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HYDRONEPHROSIS.

AN ESSAY BASED UPON THE COMPARATIVE STUDY OF SEVENTY-ONE
CASES OF THAT LESION, OF WHICH ONE CASE CAME UNDER
THE PERSONAL OBSERVATION OF THE WRITER.

BY

GEORGE A. STAPLES, A.B. (Harvard), M.D.,

DUBUQUE, IOWA.



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When the urine accumulates slowly in the kidneys, either because of some obstacle in the ureter or by reason of some malformation of the parts, it occasionally happens that the calyces and pelvis renalis become dilated without perceptible inflammation of their walls: urinous or serous fluids collected in such a way, with their consequent lesions, are now known as hydronephroses.¹

Since the latter part of the 17th century this affection has been described under different names: first, by Rudolphi and Franz, as *hydrops renalis*, then by Ruysch as *expansio renum* or *hernia renalis*, later, by Johnson, as *hydrorenal distension*, still later by Rayer as *hydronephrose*.

The old anatomist Ruysch first had his attention called to this lesion through an anomaly observed while dissecting the kidneys of a sheep. So far as I know this is the earliest case on record, and perhaps, historically considered, worth translation from its monkish Latin.

"Nearly two years ago that diligent surgeon and anatomist, Vogelsaugh, at a dissection showed us two kidneys of a sheep so stretched and filled with a watery fluid that each kidney could hold nearly two pints. The ureters were tortuous, and of such capacity that they would admit a large carrot root. Each end of the swollen kidneys had not lost its natural glandular structure, but the space between was composed of membrane. The tubuli pelvis were great sacs of such size that each would admit an acorn stripped of its green cup. By easy manipulation I could force the urine in the bladder toward the ureter and kidneys, but not from the ureter and kidneys to the bladder, except by a strong effort, very sparingly, through a little foramen in the middle of a septum I found between the bladder and ureters. From this cause arose a regurgitation of urine, and in

course of time such a large expansion of the kidneys and ureters."²

Bonetus (*Sepulcretum*, Genevæ, 1700) also makes mention of similar cases that were mistaken for hydrovaria; on page 571, Vol. II, he says: "Sometimes not only serum is derived from the kidneys by the emulgents, but even serous and mucous material; when this stays in the pelvis it becomes sandy; when it stays in the emulgent veins, because of its coarseness, a mass is formed shaped like a butterfly, having symmetrical wings and feet." This phenomenon he actually observed at an autopsy made on the Duchess of Ferrara, who appears to have suffered from hydronephrosis. A case of this lesion diagnosed during life as swollen spleen is related in the same volume, as well as probably the first congenital case on record, where the right kidney was enormously swollen, but unaltered in its general conformation.

²Rayer was the first writer to give an extended and exhaustive account of this affection; since the publication of his work several writers, Johnson,³ Vogel,⁴ Rosenstein,⁵ Roberts,⁶ Ebstein,⁷ Todd,⁸ Lecorché,⁹ and especially Simon,¹⁰ in a work that has never been placed before the profession in this country, have added much to our knowledge and treatment of this comparatively rare lesion. Nor in this connection should the writer omit to mention the monographs of such men as Cooper Rose,¹¹ C. J. Hare,¹² Krause,¹³ Hildebrandt,¹⁴ Gusserow,¹⁵ Saexinger,¹⁶ Ackermann,¹⁷

¹ *Centuria anatomico-chirurgicarum Observationum Frederici Ruyschii* Observatæ XCIX.

² *Maladies des Reins*—Tome troisième, §829, par M. P. Rayer.

³ *Treatise on Kidney Diseases*. Lond. 1852. ⁴ On same by Vogel (1865.)

⁵ *Traité Pratique des Maladies des Reins*, par S. Rosenstein, traduit par les Docteurs E. Bontentat et F. Labadie-Lagrave.

⁶ *Urinary and Renal Diseases*, by William Roberts, M.D.

⁷ *Kidney Diseases*, by Prof. W. Ebstein in Ziemssen's *Encyclopædia*, Vol. XV.

⁸ Todd, *Clinical Lectures* Page 389.

⁹ Lecorché, *Maladies des Reins*.

¹⁰ *Chirurgie der Nieren*. Theil II, von Dr. G. Simon.

¹¹ *Medical Times*, 1868. ¹² *Medical Times*, 1857, Vol. I.

¹³ *Langenbeck's Archiv.*, VII, 6. Ein Fall von Hydronephrose u. s. w., von Dr. W. Krause.

¹⁴ *Volkmann's Vorträge*, Nr. V. Ueber Retroflexion des Uteri, von Dr. Hildebrandt.

¹⁵ *Ibid.*, Nr. XVIII. Ueber Carcinoma Uteri, von Dr. A. Gusserow.

¹⁶ *Vierteljahrsschrift für die Praktische Heilkunde* (Prag), Nr. XC.III. Ueber Uterus Krankheiten, von Dr. Saexinger.

¹⁷ *Deutsches Archiv für klinische Medicin*, Heft III und IV. Atrosie beider Harnleiter u. s. w., von Dr. Th. Ackermann.

¹⁴ "Die Hydronephrose enthält im Gegensatz zur Pyonephrose nur eine seröse Flüssigkeit, etwa verdünnten Urin, aber kein Eiter." Ultzmann. *Real Encyclopædie der Gesamten Heilkunde*. Band VI, p. 662.

¹⁵ "On désigne sous le nom d'hydronephrose un état morbide, indépendant d'inflammation," etc. Lecorché—*Traité des Maladies des Reins*, p. 624.

Hotz,¹ Rosenberger,² Labadie-Lagrave,³ Lanceraux,⁴ Fenger⁵ and others, that have aided much in the elucidation of this important subject and from which most of this paper has been gleaned.

Hydronephrosis may be either congenital or acquired; of the former variety little need be said here except that it is frequently associated with atresia ani, club-foot, hare-lip, and other malformations, and that where it is double the neonatus is never viable. The aetiology of the latter kind embraces a great variety of causes.

Of such factors may be mentioned calculi or hydratides in the urinary passages, thickening or swelling of the walls of these passages, prolonged or habitual retention of urine in the bladder; these causes, it must be remembered also, are rendered especially operative in females by reason of the anatomical peculiarities of their pelvic organs.

This interesting point is thus ably discussed by Prof. Hildebrandt,⁶ whose remarks, with account of cases, I translate: "The connection of a hydronephrosis with a primary disorder will appear clearly if we consider the anatomical seat of the ureters. The ureters take a course on the right and left side next to the portio supra-vaginalis uteri. If now the middle portion of the uterus is angularly bent it is easily seen that both ureters will bend with it and will be pulled down from behind. Then the urine necessarily stagnates on its way to the bladder, above the bend, it distends the ureter and the stagnation continues yet farther up to the basin of the kidney. . . . This connection between retroflexion and distension of the ureters was shown even more clearly in a case sent to me from B—a few months ago.

Mrs. H—, besides the ordinary symptoms of retroflexion, suffered from tormenting pain in micturition and was sent to be examined because of a large soft tumor above the left Poupert's ligament. I found retroflexion and gave as a diagnosis a swelling caused by distension of the ureter in consequence of the retroflexion. I could easily at the same time verify my diagnosis. As I introduced the catheter after straightening the uterus with the sound, and emptied the urine with the aid of outside pressure on the abdominal walls, the tumor, at first as large as a child's head, shrank to the size of an apple. A diagnosis will be very much more difficult at the inception of the disease, when the ureter is but little distended and the kidney is yet sound.

Case II. Miss F., a robust girl, in her 17th year, complained of deep-seated pelvic pain with whites, backache, and too free menses with severe molimen. Numerous nervous pains, a tormenting desire to urinate, a feeling of fullness as if the bladder were over-distended, and of spasmodic constriction in its neighborhood, also troubled her. At these times a small quantity of urine would be evacuated without relief.

¹Berliner klinische Wochenschrift, Nr. XXIII, 1869. Linksseitige Hydronephrose u. s. w., von Dr. F. C. Hotz.

²Ibid., Nr. XIX, 1880. von Dr. F. Rosenberger.

³Nouveau Dictionnaire de Medecine et de Chirurgie. Art. Reins par M. Labadie-Lagrave.

⁴Dictionnaire Encyclopedique des Sciences Medicales Rein (Pathologie) par M. E. Lanceraux.

⁵Nordiskt Medicinskt Arkiv., Band V, Nr. XII. Om der partielle Hydronephrose, etc., af Dr. Chr. Fenger.

⁶Hildebrandt, loc. cit.

I found a very relaxed uterus, angularly pointed, retroflexed for more than one inch, which easily could be raised by the sound. A soft swelling on the left side somewhat above Poupert's ligament had been observed by the physician who sent the patient to me.

With the most careful examination, while the patient was lying on her back, I could not find this tumor, but when I examined her in the upright posture, I found to the left of and somewhat above the uterus, a swelling, which, when examined by conjoined manipulation, appeared of an oblong form and was somewhat tender, but at different examinations varied in size, shape, softness and resiliency. As the flexion improved the swelling disappeared permanently, and with it the difficulty in urination. I therefore inferred that in this case, also, there was distension of the ureter. Especially characteristic were the subjective troubles of the patient, the change of form and circumference of the tumor when in a fixed position, its disappearance in the recumbent posture, which evidently was caused by the distribution of the fluid along the distended ureter to the kidney; and, on the other hand, its appearance in the upright posture, in which the urine sank down upon the bent angle—symptoms that are pathognomonic of this rare form of urinary disorder.

Prof. Saexinger¹ mentions in these words a cause of the lesion in women: "Many women who suffer from carcinoma uteri die from uraemia because of the complete involvement of the ureters, or degeneration of their outlets, or obliteration of their lumen by large pieces of debris or proliferated masses. The result is a spiral-shaped ureter, that often is as large as a finger, dilatation of the kidneys, pelvis and calyces, atrophy of the renal parenchyma, hydronephrosis."

Dr. A. Gusserow,² in an essay upon the same subject, makes these remarks: "The involving of the uropoetic apparatus independently of the bladder in this disease (carcinoma uteri) is of importance. Very frequently one or both ureters are involved, resulting in a destruction of the renal function. Blau found that in 93 cases distension of one or both ureters occurred 57 times. Stenosis or total closure of the ureters rarely happens, because of a cancerous affection in them; ordinarily it is because of pressure on them at their entrance into the bladder by the cicatricial horny thickening of the pelvic cellular tissue. I have also sometimes observed that a cancerous affection of the bladder wall in the trigonum colli had more or less completely displaced the mouths of the ureters, whence, as often observed by others, continence of urine and the symptoms of uraemic poisoning will result; but suddenly, after the formation of a vesical fistula, the pent-up urine will flow away in great quantity and the uraemic symptoms will disappear. In other cases, as long as the affection is unilateral, it may be painless. A few times I have succeeded in remarkably emaciated persons in discovering hydronephrotic kidneys by palpation."

Apropos of these statements Mr. Todd³ reports a

¹Saexinger, loc. cit. Ueber Uterus Krankheiten.

²Gusserow, loc. cit.

³Todd, loc. cit., p. 389.

case in which there was great pain in the neck of the bladder and a frequent desire to urinate, with alkaline urine, and, toward the end of life, incontinence from vesical irritability existed; at the autopsy the right kidney was found completely atrophied and the ureter converted into a large cyst; a cancerous mass in the bladder blocking up both ureters was also discovered.

There appears to be a pathogenetic relation between hydronephrosis and cystoid degeneration of the kidneys. This question has been ably discussed by Dr. Th. Ackermann¹ in an article describing the frequent simultaneous appearance of the two lesions, and to this paper we refer any who may be interested.

A patient came under the care of Prof. F. N. Otis² suffering from a persistently recurring spasm of the bladder that had resulted in a thickening of the vesical walls, dilatation of the ureters and hydronephrosis; in the opinion of Prof. Otis a contracted meatus urinarius was the primary cause of the whole difficulty.

