched. Emaciation kept pace with the rapid growth of the tumour, and the patient sank gradually. He died about five months after the tumour was first detected. After great persuasion I was permitted to open the abdomen only. The viscera were found in the position above described, and all were healthy in appearance, except the left kidney. The tumour weighed 10 lbs.

The second of the cases which I saw presented the following history. A girl, sixteen months old, enjoyed good health, till one day, about four months before her death, when she was observed to

be peevish and out of sorts, and passed red and clotted blood with the urine. The hæmaturia came on suddenly, and blood was passed in large quantity. This symptom continued for a fortnight, in spite of the employment of suitable remedies. About a month later her mother noticed a swelling, of the size of an apple, on the left side of the abdomen, immediately below the ribs. The patient passed large quantities of urine, without any blood, and without pain. She became more and more emaciated, the tumour grew rapidly, but no other symptoms were present. On opening the abdomen after death, all the viscera were found to be healthy except the left kidney, which, on section, presented the appearance of encephaloid cancer. This tumour weighed 8 lbs.

The urine of this patient was from time to time examined microscopically, but no abnormal structures (pus or cancer cells) were discovered in it.

The third case referred to was a boy, who, when four months old, exhibited a swelling on the right side, just below the ribs and somewhat in front. He appeared healthy, but had been several times jaundiced. The tumour presented the same characters as in the preceding cases, and was of large size. Distinct fluctuation was felt at a point midway between the umbilicus and lower costal cartilages, where also the tumour was most prominent. The urine on examination was found to be healthy, and was secreted in normal amount. The child died, when about eight months old, in convulsions, having previously had obstinate vomiting and diarrhœa. The tumour was found after death to weight 25 ounces, and the right ureter was pervious. I examined microscopically this and the tumours from the preceding two cases, and made from them the drawings in the accompanying plate.

In all these instances, the family history betrayed no tendency to a cancerous cachexia, and the other children in these households were healthy and strong.

The most important symptoms, then, observed in this class of cases are,—the presence of an abdominal tumour which increases rapidly, and hæmaturia. Among all the cases of renal cancer (primary and secondary) collected by Dr. Roberts, in forty-nine instances was the presence or absence of hæmaturia specified. “Of

these, 25 exhibited no trace of hæmaturia throughout their entire course. In 24 cases there was hæmaturia; but in 4 of these, there existed other possible causes for it than renal cancer. In three instances hæmaturia occurred only for a few weeks at the beginning of the complaint, and then altogether ceased—the urine thereafter continuing normal. In other cases hæmaturia did not appear until toward the last few months of life.* Dr. Roberts refers the presence of hæmaturia to the ureter remaining open, and the absence of this symptom to the ureter becoming occluded. Hæmaturia, especially seeing the amount of blood passed is generally small and at intervals, is I think dependent rather on an earlier or later invasion by the disease, and consequent rupture of the malpighian tufts. “In some cases the hæmorrhage is excessive, and followed by rapid anæmia and exhaustion, though this is rare; but sometimes it is insignificant, and requiring the microscope for its detection.”†

It is remarkable to observe how little the general health suffers in children affected with cancerous degeneration of the kidney. Extreme emaciation and impediment of the respiration, from the size of the tumour, are the only alterations to be noticed. The viscera adapt themselves to the displacement to which they are exposed. The child eats well, even ravenously; and is often very thirsty. The bowels act regularly; and the neighbouring kidney bears the burden of the urinary secretion. Death is sometimes induced suddenly, by rupture of the tumour, but most commonly the gradual exhaustion of the vital powers terminates the little patient's sufferings.

The duration of the disease varies greatly. Among children, “the mean duration was between seven and eight months; the minimum, was ten weeks, and the maximum, over a year.”‡

Diagnosis.—The real nature of the disease in such cases is often difficult to distinguish: a rapidly increasing tumour situated in the region of either kidney, especially if accompanied by profuse hæmaturia, may be generally regarded as one of a malignant nature. But the diagnosis is in such instances to be arrived at by the

* Roberts. *Ibid.*, p. 443. † *Ibid.*, p. 444. ‡ *Ibid.*, p. 446.

