urine within an hour and disappear within four hours, the total amount of sugar excreted varying from 0.5 to 2.5 grammes. Disease, especially interstitial disease, retards and decreases the glycosuria or even prevents it completely. In other cases the glycosuria is excessive.

Cryoscopy.[1]—Cryoscopy is the determination of the freezing point of fluids containing certain substances in solution. Urinary cryoscopy consists in determining the relation of the freezing point of the urine to that of the blood. The most important studies in these relations have been made by Koranyi. Urinary cryoscopy has been applied to the study of renal permeability, cardiac disease, and physiological metabolism. It is currently stated that with the reduced elimination of urinary insufficiency the urinary freezing point falls. But the case is by no means so simple. The theory is based upon a series of chemical formulæ and hypotheses that cannot be familiarly handled by any but a trained physiological chemist; while as an evidence of the delicacy of the technic we may adduce the testimony which Huddleston [2] offers in his able review of this subject—viz., that his earlier experiments were rendered useless by instrumental inaccuracy, in spite of the great care which he evidently bestowed upon every detail.

Comparison of Methods.—When one endeavours to compare the relative values of the different tests of renal permeability, one is confronted by a remarkable discrepancy of authorities. We learn that the results of the methylene blue and the phloridzin tests are neither consistent with nor conformable to each other. A happy, though possibly incorrect, elucidation of these discrepancies appears in the theory that either test measures only the renal permeability to a single substance, not to all substances—a selective, not a general permeability. Again, while all award to cryoscopy a pre-eminent precision, Casper [3] claims that the phloridzin test always accords with the findings of cryoscopy, while Achard [4] proclaims the supremacy of the methylene-blue test. And finally, Bernard [5] confesses that there is no stable relation between uremia and impermeability, and Vaquez adds that the absence of any sign of reduced permeability or of reduced freezing point does not preclude the possibility of uremia.

From these diverse opinions several conclusions may be drawn. In the first place, it is evident that none of these new methods is infallible, while, unhappily, the most promising of the lot—viz., cryoscopy—is the most difficult to carry out accurately, and can only be performed by a trained chemist with special apparatus. It is also obvious that any one of the methods may hint at an important renal insufficiency, which other methods of diagnosis might fail to show; and yet that very insufficiency need not necessarily indicate an impending uremia. Finally, it is an open question whether the routine observance of the daily excretion of urea, the presence or absence of polyuria or anuria, and above all a broad-minded estimate of the patient's general condition, of the presence or absence of urinary toxemia or septicemia, do not give surer results than a too close technical examination by methods whose value is as yet only vaguely determined. I confess a greater confidence in the older familiar methods until such time as we can apply the newer elimination tests with greater precision than is as yet attainable.

[1] *Cf.* La Cryoscopie des urines. H. Claude et V. Balthazard, Paris, 1901.
[2] Phila. Med. J., 1901, vii, 1246.
[3] Berlin. klin. Wochenschr., 1900, xxxvii, 643.
[4] Semaine méd., 1900, xx, 247.
[5] Guyon's Annales, 1901, xix, 206 *et seq.*

Renal Reflexes

Here, again, we enter a field that merits further exploration. So vague is our knowledge of renal reflexes that the description of them resolves itself into the enumeration of a series of disconnected facts and opinions. We may consider reflexes concerning the secretion of urine and painful reflexes.

Reflexes concerning the Secretion of Urine.—The function of the kidneys is regulated by the nervous system. Roughly speaking, the excretion of solid matter (in solution) by the kidney depends upon the amount of such matter in the blood and the health or the disease of the renal cells. But the amount of water excreted varies widely with the nervous condition of the individual, as is best exemplified by the phenomena of hysterical polyuria, and nocturnal polyuria.

Hysterical Polyuria.—Hysterical polyuria occurs almost exclusively in young adults. By day the attacks occur as follows: the subject urinates naturally, emptying his bladder completely. Within a short time, perhaps within fifteen or twenty minutes, he is surprised by a desire to urinate—often an imperious desire. In relieving himself he notices a scalding in the perineum and along the urethra, which is the more remarkable since the urine is almost clear water. But the most startling feature of the case is the amount of urine passed. More than a pint of this clear limpid fluid may be secreted by the kidneys within a half hour. These attacks are purely neurotic, of short duration, and irregular in recurrence. They are indicative either of an acute nervous strain or of a chronic state of nervous tension and weakness. Beyond this they have no significance.

Nocturnal Polyuria.—Nocturnal polyuria might be termed the neurasthenic polyuria of the decline of life. As such it has a far more serious import than hysterical polyuria. When a man beyond his prime complains of passing great quantities of urine at night, while his output by day is about normal, it invariably means that he is suffering from some form of nervous debility. He may be suffering from chronic nephritis or hypertrophy of the prostate as well, and the former may cause a polyuria both diurnal and nocturnal, the latter a nocturnal pollakiuria; but unless the man's nervous energy—his power of resistance, his vital force—is impaired, the nocturnal polyuria will not assume notable proportions. In such a condition surgical operation of any sort is a grave risk. Treatment of any existing prostatic retention or renal disease is not to the point. What the man needs is hygiene and tonics, and, more than anything else, relief of mind from the troubles that oppress him.

Hysterical Anuria.—Anuria the result of nervous conditions may be a benign or a grave condition. Complete anuria is one of the manifestations of true hysteria (p. 634). It may last for hours, even days, during which time the kidneys secrete not one drop of urine. This anuria (or it may be only an oliguria) may be alarming, but I do not know that it has ever proved fatal. It is habitually succeeded by an extreme polyuria, as though the kidneys were striving to make up for lost time.