Various anomalies of development may lead to hydronephrosis. Dr. F. A. Walter,³ many years ago, described an instance occurring in a man thirty years old, in whom were found on both sides double ureters and pelvis: the right and lowermost ureter opened almost in the middle of the urinary bladder; the right and uppermost, after it had crossed in front of the lower, opened close behind the *caput gallinaginis*; the upper half of the right kidney "durch örtliche Vereiterung" was changed into a moderately strong bladder, while the half of the kidney corresponding to the lower ureter was perfectly healthy; nothing is said of the permeability of the upper ureter, but the drawing shows it as compared with its fellow to be from three to five times dilated.

Two similar instances of a limited hydronephrosis with double ureters and pelvis, the one occurring in an aged widow, and which had been diagnosed as hydrovarium, and the other in a maniac 69 years old, have been recorded by Dr. A. Heller⁴, of Erlangen.

Prof. Simon⁵ mentions a comparatively common, though rarely noted, cause of hydronephrosis the formation of valves⁶ at the ostium pelvicum, although the rest of the ureter is perfectly permeable. Of the cases collated below, eleven as to their causation fall into this category.

In those subjects where the kidney occupies a very deep situation, and where the initial portion of the ureter is very near the sacrum, the ureter manifestly could be easily compressed or flattened. A curious instance of such compression is related by Dr. Labadie-Lagrave⁷. At an autopsy a kidney was found atrophied because of hydronephrosis, this lesion, in its turn, being dependent on a retention of menstrual fluid in one of the halves of a bifid uterus, which,

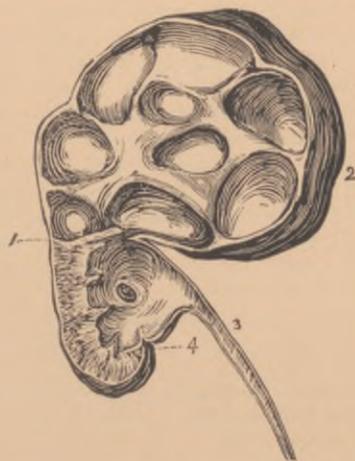
forming a large tumor, by gradual compression, had rendered the ureter impermeable.

Prof. Kehrer,¹ of Heidelberg, in a recent article has called attention to the fact that large hydronephroses are only met with where there is a long continued but not complete obstruction to the flow of urine, or where, as sometimes happens, the obstruction is intermittent. This writer believes that displacement of the kidney, as thought by some, cannot cause a serious continence of the renal secretion.

In certain cases the most careful scrutiny has failed to find any mechanical obstruction, and their aetiology, therefore, is obscure.² In literature are recorded other causes of hydronephrosis, as abscess of the bladder, supernumerary renal arteries, congenital absence of ureters (Cruveilhier), imperforation of the ureter in its whole length (Bonnet), diverticula of the bladder (Ebstein); to sum up the aetiology, however, it may be stated that any obstacle to the continuous and free flow of the urine from the calyces into the pelvis, from the pelvis into the ureter, or from the ureter into the bladder, whether it exist on one or both sides, can lead to the development of hydronephrosis.

Many conditions, such as the position of the obstacle, the completeness of the stenosis and the duration of the lesion, may greatly modify the pathology of hydronephrosis: the lesion, too, may be bilateral, unilateral, or in rare cases even partial, *i. e.*, where not all of the calyces of one kidney are involved.

A very interesting case of the latter variety has been described by Prof. Fenger:³ the patient was a young man in whom had been developed a renal tumor of traumatic origin; this, being punctured, poured forth urine. An inguinal abscess caused the death; and, at the autopsy, a partial hydronephrosis, limited by the distension of only one calyx, whose orifice was obstructed by a valve-like growth, was found.



Right partial hydronephrosis from valvular closure of the ureter, from Dr. Fenger's paper on "Partial Hydronephrosis"

1, Valve. 2, Hydronephrotic sac. 3, Ureter. 4, Normal calyces and papillar.

¹F. A. Kehrer, *Archiv. für Gynäkologie*, '81, Heft III, S. 370.

²Rosenstein, *loc. cit.*, p. 358. "In manchen Fällen ist kein mechanisches Hinderniss zu finden und die Ätiologie daher dunkel."

³Fenger, *loc. cit.*

¹Ackermann, *loc. cit.*, Seite 436.

²Otis, *Med. Gazette*, April 23, '82, page 123.

³F. A. Walter, *Einige Krankheiten der Niere und Harnblase*, Seite 14. Oertliche Vereiterung der Niere.

⁴A. Heller, *deutsches Arch. für klin. Med.*, Heft II, Seite 267. Hydronephrose der einen Nierenhälfte u. s. w. und *Ibid.*, Heft VI, Seite 276.

⁵Simon, *loc. cit.* "Klapperbildung."

⁷Labadie-Lagrave, *loc. cit.*, p. 12.

It has more often happened, however, that these partial cases exist coincidentally with double ureters. In a recent publication a German writer¹ has gleaned from literature seven such instances.

When the obstacle exists in the ureter or bladder there is found inside the hilum of the kidney a spheroid tumor of greater or less size, the walls of which are formed of the dilated pelvis. The kidney, pushed back, compressed and atrophied, fits over the tumor like a sort of helmet, and usually presents a deeply lobulated surface; this distension may, at the same time, occur within the pelvis and calyces.

At first the dilatation is slight and reacts with especial force on the walls of the pelvis, the renal tissue still offering to the touch its normal resistance; a little later the surface of the organ becomes covered with projections produced by distension of the calyces and atrophy of the renal substance, the kidney, as a whole, now assuming the flabbiness of a cyst filled with fluid.

When the pelvis and beginning of the ureter are distended inside the hilum the tumor assumes a pyriform shape, pointing downwards. As a rule, one or both kidneys attain great size and are transformed into immense bags, on whose inner surfaces are seen little islands of renal substance; on making a cross section the basin appears dilated, the papillæ more or less sunken, and the calyces elongated and funnel-shaped; to the touch the papillæ, recognizable by the convergent red striæ, seem roughened.

In the more severe cases the calyces are so dilated as to form large pockets continuous with the dilated pelvis; the latter when excised and extended upon a table, presents countless folds, is nearly always opaque, of a pure white color, and in its substance blood-vessels can rarely be distinguished. The wall of the sac now is altered to dense connective tissue, that varies in thickness at different points; it has even been observed of the consistency of cartilage; generally, too, when the ureter participates in the expansion its muscular layer is hypertrophied, this condition being strongly marked in those cases where it has been excited in the effort to expel a calculus. The tubular and cortical substances, as a result of continuous compression, become so atrophied that M. Rayer² has seen the kidneys of a child that were no larger than a berry or Lima bean, and those of an adult, that, stripped of their membranes, weighed but two ounces. In all hydronephroses the renal blood-vessels are developed out of proportion to the size of the renal parenchyma.

Those curious partial hydronephroses, to which allusion has been made, have been often observed in some of the lower animals, notably in the ox.³ In this beast cysts of the size of a child's head, and containing urine more or less modified, and sometimes calculi have been seen. Such an anomaly in man, the earliest one, perhaps, on record, has been finely depicted by M. Rayer.⁴



Typical case of right hydronephrosis, posterior view, calculus found in the ureter that was dilated above and normal below where the stone was engaged.

Rayer, Atlas des Maladies des Reins, pl. xxi.

These tumors may attain enormous proportions. In the case of Johann Elzer, reported by Dr. Hotz,¹ the cyst extended from the first sacral vertebra and crest of the ilium clear to the pancreas, behind the border of which the upper limit of the cyst was lost. To the right it extended to and became adherent with the right kidney; it, moreover, included the left kidney, that was transformed into a tumor the size of a child's head. In addition, pushing outwards the left circle of the ribs, it considerably displaced the heart and thoracic organs, and was not limited until it had passed at least three inches beyond the linea alba.

Numerous adhesions to the neighboring organs constitute an unwelcome though frequent complication. In an autopsy performed by Dr. Wilien² the cyst was found wholly adherent to the peritonæum, and partially so to the omentum, pancreas, colon descendens, sigmoid flexure and spleen. The coils of intestine regularly are displaced, and for the most part lie in front of the tumor. Diastasis of the recti muscles has also been noted.

The histological lesions in hydronephrosis have been little studied. In severe cases there is first a nuclear infiltration³ about the uriniferous tubules that is followed by a fibrous condition; the collecting tubes are obliterated, their epithelium undergoing embryonic retrogression; the glomeruli are either fibrous or cystic, and the lining of the convoluted tubes undergoes a fatty-granular degeneration. An examination made by Professor Krause,⁴ of Göttingen, showed that the canaliculi of the cortical portion were distended and the Malpighian bodies enlarged. In the medullary substance the loops of Henle were greatly dilated and filled with fibrine casts and calcareous infarctions. The ureters exhibit a great variety of alterations; regularly they are narrowed below and dilated above the points of stoppage. Cases are known, though, where narrowing occurred throughout the whole caliber, this being the

¹ *Englisch-Deutsche Zeitschrift für Chirurgie*, 1876. Band XIII, Seite 11 und 252. "Ueber primäre Hydronephrose."

² Rayer, loc. cit., p. 479.

³ Rayer, loc. cit., p. 499, "Chez le bœuf," etc.

⁴ Rayer, Atlas des Maladies des Reins. Pl. XXV., Fig. V.

¹ Hotz, loc. cit.

² Wilien, *Trans. Am. Med. Ass'n*, 1875, p. 271.

³ *JOURNAL AM. MED. ASS'N* Jan. 5, 1884, p. 40.

⁴ Krause, loc. cit.

general condition where the obstacle exists near the ostium pelvicum. It has not rarely happened that the dilated ureter has acquired the dimensions of the intestine. In hydronephrosis arising from uterine difficulties, much dilatation is rarely seen. Coincidentally with the widening occur thickening of their walls, hypertrophy of their muscular coat, and often an assumption of anomalous forms. Thus, Dr. C. J. Hare¹ observed an instance in which one ureter perfectly simulated the shape of the letter S.

Hydronephrotic fluid consists of the normal secretion of the kidneys more or less altered. Rarely, as in the case of Lee, (Labadie-Lagrave), it is urine pure and simple. In slight cases there is, of course, little modification in the secretion, but in the more advanced cases there is, as a rule, much change, urea rarely being present.

Half a century ago M. Rayer² demonstrated that albumen and urea were present in renal cysts; a careful examination of 600 cub. ctm. from a typical case revealed the following:³

- Fluid weakly alkaline, specific gravity 1000 ?
- 0.33 grm. chloride of sodium; sugar, inosite.
- 0.47 " urea, biliary coloring.
- 0.11 " albumen, matter, etc., not detected.

The sediment from another case⁴ was composed of numerous crystals of calcic oxalate, an abundance of lymphoid cells, uric acid salts, urea, and much albumen.

In Hotz's⁵ patient the fluid was reddish-brown, slightly turbid, and odorless, holding in suspension albumen, broken down red blood corpuscles, but no traces of uric acid. Sir Spencer Wells⁶ removed twelve pints of fluid from a young girl, that gave the following results on examination: color, a clear, light yellow; odor, faintly urinous; specific gravity, 1006. On standing a few flocculent clouds formed. Urea, urates and chlorides were found in the proportions of normal urine. The microscope showed a few pus cells, many red blood corpuscles, some squamous epithelial and granular cells, but no tube casts or crystals; slight traces of albumen and phosphates, but no sugar were detected. The same surgeon, as well as Mr. Cooper Rose,⁷ have mentioned examples in which there was no urea, and even none of the constituents of urine. The account⁸ of a very unique case recently published makes mention of a gas, supposed to be carbonic dioxide, that developed in the cyst and gave rise to a metallic, tympanitic sound on percussion, and, when acetic acid was added to the contents of the tumor, gas in considerable quantity was evolved. The accumulation of fluid in these sacs is often enormous. Glass⁹ observed a patient born with fluid in the abdomen, which at her death, at 23 years of age, contained nearly thirty gallons (100,000 c.cm.) of copper-colored serum; over nine gallons (36,000 c.cm.), as reported by Dumreicher,¹⁰ were

found in a case of P. Frank's—and Prof. Simon¹ watched for several years a patient, from whom, through an artificial fistula, there was a daily discharge of over six ounces (200 c.cm.) of a sero-mucous, albuminous nature.