logic of exclusion. Renal cancer has been mistaken for enlargement of the liver, spleen, ovary, or uterus; for ascites, aneurism of the aorta, or perinephritic abscess; for pyonephrosis, hydatids, cystic degeneration, hydronephrosis; and most commonly for tabes mesenterica. These errors arise chiefly from an imperfect knowledge of the diagnostic signs of renal cancer, from undue weight being attached to the absence of hæmaturia, and from the diagnosis being based on one symptom without reference to others, or to the history of the case. "As a positive sign," says Roberts, "associated with abdominal tumour, hæmaturia—profuse, spontaneous, and recurrent—is of the highest significance; but its absence signifies comparatively little."* Cancerous degeneration of the right kidney is distinguished from hepatic enlargement, by the possibility of tracing the upper limits of the tumour below the ribs, so as to separate it from the liver. Hepatic tumours are dull on percussion *all over* their surface; whereas renal tumours have the colon in front. Hepatic disease is, also, very rare in children of the tender age at which the kidneys are attacked by cancer.

"A splenic enlargement," remarks Roberts, "is distinguished by the following signs:—absence of the descending colon in front; its rigid, somewhat thin, borders (not rounded); its extension upwards under the ribs; its mobility; generally, a tympanitic note is obtained in the extreme left lumbar region; often, on deep percussion, a bowel sound is perceived through its substance, which is not thick (a renal tumour is absolutely dull on the deepest percussion); antecedent history of ague or remittent fever, or evidence of leucocythæmia on examination of the blood; the direction of the enlargement is downwards and inwards to the epigastrium and umbilicus, and not towards the iliac fossa. It also rises higher toward the axilla than a renal growth. When the latter rises from the upper and lower part of the kidney, and pushes forwards and upwards rather than downwards, the diagnosis becomes very difficult, and depends mainly on the absence or presence of the colon in front of the enlargement, and hints

* Roberts. *Ibid.*, p. 451.

derived from the previous history, or the state of the blood on microscopic examination.”*

Ascites can resemble a renal cancerous tumour when this is very full of cysts and imparts a fluid feel; but the latter is differentiated by giving a dull note on percussion in one flank and a resonant sound in the other, whereas ascitic fluid, to the amount requisite to cause a similar abdominal swelling, would give a dull note on both sides. It is only by overlooking the history of the case, and by making a hurried, imperfect examination of the abdominal swelling, that a renal tumour can be confounded with *tabes mesenterica*. The source of origin of the tumour, its mode of growth, and its anatomical situation are quite sufficient (at least in the early stage of the disease) to indicate its topical character.

The malignant nature of renal tumours is, however, a matter often difficult to determine; and it is indicated alone by their rapid growth. The microscope unfortunately affords no reliable aid in the diagnosis of cancerous degeneration of the kidney. According to Walshe both kidneys may be implicated without the urine exhibiting any unhealthy characters. Cancer cells in the urine usually indicate cancerous disease of the bladder. According to Neubauer and Vogel, “when cancer-cells are found in the urine, the existence of the disease may sometimes be diagnosed by negative signs, indicating the absence of any affection of the bladder; and sometimes also by percussion, which points out enlargement of one or both kidneys.”† Cancer cells in the urine are liable to resemble the irregular transitional forms of the epithelial cells lining the urinary passages, and which are so common in the urine of children. They also present very abnormal varieties, from being exposed to the action of the urine; and are associated with blood corpuscles. The urinary deposit, sometimes met with in cases of renal cancer, is “a thick, dirty, blood-stained sediment, containing abundance of blood corpuscles, mixed with spindle-shaped, oval, and irregular cells.”

* Roberts. *Ibid.*, pp. 452, 453.

† Neubauer and Vogel. *On the Urine*. New Syden. Soc. Transla., 1863 p. 343.

Malignant renal growths generally give a distinct impression of their solid structure ; while renal hydatids, purulent and hydronephrotic cysts betray their nature, by the history of their origin or by their fluctuating feel. Extra-renal abscess is distinguished by its fluctuating feel, by its history, often by the discoloration of the skin, by tenderness on pressure, and by its tendency to point.

Cancerous degeneration of the kidney in children is always fatal ; and the management of such cases is truly "a melancholy duty." Cure is hopeless, and remedies are used only to afford relief. The system is to be well supported, while the performance of the various functions is aided by the ordinary remedies when required. Hæmaturia rarely proves disadvantageous, and therefore requires but seldom to be checked. If it be excessive, it can be controlled by the use of ice, or the administration of acetate of lead or of Gallic acid.