From a study of the above facts these conclusions are reached: first, that so long as any of the renal parenchyma is capable of work and serous transudation takes place, the normal urinary ingredients in the sac will be preserved and augmented; second, that when total destruction of the secreting portion of the kidney occurs, a fluid more or less sero-mucous in nature remains, that, if a ferment is prevented from entering, will exist undecomposed for an indefinite period of time.

Hydronephrosis of slight degree causes no symptoms, and if the sac be unilateral old age may be reached without the discovery being made that any trouble exists. In more severe cases, however, symptoms referable to impeded activity of the kidneys, and to the presence of a large abdominal tumor, may be expected.

There have been noted severe pain in the bladder and vesical region, with constant desire to urinate (Todd),² total anuria, intermittent accumulation and escape of the renal secretion (Morriss),³ bearing down pains with sensation of constriction (Hildebrand),⁴ obstinate constipation from compression of the intestine, a cirrhotic or varicose appearance of the superficial abdominal vessels from disturbance of the circulation (Moreau),⁵ etc.

In bilateral hydronephrosis, which sometimes accompanies cancer of the uterus, the supervention of acute or chronic uræmia may be looked for at any time.

Generally a palpable tumor that may be of great size is found in the abdomen. It is situated in the flank, and regularly extends from the region of the lumbar vertebrae forward to the umbilicus, downward to the iliac region, and upward into the hypochondrium. Displacement more or less of the viscera occurs, and on palpation distinct fluctuation, on percussion a dull note, may be expected. These tumors, by their constant growth, interfere more and more with the functions of the diaphragm, though, with the exception of a feeling of tension, they are often painless.

But, because of the great advance in abdominal surgery, the differential diagnosis of hydronephrosis from other tumors similarly situated must be regarded of the first importance, though, unfortunately, it is attended with many difficulties.

It is most gratifying, however, to an enthusiastic believer, as the writer is, in the ultimate approach to something of perfectibility in surgical method, in the recognition and therapy of any subject, to trace a gradual, though often slow evolution from chaos to a state akin to order; and in respect to no other malady, as is our purpose to show, has this welcome change been more apparent during the last twenty years than in hydronephrosis.

¹ Simon, loc. cit., s. 187.

² Todd, loc. cit.

³ Morriss, *Lancet*, vol. 1, 1876, page 637.

⁴ Hildebrand, loc. cit.

⁵ Labadie, Lagrave, loc. cit., page 18.

¹ Hare, loc. cit., p. 29.

² Rayer, loc. cit., p. 480. J'ai reconnu, dans ce liquide, de l'urée et une quantité notable d'albumin, etc.

³ Krause, loc. cit.

⁴ Heller, loc. cit.

⁵ Hotz, loc. cit.

⁶ Sp. Wells, *Medical Times and Gazette*, 1872, Vol. I p 483.

⁷ Cooper Rose, loc. cit.

⁸ F. A. Kehler, *Arch. für Gyn.*, Heft III, p. 374.

⁹ Rayer, loc. cit., p. 538.

¹⁰ Simon, loc. cit., S. 187.

¹“The discrimination of a hydronephrosis from tumors of another kind, but especially from ovarian cysts, unless its gradual development be observed, must be very difficult, if not impossible.” Many mistakes of surgeons of the first order are, therefore, recorded in medical literature. Nearly two centuries ago Bonetus² diagnosed such a case as a swollen spleen, and in our own day men of undoubted skill, as Professors Esmarch,³ and Bilroth³, and Sir Spencer Wells,⁴ with others perhaps less widely known, have each regarded the lesion as an ovarian cyst, and have operated for the latter affection. However, the statement⁵ “that the diagnosis of an ovarian cyst from a nephrectasis in a very large tumor cannot be made apparent,” is, it seems to me, now susceptible of some modification; for, by bearing the following statements in mind, an accurate diagnosis can be made in a good proportion of cases.

First. If a reliable history of the case be obtainable, it may be expected that any renal tumor, in its earlier stages, would extend forward from the lumbar spine, having first been noticed between the false ribs and ilium; while an ovarian cyst has, in all probability, first appeared in one inguinal or iliac region, and increased from thence upward and inward.⁶ “Therefore,” as Prof. Krause well remarks, “the importance of a careful observation of ovarian tumors in their early development, is very obvious.”

Second. Large tumors of the right kidney usually have the ascending colon on the inner border of the tumor. Tumors of the left kidney are usually crossed from above downwards by the descending colon.

Third. Regularly ovarian tumors are in front of the intestines, renal tumors are behind the intestines. The exception to this rule must occur only in rare and isolated cases. The intestine may not be recognized on percussion, but when rolled between the fingers it contracts into a firm, cord-like movable roll, or the gurgling flatus along it may be detected by the patient or by auscultation; to obtain tympanitic resonance, the colon might be inflated with air through a long elastic tube per rectum; but a surer means is to inject water in addition, whereby, the air can be forced clear to the ileo-cæcal valve. On the left side the tube may sometimes be felt through the abdominal walls. The discovery of intestine in front of a doubtful abdominal tumor should always lead to a careful examination of the urine, which, in renal trouble, may be expected to contain blood, pus, albumen or epithelial debris.

Fourth. ⁸In ovarian tumors there is a movability of the cyst *in toto*, a condition that is never seen in hydronephroses.

Fifth. In renal cysts the uterus is freely mobile;

¹ Rosenstern, loc. cit. Die Unterscheidung, u. s. w.

² Bonetus, loc. cit., p. 290, obs. xxii. Quidam splenam intumuisse, etc.

³ Kröner, Arch. für Gynäkologie, Bd. xvii. Rechtsseitige. H. u. s. w.

⁴ Wells, Diseases of the Ovaries, p. 216.

⁵ Krause, loc. cit.

⁶ Wells, loc. cit., p. 222, and Braun, Lehrbuch der Gesamten Gynäkologie, S. 927. Die linksseitige hydronephrosen, u. s. w.

⁷ Simon, loc. cit. Seite 208.

⁸ Rosenstern, loc. cit., and Simon, l. c. S. 205. “Die Beweglichkeit der Hydronephrose als Ganzes ist gleich Null.”

in ovarian tumors this is hardly apt to occur. Dr. Rosenberger attaches much importance to this symptom, to which he says too little attention has been given. The best method of examination is by the hand introduced into the rectum, and for its effective accomplishment the use of an anaesthetic is required. ¹By this means, any connection of the tumor with the ovaries, uterus or bladder, may be mapped out with great exactness; with the other hand upon the abdomen, the pelvic organs may be defined from those viscera lying higher up; and, if this palpation can be made with half the hand (four fingers), not only may we determine whether the cyst is connected with the pelvic organs, but whether it extends from above down into the pelvis. This aid to diagnosis is especially valuable in hydronephrosis, as in this lesion the pelvic cavity is not narrowed, and because the dilated kidney can be felt as a single mass reaching into the introitus of the pelvis; moreover, the presence or absence of stones in the ureters, or change in their caliber can easily be made out. Trechmann (Labadie-Lagrave) invented an instrument bearing a certain resemblance to a lithotrite, which, when introduced into the bladder could, at will, stop the mouth of one ureter; thereby determining whether a ureter be at fault. Unfortunately, though the instrument may be employed on either sex, its use requires a practiced hand.

Sixth. ²Just as ovarian tumors are usually associated with some disturbance in the catamenia or change in the mobility or shape of the uterus, so there is regularly found in connection with renal tumors some history of calculus, nephritic colic, hæmaturia, albuminuria, or change in the quantity or state of the urine. In rare cases, it must be admitted, this rule does not hold good.

Seventh. If some of the contents of the tumor be procured through a small canula, or by aspiration, its examination will greatly aid the diagnosis. If there be found in the fluid paralbumen, colloid substances or cylindrical epithelium,³ they argue the presence of an ovarian cyst, while any trace of urinary ingredients or of pavement epithelium would indicate a hydronephrosis. A confirmation of the diagnosis may be arrived at by sounding through the canula with a long, slender, metallic sound. This instrument, if the cyst be of renal origin, can be thrust to the deepest portion of the kidney and swept under the liver and dome of the diaphragm, and to some extent down into the pelvis; if the tumor proceed from the ovary, the sound cannot reach nearly as high, but can be easily pushed far deeper into the pelvis. It is proper to add, that though the weight of authority seems to be in favor of an exploratory puncture of these tumors, with the utmost care, there is danger of supervention of peritonitis from the wound.

Eighth. ⁴If the tumor be partially emptied, it will, if renal, be felt growing smaller in the direction of the kidneys; if ovarian, in the direction of

¹ Simon, loc. cit. S. 88. The author has performed this 130-150 times.

² Wells, loc. cit. p. 223.

³ Simon, loc. cit. p. 212.

⁴ Simon, loc. cit., p. 214. ⁵ Simon, loc. cit., p. 214.

the ovaries; and if it be wholly emptied, a repetition of the sounding will be of value.

¹Incision of the tumor followed by introduction of the finger has been practised. By this method the renal calyces were easily recognized as round or crescent-shaped cavities, that were covered with mucous membrane and bounded by sharp walls. In rare cases fortunate accidents have been of much assistance; thus, as noted above, it has happened that when a patient was placed in a certain position the tumor could be emptied through the bladder by external pressure, and in a few instances the ureter, enlarged, could be felt through thin abdominal walls.

²The discrimination of a hydronephrosis from other abdominal tumors is more easy to make, and its discussion will be dismissed in a few words. In renal cyst the swelling does not change its position with that of the patient, in ascites it does; echinococcus cysts are distinguished by the hydatid fremitus, and if situated in the kidneys by the escape of hydatid vesicles in the urine; pyonephrosis usually gives more severe constitutional symptoms and causes recurrent rigors and signs of suppuration, the same being true of perinephritis and renal abscess; finally ³the "possibility of a horse-shoe kidney must ever be borne in mind" if from the symptoms a hydronephrosis be suspected, but the colon ascendens and descendens take their normal course.

The differential diagnosis between hydronephrosis and certain renal troubles that have a somewhat similar clinical history is often attended with difficulty, and to facilitate matters, a diagnostic table, slightly altered from one devised by Dr. J. A. Ochterlony,⁴ is appended.

CANCER RENIS.	HYDRONEPHROSIS.
Generally unilateral tumor of enormous size.	Often bilateral, and of small size.
Tumor stationary, does not move with diaphragm.	Tumor fluctuating.
Runs a rapid course.	Of chronic character.
Well-marked cachexia setting in early.	No cachexia.
Pain generally intense and rarely wanting.	Regularly painless.
Hæmaturia occurs in fifty per cent. of the cases.	No hæmaturia.
CYSTIC DEGENERATION OF KIDNEYS.	HYDRONEPHROSIS.
Always bilateral.	Often unilateral.
Tumor soft solid, non-fluctuating	Tumor fluctuating.
In later stages, dropsy.	No dropsy.
Hæmaturia.	No hæmaturia.
Occurs in those over 30 years of age.	Often congenital and in the young.
Tumor fairly well preserves shape of kidney.	Tumor does not preserve shape of kidney
Tumor slowly increases	Tumor often of rapid growth.

A neonatus with double hydronephrosis is never viable, and even in those congenital cases when only one kidney is involved, life is often cut short because

of the pressure exerted on the thoracic organs. ¹A unique case, however, in an infant, where existed atresia of both ureters with hydronephrosis of one kidney and cystic degeneration of the other, who survived 15 days, is recorded.

In those instances where the malady is bilateral, the danger is proportional to the degree of atrophy in the renal substance, all cases being more or less quickly fatal; these patients are not usually confined to bed but a few days before death, which regularly takes place in a rapid and unexpected manner.

The prognosis² in all hydronephroses that are uninterfered with is, in general, unfavorable, for, as the tumor attains great size, it occasions by pressure unbearable distress, and interferes with the functions of nutrition and respiration. The natural sequence is traumatic or spontaneous rupture, (an accident observed in four patients by Prof. Simon), or suppurative inflammation followed by death. Another event to be dreaded in unilateral cases is the involvement of the other ureter, though this accident may be deferred many years. A curious instance³ of the latter variety is recorded where the first symptoms of the lesion were manifest nearly 50 years before death, that was caused by a calculus caught in the opposite ureter.

A spontaneous cure with *restitutio in integrum* can never be expected, since a kidney so altered and atrophied can never perfectly recover and perform its functions.

No longer ago than 1870 an eminent surgeon wrote in regard to the treatment of this lesion: "Of⁴ therapy there can scarcely be any account; a careful avoidance of things hurtful to the other kidney must be the only problem. An opening of the hydronephrosis has been undertaken several times, partly with good, partly with bad results; chiefly it appears from diagnostic errors." And yet, but a few months earlier, an operation destined to revolutionize the surgery of the kidney was performed, for, on April 2, 1869, Prof. Simon, after a long series of experiments and careful study, first successfully practiced nephrectomy.

Purely medical treatment has rarely been of much avail. M. Rayer⁵ advises, if the obstruction seem due to a calculus, that an attempt be made to soften or dissolve it, removing as far as possible all the causes that tend to inflame the cyst and increase the secretion of the pelvis and calyces; if the tumor seem caused by a malformation, as is probably the case if nephritic colic have been absent, the same author teaches that by frictions and light compression, the posture of the patient being continually changed, the normal course of the urine may be facilitated; and that, when the cyst walls seem to take on inflammation, an evil result may be aborted by local and general blood-letting, emollient cataplasms and the evacuation of the large intestine by enemata and purgatives.

As it is not possible to recognize this affection till

¹ Th. Ackermann, loc. cit.

² Simon, loc. cit.

³ Rayer, loc. cit. Obs. II. A case is also noted here where the symptoms lasted 23 years.

⁴ Rosenstein, loc. cit. "Von Therapie kann wohl kaum die Rede," u. s. w.

⁵ Rayer, loc. cit., § 833.

¹ Simon, l. c., p. 216.

² Ibid, loc. cit. p. 217.

³ Hotz, loc. cit. p. 235.

⁴ Ochterlony, J. A. Trans. Amer. Med. Association, 1875. P. 143.

it has reached a considerable development, prophylaxis is out of the question. In calculous cases Dr. Rosenstein¹ asserts that the alkaline waters are very efficacious as dissolvents, and in unilateral cases the treatment should consist of a careful regimen, scrupulous cleanliness, stimulation of the skin by frequent baths, and all means that are of use to keep the healthy organ in good working condition.

M. Lecorché² advises the abundant use of liquids and the avoidance of animal food where there is any reason to suspect a uric acid diathesis.

Where, as often happens, the ureter closes over the calculus by a sort of spasm, M. Lancereaux³ proposes the hypodermatic use of morphine. In a case observed by the writer, cataplasms of stramonium leaves have given much relief.

It is of interest to add that there are three⁴ recorded cases in which manipulation has effected a cure. In two of these cases, instructions were given for the abdomen to be rubbed with mercurial or iodine ointment, and while this was being carried out the tumors suddenly disappeared, their disappearance being followed by a large discharge of urine. In the third case the mother of the patient was in the habit of rubbing the tumor to relieve the pain, and the effect of the pressure was to cause the tumor to disappear and the bladder to swell up. In only one of these cases, however, was the relief permanent.

"The sum of medical doctrine on the subject amounts to this: Palliate where you can; do no mischief where you cannot." Every attention is to be paid to the general health of the patient, and all matters of diet, hygiene, tonics for the body, and consolation for the mind, are to be administered to support the strength and cheer the spirits. The true method of medical treatment "is to seek temporary relief of urgent symptoms by rational expedients, and either to encourage a buoyant anticipation of ultimate rescue by operation, or to lead the patient by degrees into the usual quiescence of confiding resignation to the inevitable, by the adoption of the tranquilizing motto, *Cede Deo*."⁵

It is obvious that in the great majority of cases, for the radical cure of hydronephrosis, recourse must be had to the art of surgery, and it is a matter for sincere congratulation, as the data collected below by the writer show, that the experience of less than fifteen years has negated the assertion, "Die operative Therapie der Hydronephrosen hat bis jetzt noch keine glänzenden Resultate geliefert."

The various operative procedures that from time to time have been practiced, may be resolved into two general classes: First, extirpation; second, the different operations to obliterate the cyst.

Again, broadly speaking, extirpation can be conducted in two ways—either through the peritonæum by abdominal nephrectomy, or extra peritonæum by lumbar nephrectomy.

Abdominal nephrectomy may be divided into several steps.

First step. Incision of the abdominal walls. There is some diversity of practice about this incision. Thus, Prof. Esmarch¹ made a cut through the linea alba 15 ctm. (6 inches) in length; in a case of Dr. Kocher's² the incision was begun at the xiphoid appendix, and prolonged below the umbilicus; while in a patient of Dr. Martin's³ the knife was first plunged into a spot about 5 ctm. (2 inches) above the umbilicus. In some instances, as suggested by Prof. Langenbuch,⁴ an incision along the outer edge of the rectus abdominis, in the linea semilunaris, is recommended.

Second step. Isolation of the kidney.

After having detached the tumor from the portions of intestine or omentum that adhere to it, the peritonæum covering the anterior face of the kidney, and which generally is very thick, should be incised. Dr. Kocher recommends the incision of the posterior peritonæum to be made outside of the colon ascendens or descendens, or above the transverse colon, attributing one failure, though the operation was unfinished, to the fact that he incised the peritonæum below the transverse colon.

Third step:

The tumor uncovered, the cellular tissue by which it is adherent to the diaphragm, liver, spleen, etc., must be cut, carefully guarding against hæmorrhage that often is excessive, Prof. Esmarch,⁴ in one case, being compelled to take, in all, sixteen ligatures. In the second case, for which nephrectomy was practiced, the patient died on the fourth day from hæmorrhage from the pedicle. The remaining procedure is similar to that so familiar in ovariectomy, viz.: Puncture to let off the contents of the cyst, isolation of the mass, ligation of the pedicle, careful sponging of the peritonæum, and closure of the wound.

Lumbar nephrectomy may also be divided into several steps.

First step: Incision of the integument.

Many operators now make the incision of Linsler,⁵ cutting about 7 ctm. from a line striking the tips of the spinous processes and parallel with it, and extending it from the inferior border of the 12th rib to the crest of the ilium. Mr. Couper,⁶ however, and others, have employed an oblique incision as in colotomy; Dr. Klineberger⁷ has suggested that it be curved, with its convexity upwards and inwards, thus sparing the last dorsal and first lumbar nerves; Mr. Lucas⁸ advocates a combination of an oblique incision that should be higher than that for colotomy, that is, within about half an inch of the last rib and parallel with it, and of a vertical incision along the outer border of the quadratus lumborum, commencing at the upper edge of the last rib and extending to the iliac crest. The latter plan has been employed

¹ Simon, loc. cit. s. 220.

² E. Quénu, Archives Gen. de Med., December, 1882, De la Nephrectomie.

³ Trans. International Med. Congress, vol. ii., p. 278.

⁴ Simon, loc. cit. s. 220.

⁵ Quénu, loc. cit.

⁶ Lucas, Brit. Med. Journal, Sept. 29, 1883, p. 614.

⁷ Medical News, Dec., 1880, p. 750.

⁸ Lucas, loc. cit. p. 615.

¹ Rosenstein, loc. cit.

² Lecorché, loc. cit.

³ Lancereaux, Dict. Encyclopæd. des Sciences Médicales, Art. Rein (Pathologie). J'ai des raisons de croire que dans les cas de ce genre, etc.

⁴ Lucas, British Med. Journal, Sept. 29, 1883.

⁵ Spencer Wells, loc. cit., p. 259. Reference is here made, of course, only to the most severe cases.

⁶ Hotz, loc. cit., s. 236.

by Mr. Barwell, Mr. Marrant Baker, Mr. Golding Bird and Mr. House.

Second step: Uncovering the kidney.

The layers of the lumbar region to be incised are:

1. The fatty sub-cutaneous tissue.
2. A slender muscular layer.
3. The very firm lumbar aponeurosis. Here is an important land-mark, the external border of the sacro-lumbalis that is to be pushed to the inside.
4. The very strong middle lamina of the aponeurosis of the transversalis. This should be incised upon a grooved director that has first been bent on itself to avoid cutting the first lumbar and 12th intercostal vessels, which are first to be tied and then cut.¹
5. The quadratus lumborum.

After cutting through the external border of this muscle, the anterior lamina of the transversalis, best torn by the forceps and finger, appears. The couche viscérale of M. Tillaux, composed of the kidney and colon joined, is the last structure to come in view. The kidney occupies the superior portion of this region.

Third step: to isolate the kidney.

This step is often very difficult; it has even been found impossible to execute, and the operation has had to be abandoned. The object is to be accomplished chiefly by the finger, aided by the scissors but slightly.

Any tearing of the renal substance, as it is likely to result in severe hæmorrhage, is, if possible, to be avoided. In such a complication Zweisell² seized the torn end of the kidney with a Nelaton's forceps and then proceeded to enucleate. Two other grave accidents have happened, injury to the colon, and opening into the peritoneal cavity. The peritonæum is perhaps, to some extent, unavoidably bruised even if it be not severed.

Mr. Barker advises that extirpation of the kidney with its envelope, that is almost an inch thick, should not be attempted, but that the kidney should be extirpated alone. He asserts that separation of the kidney from its capsule, enucleating the organ with the finger, is always easier than to separate the capsule from the ambient tissue; thus, in one of his cases, he lost much time, and copious hæmorrhage occurred in trying to get out the mass entire; later, changing his tactics, he enucleated with ease the kidney from the perirenal tissue, the latter course occasioning but little loss of blood.³

In hydronephrosis operated on by the lumbar method, the cyst should be punctured and its contents drawn off for the purpose of reducing its volume, that it may the more readily be drawn through the costo-iliac space.

Fourth step: Ligation of the pedicle.

On drawing out the kidney the pedicle should be grasped with one or two forceps and, as in ovariectomy, ligated. It is better,⁴ perhaps, to tie the pedicle in two portions by passing a curved aneurism needle, armed with a double thread, through its middle, taking care to avoid the vessels and tying each

part separately, this procedure giving greater security. Prof. Czerny¹ is of the opinion that it is better to cut the ligatures short rather than leave them out of the wound. A separate thread had better also be thrown about the branch of the renal artery that penetrates the superior portion of the kidney. The space obtained by the incision of Linser may be insufficient². A second incision, parallel to the crest of the ilium, may be added, or the twelfth rib may be resected. Prof. Czerny has employed the latter method twice with success; in the first instance he resected 9 cm. of the twelfth rib; in the second, he cut away subperiosteally considerable of the eleventh and twelfth ribs without opening into the pleura. But injury to the pleural sac may happen unless guarded against with the greatest care, as, in a patient of Dr. Dumreicher's of Vienna, the twelfth rib being rudimentary and the operator mistaking the eleventh for it, the incision was made too high.

Stimulated by this accident,³ Dr. Hall, a prosector of Vienna, studied the topography of the twelfth rib and found that "the limit of the pleural cavity is represented by a line drawn from the superior border of the first lumbar vertebra to the extremity of the eleventh rib; this line strikes the twelfth rib when it is normal about 3 cm. behind its cartilage; there the greater part of the anterior face of the rib is covered by the pleura. If the twelfth rib be absent there exists in its place a ligamentous tract that may be incised fatally on mistaking the eleventh for the twelfth." The rational conclusion, therefore, is before incising deeply, to be assured of the state of the twelfth rib.

If there be hæmorrhage from the pedicle, Mr. Lucas advises that it be not re-tied, but that the wound be stuffed tightly with sponges steeped in the perchloride of iron, and that a tight bandage be placed about the abdomen; in this way he saved one patient. The same writer has derived great benefit from wrapping the patient's extremities in cotton wool and flannel to guard against shock. 'Of course in these grave operations antiseptic precautions are called for, and during the first four or five days after the operation anything pressing upon or interfering with the wound which might produce bleeding, must be prevented. The bowels must be thoroughly emptied before the operation; opium and a low diet prescribed in the first days afterwards. The catheter must be used, if necessary, but regularly after the operation if the urine is scanty. It will be conceded that nephrectomy in this lesion is a *dernier ressort*, and as taught by Prof. Czerny, is to be tried when the life of the patient is threatened, and other therapeutics have proven ineffectual. M. Ollier,⁵ however, has lately brought forward a point that may be of importance. He is in favor, in those lesions where but one kidney is involved, of the enucleation of the diseased organ for the reason, that as often

¹ Lucas, loc. cit., p. 615.

² Quénu, loc. cit., and Lucas loc. cit.

³ Quénu, loc. cit.

⁴ Medical News and Abstract, p. 752, December, 1880.

⁵ M. Ollier, Bulletin de l'Académie de Médecine, 2nd serie. Tome xii, p. 1077. De la Nephrectomie: "Mais d'autre part, l'ablation d'un rein," etc.

¹ Quénu, loc. cit.

² Quénu, loc. cit.

³ Quénu, loc. cit.

⁴ Medical News and Abstract, Dec., 1880, p. 751.

happens with the eyes, sympathetic trouble might be induced.

That a patient, after nephrectomy, can perfectly perform all of the bodily functions is shown by a case of pyonephrosis operated on by Prof. Czerny. Although very low at the time of operation, May 22, 1879, she rallied; conceived in August of the same year; aborted on November 12, 1879, and bore in December, 1880, a healthy child, nursing it herself for over a year.¹

Nephrectomy determined upon, where shall the incision be?

If statistics be of value, those of Mr. Barker² give 59 per cent. of cures by lumbar, 50 per cent. by peritoneal nephrectomy. Those of Dr. Harris³ are also somewhat in favor of lumbar nephrectomy. But these cases include all varieties of renal lesions.

Mr. Knowsley Thornton⁴ prefers the operation by Langenbuch's incision, the advantage being that the parts are better exposed than by the lumbar incision.

Mr. Tait goes so far as to advocate an exploratory abdominal section to determine the diseased condition and the advisability of nephrectomy.⁵

On the other hand, M. Quénu is of the opinion that lumbar nephrectomy is to be chosen, in that it permits, after the kidney is reached, an exploration and substitution of nephrotomy for nephrectomy, or *vice versa*. In addition, he believes that the abdominal method is to be reserved for the largest cysts. Mr. Barwell⁶ also favors the lumbar method when practicable.

Prof. Czerny, while regarding the lumbar incision as the safer operation, recommends that by the abdomen if the kidney be movable. A very similar opinion is expressed by Mr. Lucas.

Lastly, in the words of Prof. Kehrer,⁷ "that the median incision is the easier accomplished and preferable to the flank incision there can be no debate. The motive not to open into the peritoneal cavity is to-day, considering the circumstances, of no value. But I think, nevertheless, that the choice of the seat of incision should depend upon the peculiarity of the case, and upon the place where the swelling lies nearest the integument."⁸

In the first table at the end of this essay, in which are reported the results of 31 nephrectomies for hydronephrosis, it will be seen that 19 of these cases were operated on by the abdominal method, and 11 by the lumbar method, the manner of operating in one case⁹ not being learned. Of these 31 cases, 15, or a little over 48 per centum, recovered. Of the 19 cases on whom laparotomy was performed, 8, or a little over 42 per centum, recovered, while of the 11 cases treated by the lumbar method,⁹ 7, or over 63 per centum, were permanently cured. It is, perhaps, fair to add, as Mr. Knowsley Thornton has stated, that the higher mortality at present attached to abdo-

minimal section was due to the fact that many of the cases were stumbled upon by operators intending to remove an ovarian tumor.

The causes of death in the fatal cases, when reported, will be found in the table referred to above, and which is believed by the writer to be fairly complete.

In the opinion of Prof. Simon¹ the methods for obliteration of the cyst have not yet arrived at a satisfactory value in surgery; though, rightly performed they might work wonders; the reason being that only those tumors are adapted for obliteration whose walls are somewhat shrunken and whose contents could be gradually dried up. This state of things exists in some unilocular ovarian cysts, but exists rarely. These methods may be grouped into two divisions: first, the cyst is to be emptied, air being carefully excluded; second, air being admitted and suppuration induced, it is to be carefully drained.

Examples of the first variety are puncture without leaving in a canula, and puncture followed by the injection of a medicated fluid, such as iodine. By the former plan the vessels that course in the shrunken walls are intended to be so compressed as to abolish their function. By the latter a moderate inflammation, not leading to suppuration, but only so far as to destroy the secreting activity of the cyst or create adhesions, is aimed at.

The single puncture, effected by means of a small trocar or Dieulafoy aspirator, is the least dangerous procedure and only by frequent repetition excites inflammation. Prof. Czerny declares that it is "absolutely void of danger." M. Lecorché² advises that the puncture be made anteriorly, in the eleventh intercostal space, carefully avoiding injury to the peritoneum or intestine.

Dr. Cabot³ advocates in hydronephrosis of recent origin, especially when dependent on traumatic causes, that aspiration or lumbar incision be practiced, asserting that the relief from pressure will allow the ureter to recover its caliber, and, if fever and other unpleasant symptoms do not follow, that the operation be repeated a number of times, one case of recovery after eight aspirations being reported. Regularly, however, relapses demanding more decisive measures are to be expected.

In the second of the three tables collated by the writer are shown seventeen cases treated by this general method of puncture. Of these seventeen cases eleven died, in three instances temporary relief was obtained, and in three a cure was effected. One⁴ of the cases in which relief was obtained through aspiration and adjuvant treatment was observed by the writer, and as it presents some unique points of interest, is related in full.

Mrs. M., of German descent and aged forty years, first consulted Dr. G. M. Staples, of Dubuque, Iowa, on May 17, 1881. She was of strong build, free from any oedema, even somewhat thin, and in early life had been a clerk in a store, but had married happily, borne five children, and now lives in comfort

¹ Czerny, loc. cit.

² Med. Chirurg. Transactions, 1880-1881.

³ Amer. Jour. Med. Sciences, July, 1882.

⁴ Med. Times and Gazette, May 6, 1882.

⁵ W. Walter, Brit. Med. Journal, Sept. 29, 1883, pp. 6-7.

⁶ Lancet, May 26, 1883.

⁷ F. A. Kehrer, Arch. für Gyn., 1881, Heft III., p. 383.

⁸ Case XXV.

⁹ Doubt is also attached to one of the cures by the lumbar method, (Case VIII.)

¹ Simon, loc. cit., p. 222.

² Lecorché, loc. cit. See, however, Labadie-Lagrave, loc. cit.

³ Cabot, Boston Med. and Surg. Journal, Feb. 22, 1883.

⁴ Case XLIX.

able circumstances. Her family history as to health was good.

In 1861, when about twenty years of age, she first began to experience a feeling of uneasiness in the left latero-lumbar region, suffering in addition from a "heavy feeling of sleepiness," with a sense of expansion in the left hypochondrium. As the expansion increased there were added nausea and vomiting, with intense pain, and a fluctuating tumor was soon discernible. The patient was thus first attacked at a ball, after dancing once or twice, and had to be taken home, supposing she had caught a severe cold. Since that time these spells came on with tolerable regularity every two to four weeks, but had no connection with the menses, which were perfectly regular.

The patient when first seen was laboring under an unusually severe attack that was complicated by new and alarming signs of prostration, the pain being very acute, though unaccompanied by rigors. It was chiefly located in the left loin, where it was most severe, but it also radiated toward the left groin and rendered flexing of the thighs painful. The patient stated that these spells lasted generally thirty-six to forty-eight hours and obliged her to go to bed and have fomentations applied, that the attacks were characterized by an almost perfect periodicity, the longest interval ever experienced of freedom from them being seven, the shortest about two weeks.

Although never troubled by colic or other renal difficulty, exposure of any kind or a strong emotion is capable of bringing on a spell, and a tumor, tender on pressure, is soon felt, the more severe symptoms supervening later.

The attack may subside gradually, but oftener it ceases suddenly, and, in either event, relief is coincident with the passage of an increased quantity of urine, giving rise, to use her own words, to the "sensation of something giving way," and marking the disappearance of the tumor. The urine evacuated is of a light color, but on the next day becomes darker and has rarely contained a brick-dust sediment. There has never been hæmaturia, nor has the urine ever contained pus. The affection has always been unilateral.

The affection had been diagnosed by various physicians in St. Paul, St. Louis and Dubuque as tumor of the spleen, phantom tumor, etc. No therapy advised had been of service. Dr. Staples diagnosed hydronephrosis, but his opinion was not sustained by any other surgeon consulted.

On Oct. 28, 1881, Dr. Staples was again called to see the patient, who was suffering from a protracted and unusually severe attack that had already lasted eight days. The same diagnosis was made and aspiration advised. Consent was given after eleven days of suffering, and, on Nov. 1, a No. 2 needle of Codman and Shurtleff's aspirator was thrust into the tumor at the upper part of the left lumbar region, and forty-four ounces of a clear amber-colored fluid, that had the odor and characteristics of urine, were drawn off.

On examination of the fluid it was found to possess a specific gravity of 1010 and a faint alkaline reac-

tion. Fehling's test did not reveal sugar, nor was albumen detected. After concentration of a small portion of the fluid and the addition of nitric acid a few crystals of nitrate of urea were deposited.

The patient was again aspirated on April 20, 1882, and thirty-nine ounces evacuated; and a third time on July 17, 1882, when thirty-seven ounces were obtained. In the former instance the tumor had existed eight and in the latter seven days. On each occasion the patient was about the next day.

In the operation the needle was pushed upward and inward from three and a half to four inches. As the cyst grew smaller its wall, which was quite tough, as the flow of the fluid ceased, was felt to slip away from the instrument with a contractile sensation.

It is proper to add that the increased flow of urine after a "spell" had not been noticed until Dr. Staples called attention to the fact by his inquiries.

About the middle of October, 1882, another protracted attack came on, and the use of the aspirator was urged. Cataplasms of stramonium leaves were ordered instead, and relieved her in a few hours. A like result has attended their use since, and it is hoped that a remedy to take the place of aspiration has now been found. The patient has learned to employ the hypodermic syringe when the pain is unbearable.

Later therapy has consisted in the use of antiperiodics and diuretics, the exhibition of iodide of potassium and extract of stramonium in the intervals between the attacks with the result of much lessening their frequency and abating their severity.

Since the preparation of this paper Mrs. M. was aspirated for the fourth time by Dr. Staples, assisted by Dr. Parke W. Hewins, and 55 ounces of fluid drawn off. The patient had over-exerted herself, neglected to employ any therapeutic measures, and, when seen, was largely distended in her left latero-lumbar region. Up to that time her general health had continued good, with little trouble from the kidney; since the last operation she has been perfectly well.

The etiology of this case is doubtful. It is not believed, however, that the cause is to be ascribed to calculi or any mechanical obstruction, as the most careful and repeated examinations of the urine have failed to show any evidence of stone, and there never has been any renal colic.

The hypothesis is advanced that the true cause is a nervous irritability of the ureter, producing a stricture near the ostium pelvicum. Regularly the ureter would relax when the fluid in the pelvis increases, so as to produce great pressure from above, and, at the time when aspiration was necessary, it is also believed that an invagination or intussusception of the ureter had taken place.

This hypothesis is stated with diffidence, as no author seen by the writer, in treating of the ætiology of hydronephrosis, has mentioned it, but it is not difficult to imagine that, as the tumor, by reason of a protracted spasm, extended downward as well as laterally, the ureter must either double in upon itself or yield in some manner, thereby making a permanent or fatal trouble were the cyst not emptied artificially.

In support of this theory, it may be mentioned that

analogous strictures have been observed in retention of urine from spasmodic contraction of the muscular fibers of the sphincter vesicæ, in asthma from spasm of the bronchial muscles, and in spasmodic stricture of the urethra. It is also known¹ that where a moderate urethral stricture or an enlarged prostate exists there may be ordinarily a sufficiently free passage for the urine, but occasionally the bladder becomes over-distended, and complete retention is the result. In such cases the urethra again becomes permeable when by aspiration or puncture the urine is drawn off and the pressure relieved.

The writer has been unable to find accounts of cases bearing close analogy to the above. Dr. W. West,² however, has recorded a case in an unmarried woman where there were attacks of acute pain from this cause more or less synchronous with the menses, and in addition a very much disturbed menstrual function and leucorrhœa.

The above case would seem to bear out the opinion of Prof. Czerny that "the single puncture with the Dieulafoy aspirator, under antiseptic measures, is absolutely void of danger." Indeed, the belief that puncture was dangerous was formed at a time when antiseptic methods had not been perfected. The results, as shown by the table, are certainly such as would warrant a persevering trial of a comparatively innocent therapeutic measure, the facts being that in 17 per cent. of the cases tried it was competent to effect a cure, and in 35 per cent. to effect decided improvement.

The injection of medicated fluids, as iodine, has proved futile and is dangerous, for if any of the fluid pass into the abdominal cavity, diffuse peritonitis will result, and even with the greatest care there is much probability that it will induce suppurative inflammation in the sac. In no case on record has this treatment been successful.³

The second general method of surgically treating hydronephrosis is by nephrotomy and open treatment of the wound. As the cyst is daily syringed out, its walls through shrinkage and formation of granulations become converted into cicatricial tissue. This method is applicable to all cysts, no matter what may be the state of their contents or walls. The symptoms accompanying the operation are often at first alarming, but with proper care not very dangerous. As suppuration happens considerable fever, with a pulse of 110 to 120 beats, and rigors supervene. These abate, however, in a few days if there is made a free exit for the pus, the latter quickly taking on an innocent character. Complete obliteration usually occurs in from two to five months. Dr. Tuckwell remarks that a gradual puckering of the skin at the seat of incision is to be looked for as a favorable sign, marking the gradual contraction of the sac.⁴

In general, the measures by which obliteration may be accomplished by open treatment are three in number: (a) puncture with a large trocar and leaving in

of the canula, (b) thorough cauterization of the abdominal and cyst walls, and (c) incision into the cyst with or without drainage. In operating by the first and oldest measure, the trocar will be thrust in at the most prominent portion of the tumor through the anterior abdominal wall. The peritonæum is but slightly lacerated and there is little danger of peritonitis, the canula that is left behind prevents the opening of the peritoneal cavity to septic influences.

The great drawback is that even with the assistance of a long elastic catheter or a double sound and syringe, the pus can hardly be emptied satisfactorily. Unsuccessful attempts to widen the opening with laminaria have been made, but it soon narrows again.¹ The pus then stagnates, with great danger of pyæmia or septicæmia. In calculous hydronephrosis this event is especially to be looked for. This measure has been tried three times, with two deaths² and one recovery,³ the favorable result being independent of the operation, as the ureter again became permeable after the spontaneous discharge of two stones. In both fatal cases the cysts could not be destroyed, although in the first more than one and in the second two years were consumed in treatment.

Cauterization (b) of the abdominal and cyst walls to create adhesions and avoid opening into the peritoneal cavity has been employed four times,⁴ and in all the opening was made by trocar. In one case fatal peritonitis supervened, in the others, in spite of daily drainage and injections, acute or chronic septicæmia was the cause of death.

The third procedure (c) is by an incision through the abdominal and cyst walls; this may be done either by opening directly into the peritoneal cavity, or after adhesions have been created between the parietes of the cyst and abdomen, the tumor may be incised without exposing the peritoneal cavity. In some hydronephroses this incision could be made outside of the peritoneum.

The method first mentioned is the older and more dangerous of the two.⁵ After laparotomy the cut edges of the cyst and abdominal wounds are to be stitched together, or the cyst before being opened is to be stitched to the wound in the integument. It is obvious that in the use of this method there is great liability to diffuse peritonitis. The results of this plan, however, are good, but are so made probably by the antiseptic precautions adopted. There are on record at least four cases⁶ in which this method was employed on the lumbar side all of which were cured, and two instances of abdominal nephrotomy, one⁷ of which died, and one⁸ recovered. To these might be added the case of Dr. Wölfler's,⁹ in which I cannot find the seat of incision, that resulted in a cure.

Prof. Simon regards incision after adhesions have been artificially induced as less dangerous. Recamier and his followers used caustics to create these adhesions; but many years ago Prof. Simon substituted the double puncture with two exploratory trocars; these are pressed through the integument at a distance

¹ Cabot, loc. cit.

² W. West, *Amer. Med. Weekly*, Nov. 14, 1882.

³ Although Prof. Czerny, (loc. cit.) says that "in single cysts the injection of iodine into the emptied sac may many times accomplish a lasting cure," I can find no such cure on record. See, however, case LIX.

⁴ Tuckwell, *Lancet*, July 29, 1882.

⁵ Simon, loc. cit., S. 227.

⁶ Cases LI and LVII.

⁷ Case LIII. ⁸Cases L, LII, LIV and LV.

⁹ Simon loc. cit., p. 230.

¹⁰Cases, lxii, lxviii, lxviii, lxv, ¹¹Case i. ¹²xi. ¹³lix.

of $\frac{3}{4}$ cm. from each other, and the canulæ left *in situ* after withdrawal of the stylets; later, for larger incisions he increased the number of trocars to four, making the double puncture a "mehrfache Punktion." After being thrust in the canulæ are stopped with wax and protected by charpie and plaster. Adhesions form, as Prof. Simon has proved, in twelve to fourteen hours, and for a radius about each canula of 2—3 cm., and are complete in from three to seven days, after which time the incision is to be made. To prevent any possible slipping away of the cyst from the canulæ they should be curved and describe a half circle with a radius of from 4 to 7 cm.

This operation can be performed from three different sides; if from behind (*incisio renis lumbalis*) the peritoneum is never injured; if from the side (*incisio renis lateralis*) it is rarely cut; if made in front (*incisio renis anterior*) it will always be cut. The objections to the *incisio renis lumbalis* are that the soft parts are here the thickest, that the room for incision is scanty, and that to reach the tumor the posterior portion of the kidney must be incised, a proceeding that causes profuse hæmorrhage. By the *incisio renis anterior* not only the peritonæum but the colon may be injured. Prof. Simon, therefore, prefers the *incisio renis lateralis*; from this side the renal substance is not likely to be wounded, the integument is little thicker than in front, and an opening can be made to the bottom of the cyst, giving free exit to any pus that might form. In an incision so made two fingers can be thrust to search the interior for renal calyces, calculi, etc. If there is needed a larger outlet the cyst and abdominal walls are to be first stitched together with a long curved needle.

The after-treatment consists in daily washing out the tumor with luke-warm carbolyzed water and drainage. The bandage should be changed frequently.

Prof. Simon performed the "mehrfache Punktion" eleven times for abdominal tumors, in all of which adhesions were successfully induced. This operation has been performed for hydronephrosis at least three times. In one¹ of the cases death from peritonitis resulted in 22 days, in the other two,² cures with fistulæ remaining were effected.

The above plan of treatment is certainly on the Continent regarded with much favor. The opinion of Dr. Ultzmann³ is that of all modes known to surgery for the relief of hydronephrosis incision of the tumor, when done by Simon's method, is the most advantageous.

A modification of the above method consists in the re-creation of the permeability of the ureter or in the creation of a renal fistula. The clogged ureter may be made pervious either from the vesical or pelvic end; the most natural plan is to sound the ureter from its vesical mouth. In the male this is very difficult; in women, when anæsthetized, after widening the urethra and introducing the finger into the bladder, the mouths of the ureters can be easily touched. If the sound be now directed to the so-called liga-

mentum inter-uretericum from the middle and then pushed a little outwards, forwards and upwards, it will pass into the ureter and can be thrust to the pelvis renalis. This was done successfully 17 times by Prof. Simon.¹ If stones be present they can thus be forced back, strictures can be made pervious, and valvular stenoses widened.

Rarely can the ureter be sounded from the pelvic end, even with the tumor well incised. In a case, although aided by the endoscopic apparatus and magnesium light, and with his whole hand exploring the sac, Prof. Simon could not accomplish his object.²

These procedures failing, for the safety of the patient an external fistula may be made. By this means an infirmity remains, but danger to life is averted. The secretion is usually so scanty as not to be very burdensome, much of the secreting renal substance having regularly disappeared.

It is recommended that a lip-shaped fistula, with the skin adherent to the mucous membranes of the pelvis to prevent closing be made, and that the opening be on a side where the integument is not too thick. In 1870 Prof. Simon thus operated on a man, who, with a daily discharge of 150 ctm. of fluid from the fistula, now works as an efficient nurse in the surgical clinic at Heidelberg.³

In the opinion of Dr. Israel⁴, the creation of a pelvic fistula is only indicated and possible where the pelvis renalis is greatly distended, but in cases where the calyces are the seat of large pockets, and the kidney thus is changed into a multilocular cystic tumor nothing could be expected from an incision into its substance.

There have been at least eight⁵ cases operated on in this manner, all of which resulted in cure, and in most, if not all, the instances cited the cyst as appears from the daily diminution of the discharge, seems to be gradually drying up.

It adds much to the comfort of these patients to attach to the fistula a tube expanded below into a light rubber bag, and secured about the abdomen by a belt, for the purpose of catching the discharge. This apparatus, as Dr. Schramm remarks, can be worn without special discomfort. A most interesting letter from Prof. Pernice, of Greifswald, describing his case, the writer is unable, owing to the already great length of this essay, to insert, but some points described are certainly too important to be omitted.

The patient was an unmarried woman, 23 years of age, in whom the diagnosis of ovarian cyst with very long pedicle had been made, and for which an operation on the 28th of October, 1878, was essayed.

The description of the operation is given literally: As soon as laparotomy was performed severe vomiting from the chloroform began; after the tumor was freely exposed it appeared to be covered on all sides with peritonæum, and gave the impression

¹ Dr. Hirschberg asserted, in the 6th Congress of German Surgeons that he saw Prof. Simon do the above operation, and, passing his finger through the urethra, could feel the probe in the ureter. *Verhandlungen*, etc., p. 36.

² Dr. R. F. Weir. (*Case LXIII*), however, succeeded in probing the ureter from the pelvic end.

³ *zeryy*, loc. cit.

⁴ Israel, *Berl. Klin. Wochenschrift*, Nov 5. Ein Fall von Nieren-exstirpation.

⁵ Cases LVIII, LX, LXV, LXVI, LXVII, LXIX, LXXI, LXIV.

¹ Case LVI.

² Cases LVIII and LX.

³ Ultzmann, *Real Encyclopædie der Gesammten Heilkunde*. Bd. VI, p. 662.

(Eindruck) to one as if a cyst of the broad ligament. It was then enucleated for a small space to the right and left, and punctured by the large trocar of Spencer Wells, and a perfectly clear, yellow fluid evacuated.

As the enucleation was proceeded with, it was quite easily accomplished on the left side by grasping the cyst-wall with the forceps, and by tearing away the peritoneal covering with the hand. At the lower part everything went well; the uterus and the left ovary could be obscurely felt in their proper relations. The enucleation was next continued on the right side, where difficulties presented themselves; after the cyst was scratched loose for about 4.5 cm. there appeared on the right wall a hard, glandular, polished organ that could only be a part of the liver pushed forward, or a portion of the kidney. Farther work on this side outside the tumor was impossible, since by every tear or cut a considerable hæmorrhage from the glandular structure spoken of happened. Therefore the tumor was slit up at the place where it had first been incised to get at it from the interior. We succeeded in probing clear to the right renal region and could touch the liver. Upon the right side, corresponding to the bit of glandular tissue alluded to, could be felt a sharply defined ring of the size of a fifty pfennig piece. In this, but somewhat under the plane of the cyst-wall, lay a renal papilla. The smooth glandular lump upon the outer wall of the tumor was then the remains of the right kidney, much pushed out of its normal situation, the tumor itself, the dilated pelvis and calyces. Inserted into the sac was the distended right ureter.

It was then determined upon to draw the partly enucleated tumor out of the abdomen, to take away as much as possible, and stitch the remainder of the hydronephrotic sac to the abdominal wound. That part of the cyst-wall to which the ureter was attached, with much of the sac, was then cut away. The upper part of the ureter was left behind, ligatured and thrown back. That part of the ureter cut away was found perfectly pervious. After the customary dressing a bandage was placed about the abdomen. The spray was continuously used during the operation which lasted an hour and a half.

The patient rallied well from the operation and made a good recovery, with a fistula remaining; on the first day of March, 1879, there was complete cicatrization of the wound after some slight ulceration; the opening is 3 cm. in length, and is so stopped as to permit the drainage of the urine. Later a satisfactory apparatus, by which the urine dribbled into a flask, was arranged.

The chief point of interest about this case is the notable displacement of the kidney, by which an error in diagnosis was caused. The subject of hydronephrosis in the so-called wandering kidneys is one too extensive to be considered in this essay. The writer refers those interested to an exhaustive work on such lesions, "Die Warderniere der Frauen," Berlin, 1881, by Prof. Landau.

It only remains for the writer to say that Dr. J.

Schramm,¹ in a lately published article, states that there have been but four well-defined cases of hydronephrosis in the wandering kidneys that have been operated on. In one case² a cure was effected by extirpation of the offending organ, in the other three³ by a creation of a permanent fistula from the pelvis renalis.

Of the 22 patients, (Table III), in whom the wound was dressed after some one of the open methods, 18, or over 68 per cent. recovered.

The three supplementary tables reveal some interesting facts. Thus, in 50 instances where the seat of the lesion is noted, 24 are found to be right and 26 left hydronephroses. No age, also, appears to be exempt, for in a total of 62 cases, 4 occurred in those between the ages of 1 and 10 years, 11 in those between 10 and 20, 15 in those between 20 and 30, 7 in those between 30 and 40, 14 in those between 40 and 50, 8 in those between 50 and 60, and 3 in those between 60 and 70.

Females appear to be more subject to the malady than males, for of 68 cases in which the sex is recorded, 43 occurred in the former and 25 in the latter sex.

There are, in addition, noted certainly 13, and perhaps more cases in whom, by men of undoubted surgical skill, the diagnosis of ovarian cyst was made and adhered to until after laparotomy or lumbar incision, the tumor lay exposed before their eyes.

From the gloomy declaration in regard to the treatment of hydronephrosis, that "of therapy there need be no account given" to the happier statement, proven by the records collated below, that 63 per cent. of patients operated on are cured by lumbar nephrectomy, 68 per cent. by open methods in general, and, up to date, 100 per cent. by either lumbar incision and drainage or the creation of a fistula, seems a long distance, and yet these are but the results of the last 15 years. It is well, too, to remember, at least for young men, that these wonderful successes were brought about, using the word in its noblest sense, by the empirical method, and that they quite justify the advice of old Aretæus: "Trial indeed is a good teacher. It is therefore a man's duty to try, for it is ignorance that is timid."

In the first series of the following collection of cases are given, the attempted and accomplished extirpations; in the second, the general operations for obliteration of the cyst. The latter series is subdivided into two groups—(a) Operations for obliteration by emptying the cyst and occluding air, and (b) operations for obliteration by open treatment of the wound.

¹ Schramm, loc. cit., p. 561.

² Case XII.

³ Cases LX, LXIV, LXVI.

TABLE I.
ATTEMPTED AND ACCOMPLISHED EXTIRPATIONS.

Date.	Age.	Sex.	Operator.	Operation.	Result.	Remarks.
I.	1865	33	F. Baum, (Göttingen) communicated by Krause in v. Langenbeck's Archiv., VII, I, p. 219	Puncture, and 1½ years after attempt to extirpate; after laparotomy cyst emptied by trocar, because adherent, cyst stitched to integument.	Death by peritonitis in two days.	Left hydronephrosis with valvular closure of ureter. Right kidney enlarged.
II.	1866	43	F. Spencer Wells. Diseases of the Ovaries, p. 208.	First punctured, two months later laparotomy; deeper parts of cyst too adherent to remove; omentum and intestines cut, three vessels ligated and wound closed.	Death 30 hours after operation.	Cyst of left kidney as large as a man's head. Right kidney enlarged and pale.
III.	1866	22	F. Simon. Communicated to Deutsche Klinik, 1868, No 1 by Martini	Laparotomy; tumor behind colon descendens and cœcum. Extirpation impossible. Cyst emptied by trocar and wound closed.	Death from peritonitis in 7 days.	Large right hydronephrosis, valvular closure of ureter. Left kidney enlarged but healthy.
IV.	1869	19	F. Esmarch. Published by Schetelig. Archiv., für Gynækologie, B I., Heft., III, p. 415.	Puncture, 3 months later extirpation; laparotomy, cyst adherent to left ovary and tube; great hæmorrhage, 16 ligatures taken.	Death in 36 hours.	Large left hydronephrosis; cyst walls 1½ cm. thick. Right kidney enlarged, but healthy.
V.	1871	...	F. Meadows. <i>British Med. Journal</i> , 1871.	Laparotomy. Extirpation.	Death on the 16th day from hæmorrhage from the pedicle.	No trace of renal substance in the cyst; tumor diagnosed ovarian.
VI.	1872	16	F. Sp. Wells, loc. cit., p. 216.	Diagnosis made after laparotomy; cyst punctured and its wall fixed to integument; a day later it re-filled and a glass tube was inserted.	Death from uræmia in four days.	Right hydronephrosis; previously diagnosed multilocular ovarian cyst.
VII.	1873	49	F. Campbell, <i>Edinburgh Med Journal</i> , 1874, p. 36.	Laparotomy; nephrectomy.	Cure.	Cyst involving lower third of kidney and diagnosed ovarian.
VIII.	1875	42	M. Le Dentu. Reported by Harris, <i>Amer. Jour. Med. Sciences</i> , 1882, p. 112. Doubtful by Quénu <i>Archiv. Gen. de Med.</i> , Dec., 1882.	Lumbar incision, complicated by perinephritic abscess. Nephrectomy.	Cure.	
IX.	1876	46	F. Billroth. Archiv. für Klin. Chirurgie., bd. XXI, p. 694	Laparotomy; tumor enucleated.	Death on second day from septic peritonitis.	Tumor diagnosed ovarian; degenerated kidney found in the sac.
X.	1877	24	F. Heath. Harris, loc. cit.	Laparotomy; tumor enucleated. Nephrectomy.	Death.	Calculous hydronephrosis, diagnosed ovarian cyst.
XI.	1878	21	M. Müller.	Lumbar incision. Nephrectomy.	Cure.	Calculous hydronephrosis.
XII.	1879	37	F. Czerny. Archiv. für Chirurgie, bd. XXV., H IV, p. 860.	Laparotomy. Nephrectomy.	Cure; patient discharged in 30 days.	Right hydronephrosis in wandering kidney rightly diagnosed; ureter S shaped but permeable.
XIII.	1880	7	F. Thornton. <i>Lancet</i> , 1880, vol I.	First aspiration of 6½ pints fluid; then laparotomy and nephrectomy	Cure.	Left hydronephrosis, probably congenital.
XIV.	1880	46	F. Savage. <i>Lancet</i> , 1880, vol I, p. 601.	Laparotomy; nephrectomy.	Cure.	Large hydronephrosis, dilated pelvis, calyces and papillæ easily distinguished.
XV.	1880	23	M. Czerny. Transactions Internat. Med. Congress, 1881, vol. II., p. 252.	Laparotomy; nephrectomy.	Death 30 minutes after operation.	Malignant hydronephrosis with tuberculous diathesis.
XVI.	1880	40	F. Czerny, loc. cit.	Laparotomy, nephrectomy.	Death after 48 days.	Right partial hydronephrosis on lower portion of kidney.
XVII.	1880	27	F. Spiegelberg. Reported by Kroner. Arch. für Gyn., bd. XXII	Laparotomy; nephrectomy; first punctured.	Cure.	Right hydronephrosis; operation because of fistula.
XVIII.	1880	20	F. McClelland Harris, loc. cit.	Lumbar nephrectomy.	Cure.	Calculous pyo-hydronephrosis with fistula in inguinal and lumbar regions
XIX.	1880(?)	5	.. Bardenheue Czerny, loc. cit.	Lumbar nephrectomy.	Cure in 6 weeks.	Left hydronephrosis.
XX.	1880	47	F. F. Lange. Harris, loc. cit.	Lumbar nephrectomy.	Death.	Cystic kidney containing concretions; other kidney involved.
XXI.	1880	...	F. Ollier. Quénu, loc. cit.	Laparotomy; nephrectomy.	Death in 3 days.	Cyst of kidney diagnosed ovarian containing clear yellow fluid, with traces of urine.
XXII.	1880	50	F. F. B. Archer. <i>Lancet</i> , July 1, 1882.	Laparotomy; nephrectomy.	Cure.	Right hydronephrosis of traumatic origin diagnosed ovarian cyst, and weighing 5 lbs.
XXIII.	1881	51	M. Czerny, loc. cit.	Oblique lumbar incision; nephrectomy	Cure.	Left partial hydronephrosis with angio-sarcoma
XXIV.	1881	32	F. F. A. Kehler. Arch. für Gynækol., 1881, H. III, p. 371	Laparotomy; nephrectomy.	Cure.	Right hydronephrosis containing gas.
XXV.	1881(?)	...	F. Baum. Quénu, loc. cit.	Nephrectomy.	Death.	Left hydronephrosis.
XXVI.	1881	54	M. Stockwell. Quénu, loc. cit.	Lumbar nephrectomy.	Death.	Kidney much sacculated and enlarged.
XXVII.	1881	37	M. Le Dentu. Quénu, loc. cit.	Lumbar nephrectomy.	Cure.	Hydronephrosis and inguinal fistula.
XXVIII.	1881	32	M. Czerny, loc. cit.	Oblique lumbar incision; nephrectomy	Death in 37 hours from anuria and vomiting	Right hydronephrosis, calculous; left kidney atrophied.
XXIX.	1882	...	.. Heywood Smith. Harris, loc. cit.	Laparotomy; nephrectomy.	Cure.	
XXX.	1882	52	F. Goodell. <i>Philadelphia Medical Times</i> , October 21, 1882	Laparotomy; nephrectomy.	Cure.	Left calculous hydronephrosis regarded as cyst of the broad ligament.
XXXI.	1882	36	F. C. J. Cullingworth. <i>Medical Gazette</i> , December 2, 1882.	Laparotomy; nephrectomy.	Death.	Left hydronephrosis.
XXXII.	1883	53	M. R. Davy. <i>Weekly Med. Rev.</i> , vol. viii., No. 22	Lumbar nephrectomy.	Cure.	Left kidney in fibro-cystic state.

TABLE II.
OPERATIONS FOR OBLITERATION OF THE TUMOR. (A.)

Date.	Age.	Sex.	Operator.	Operation.	Result.	Remarks.	
XXXIII	1860	....	....	Martineau, Simon, Ch., der Nieren, p. 274.	Single puncture, without leaving in canula; 9 litres of bloody fluid withdrawn. Later punctured by bistoury.	Death from peritonitis as fluid entered the ab- dominal cavity.	Large hydronephrosis.
XXXIV.	1862	....	....	Jos. Thomson. Langen- beck's Archiv., V, p. 328.	Incision between the two last ribs, then cyst punctured by trocar. Operated on three times.	Death from spontaneous rupture of cyst 1½ years after last punc- ture.	Large left hydronephrosis.
XXXV.	1862	3½	M.	W. J. Little. Langen- beck's Archiv., V, p. 333.	Single puncture, three times in 3 months; then punctured twice, leaving in the canula.	Death from fever three years after first punc- ture.	Large congenital right hydrone- phrosis.
XXXVI.	1865	4	M.	Hillier, <i>Med. Times and Gazette</i> , 1865, Vol. I, p. 320.	Punctured several times; unsuc- cessful attempt to make perma- nent fistula.	Improvement	Large congenital hydronephrosis simulating ascites.
XXXVII.	1867	64	F.	Béhier. Virchow's Jah- resbericht, II, p. 173.	Single puncture, repeated 10 days later.	Death from erysipelas.	Very large right hydronephrosis, diagnosed ovarian cyst.
XXXVIII.	1867	...	F.	Bécard. Virchow's und Hirsch's Jahresbericht, 1868, II, p. 161.	Twice punctured.	Death.	Enormous right hydronephrosis, diagnosed ovarian cyst.
XXXIX.	1868	59	F.	Sp. Wells, loc. cit.	Twice punctured in 3 months.	Death five months after second puncture from traumatic rupture of cyst.	Large left hydronephrosis—seven stones found in it.
XL.	1868	44	F.	Simon, loc. cit.	Puncture, two canulae left in to promote adhesions. Punctured a second time.	Death from congestion of lungs on 14th day.	Large right hydronephrosis, with valvular closure of ureter.
XLI.	1871	24	M.	P. H. Fye Smith, Trans. Path. Society, Lond., Vol. XXIII.	Single puncture	Death two months later from diarrhoea.	Left hydronephrosis of traumatic origin.
XLII.	1872	16	F.	Sp. Wells, <i>Med. Times and Gazette</i> , 1872, Vol I, p. 483	Puncture.	Death from uræmic fever with temperature of 110 degrees.	
XLIII.	1872	20	M.	Holmer, pub by Fenger. Nordiskt Med. Arkiv., Band, V, Nr. 12.	Aspiration—2,000 c ctm. clear fluid drawn off	Death from inguinal abs- cess caused by old perinephritis.	Partial right hydronephrosis
XLIV.	1876	34	F.	Rosenberger, Berliner <i>Klin. Wochenschrift</i> , 1880, No. 19.	Puncture	Death in 3 weeks.	Left hydronephrosis, diagnosed ovarian cyst.
XLV.	1879	11	M.	J. L. Hicks, <i>N. Y. Med Record</i> , Apr. 17, 1880.	Aspirated three times. First, two pints; second, two quarts; third, two quarts of fluid drawn off.	Cure.	Right hydronephrosis of traumatic origin.
XLVI.	1880	12	M.	Croft, <i>Brit. Med. Jour- nal</i> , 1881, I, p. 123.	Aspirated eight times. At first 79 ounces of fluid were drawn off.	Cure.	Left traumatic hydronephrosis— hematuria for 5 days.
XLVII.	1880	51	F.	O. W. Doe, Boston <i>Medical and Surgical Journal</i> , 1880, No CIII, p. 274.	Aspirated twice. At first 16, at second time 6½ ounces were ob- tained.	Cure.	Hydronephrosis, coincident with stricture of rectum, probably cancerous.
XLVIII.	1881	...	F.	Lucas, <i>Brit. Med. Jour- nal</i> , Sept. 29, 1883.	Aspirated several times.	Temporary relief.	
XLIX.	1881	40	F.	G. M. Staples.	Aspirated four times. First, 44 second, 39; third, 37, and fourth time 55 ounces were drawn off.	Marked improvement.	Left intermittent hydronephrosis.

TABLE III.
OPERATIONS FOR OBLITERATION OF THE TUMOR. (B.)

Date.	Age.	Sex.	Operator.	Operation.	Result.	Remarks.	
L.	1855	48	M.	Nelaton. Simon, Chir- urgie der Nieren, p. 281.	Caustic potassa applied; later in- cision with trocar. Several times injected with iodine.	Death in 55 days.	Left hydronephrosis diagno-ed a splenic tumor.
LI	1864	13	F.	Dumreicher. Langen- beck's Archiv., Band VIII, p. 705	Punctured several times, then in- jections of iodine; also of ferri sequichlor. Three times cath- eter inserted, and cyst daily syringed out with luke-warm water.	Death a year after first puncture.	Right hydronephrosis with many adhesions, regarded as a hydro- varium.

TABLE III.—CONTINUED.

Date.	Age.	Sex.	Operator.	Operation.	Result.	Remarks.	
LII.	1865	48	M.	Touren. Virchow's Jahresber., 1866, II, p. 149.	Vienna paste applied five times; syringing out of cyst, and injections of iodine.	Death 17 days after operation	Right hydronephrosis.
LIII.	1865	64	F.	Sp. Wells, loc. cit.	Puncture with trocar, again with bistoury and tent inserted.	Cure after discharge of 2 stones per urethram	Right hydronephrosis.
LIV.	1868	...	M.	Siotis. Virchow's und Hirsch's Jahresbericht, 1868, II, p. 161.	Caustic applied, and puncture.	Death from peritonitis.	Left calculous hydronephrosis—right kidney doubled in size.
LV.	1868	26	M.	Dolbeau. Simon, Ch. der Nieren, p. 281.	Caustic applied. A few days later opened by trocar. Cavity daily syringed out.	Death in several months.	Right hydronephrosis.
LVI.	1868	39	M.	Simon. Reported by Hotz, <i>Berl. Klinische Wochenschrift</i> , 1869, No. 23.	Double puncture, with incision in most prominent part of swelling. Two catheters put in, and cyst daily syringed out	Death from peritonitis.	Left hydronephrosis in horse-shoe kidney.
LVII.	1870	...	F.	Rose. Simon, loc. cit.	Punctured, and wound kept open	Death two years later. Other kidney involved.	Large left hydronephrosis.
LVIII.	1870	26	M.	Simon, loc. cit., p. 288.	"Mehrfache Punktion," with subsequent incision. Iodine injections and cauterization of calyces fruitless. Fistula made.	Cure, with renal fistula.	Right hydronephrosis.
LIX.	1876	13	M.	Wölfler, <i>Wiener Med Wochenschrift</i> , 1876, No. 8.	Three successive punctures, with injections of very dilute iodine twice.	Cure.	Congenital hydronephrosis, with much urea in fluid.
LX.	1877	21	F.	Winckel, Verhandlungen der Deutschen Gesellschaft für Chirurgie, 6ter Congress, p. 34.	Exploratory puncture. Fluid drawn off, then trocar inserted and "mehrfache Punktion" successfully performed. Drainage tube inserted.	Cure, with fistula. Apparatus fixed to patient, who was exhibited to the 6th Congress of German Surgeons.	Right hydronephrosis in a supposed wandering kidney.
LXI.	1878	19	M.	R. F. Weir, <i>N. Y. Med. Record</i> , May 6, 1882.	Aspirated three times, then abdominal nephrotomy and drainage	Cure.	Left hydronephrosis.
LXII.	1877	27	F.	Thornton, <i>Brit. Medical Journal</i> , May 26, 1883	Tumor in right loin twice antiseptically incised and drained. Tumor in left side opened, and drained later. Ovariectomy also performed.	Cure.	Double cysts of kidneys, supposed to be due to compression of ureters by early pregnancy.
LXIII.	1879	21	M.	R. F. Weir, <i>N. Y. Med. Record</i> , March 13, 1880.	Twice aspirated; then lumbar nephrotomy and drainage.	Cure.	Left hydronephrosis. Metallic probe passed freely into ureter, but no calculus found.
LXIV.	1879	27	F.	Ahlfeld, <i>Arch. für Gynækol.</i> , 1879, XV, p. 114.	Laparotomy. Sac adherent behind when vessel entered. Creation of fistula determined on, as three papillæ were found. Cyst stitched by 12 suture to wound. Operation three hours long.	Cure, with pelvic fistula.	Hydronephrosis in wandering kidney. Diagnosed ovarian cyst. Colon ascendens in front of the cyst. Tumor right
LXV.	1880	47	F.	G. A. Peters, <i>N. Y. Med. Record</i> , May 6 1882.	Lumbar nephrotomy. Two drainage tubes inserted, and cavity daily irrigated with catbolized water.	Cure, with fistula, through which fluid dribbles slightly.	Very large left hydronephrosis.
LXVI.	1880	60	F.	Landau. <i>Archiv. für Chirurgie</i> , Bd. XXVI, Heft 3, 1881.	Exploratory puncture, with negative results. Punctured 4 times and evacuated; then ureter, cyst and abdominal wall stitched together. Again punctured and drained. Permanent fistula made.	Cure, with fistula.	Right hydronephrosis in supposed wandering kidney.
LXVII.	1880	47	F.	Svensson, Hygieo, Stockholm, July, 1881.	First aspirated, and 200 c.c. fluid drawn; again one month later, and 600 c.c. obtained; a third time, and 300 c.c. obtained. Oct. 28, 1880, cyst sewed to abdomen by 7 or 8 sutures to create adhesion. Nov. 7, Paque- lin's cautery burned through cyst walls, and 1700 ctm clear fluid drawn off. Two drainage tubes inserted, and irrigation by warm solution salicylic acid.	Cure, with fistula. Cavity steadily diminishing.	Left hydronephrosis.
LXVIII.	1881	11	M.	Tuckwell, <i>Lancet</i> , July 29, 1882.	Aseptic lumbar nephrotomy and drainage. Aspirated at first.	Cure.	Left hydronephrosis, supposed to be congenital.
LXIX.	1881	47	F.	Schramm, <i>Berl. Klinische Wochenschrift</i> , Sept. 10, 1883.	Laparotomy twice; exploratory incision first with Frauzel's trocar; 800 c.c. reddish urinous	Cure, with fistula, to which an apparatus was adjusted.	Large right hydronephrosis in wandering kidney.

TABLE III.—CONTINUED.

Date.	Age.	Sex.	Operator.	Operation.	Result.	Remarks.
				fluid let off. In the first laparotomy the sac collapsed, as too big a trocar was used. Right ovary extirpated. This on March, 10, 1881. On Nov. 23, 1881, by small trocar. 1200 c. cm. fluid let off. Sac stitched to integument. Artificial pelvic fistula made. Daily diminution of discharge.		
I.XX.	1882	10	M. A. T. Cabot. <i>Boston M. and Sur. Journal</i> , Feb 22, 1883.	Twice aspirated; then lumbar nephrotomy. Cyst wall stitched to skin.	Cure.	Right hydronephrosis of traumatic origin.
I.XXI.	1878	23	F. Pernice. Private letter to writer.	Laparotomy. Cyst tapped by Sp Wells' trocar. Part of cyst and ureter cut away. Cyst stitched to wound, and fistula made.	Cure, with fistula.	Right hydronephrosis in an abnormal movable kidney. Diagnosed ovarian cyst.