Reflex Anuria.—A more serious type of anuria is that which sometimes follows traumatism to the urethra, the passage of a sound, or the performance of urethrotomy. The kidney secretion is immediately inhibited. There may or may not be urethral chill; there may or may not be evidence of renal disease. The clinical features of this anuria, so often fatal, have already been discussed (p. 43). In most cases it is associated with infection and disease, but by its very clinical features it is evidently reflex in origin, due to the irritation of the nerves of the deep urethra.

Of no less importance is the reno-renal reflex anuria. This is not a purely nervous anuria, for it occurs only under such circumstances of anesthesia or of bilateral kidney disease as make it in great part evidently referable to an irritative and compensatory congestion. But the fact remains that when one kidney is cut down upon, the other is very likely to cease functionating for a time. The details of this condition may best be discussed elsewhere (p. 644).

Pain Reflexes.—The pain reflexes of the kidneys are threefold: pain referred from the prostatic urethra to the kidney; pain referred from the kidney to the prostatic urethra; pain referred from one kidney to the other.

As a rule pain referred from the prostatic urethra to the kidney is of no great importance. Patients with posterior urethritis, especially at its onset or during an exacerbation, may complain of a dull ache in the loins (not due to sandal-wood oil). I have not known this ache to prove unbearable nor to portend any serious consequences. Again, the sufferer from prostatic neuralgia may complain bitterly of pains radiating up the ureter to one or both kidneys. Such pains merit no especial attention.

Pain referred from the kidney to the prostatic urethra will be referred to later (p. 584).

Pain referred from one kidney to the other is alleged to be a misleading feature of some cases of renal calculus, but it must be rare. Morris has never met with it nor have I.

The Effects of Anesthetics upon the Kidneys

It is generally admitted that whatever the anesthetic employed, anesthesia has no permanent or serious ill effects upon the kidneys. The lists, published from to time, of urinary analyses taken before and after operations upon individuals whose kidneys are presumably sound, show the appearance of albumin and casts after operation where none existed before, and it is familiarly recognised that after any serious operation, whether on account of operative shock or anesthesia, the urinary output is markedly decreased during the first twenty-four to forty-eight hours. Beyond this there is no universally accepted rule. Some maintain that if the kidneys are seriously diseased and unequal to withstand a severe shock it is safer to use ether, while others cling to chloroform. I believe, however, that the majority of clinicians prefer chloroform to ether in such cases. Such has always been my preference, and the researches of Thompson and Kemp[1] add scientific support to this belief.

These observers state:

"As regards ether, it would appear that this agent produces a special contraction of the renal arterioles, with a consequent damaging effect upon the renal secretory cells, similar to that which follows clamping the renal artery. The kidney shrinks in bulk, with consequent fall of the oncometric tracing, and accompanied by diminution of secretion, marked albuminuria, and, finally, suppression. As remarked before, this condition of the kidney is not due to any change in the general arterial circulation.

"These facts would seem to contra-indicate the use of ether as

[1] Med. Record, 1898, liv, 325.

an anesthetic when renal disease is present, and particularly when with albuminuria there is a tendency to pulmonary edema.

" The effect of chloroform upon the kidney seems to be nil. The oncometric curves are nearly normal and are affected only through sharing in general circulatory changes. The secretion of urine continues up to the last moment of life, and the albuminuria is so slight that its presence at all is apparently due only to respiratory interference. Meantime the action of chloroform on the heart, as shown by the carotid tracings, is directly depressing. Ether, on the other hand, shows evidence of cardiac stimulation throughout.

" The A. C. E. mixture shows the special effects both of ether on the kidneys and of chloroform on the heart, either being predominant according to the mode of the administration. . . . These objections appear to be still more applicable to Schleich's anesthetic."

In this connection, however, the depressing effect of chloroform upon the heart must not be forgotten. A myocarditis often accompanies advanced renal disease, and it may be a delicate question whether it is wiser to imperil the kidneys by administering ether, or the heart by chloroform. When this question arises it is safe to hold to the rule (other things being equal): in nephrotomy spare the heart, the incision and drainage of the kidney will stimulate it to secretion sufficiently to make up for the added risk; in nephrectomy spare the remaining kidney, which will have strain enough put upon it. In any case spare the patient; make the anesthesia as short and as light as possible.

EXAMINATION OF THE KIDNEY

Inspection.—Inspection of the patient's abdomen or loin reveals nothing in reference to the kidney, unless it be greatly enlarged. The thick spinal muscles prevent tumours of the kidney from projecting backward. Hence they protrude first in the loin and thence push forward the antero-lateral portion of the upper abdomen. No definite information can be gained, however, without palpation.

Palpation.—The kidney, normal in size and situation, cannot be palpated. Indeed, it may be distinctly enlarged, especially in a stout subject, and still be impalpable.

For a proper palpation of the kidney the patient should be flat on his back with the head and shoulders elevated on a small pillow and the lower extremities flexed. In this position the abdominal wall is entirely relaxed, unless the patient voluntarily stiffens his muscles, either by lifting his head for the purpose of seeing what the surgeon is doing, or his side in a futile endeavour to help in the manipulations, or by tightening up the abdominal muscles in instinctive resistance. A few words and a gentle touch will overcome these difficulties.

The simplest and most efficacious method of examination is Guyon's *ballottement rénal*. To examine the right kidney the patient lies, as above described, at the edge of a couch, beside which, and to the right side of the patient, the surgeon sits. With the index and middle fingers of the left hand the surgeon now identifies and makes pressure upon the triangular depressible spot between the last rib and the vertebral column. The right hand is then placed close under the free border of the ribs, and firmly pressed upward and inward, while the patient is required to breathe deeply. Then, at the moment of deepest inspiration, the fingers of the left hand are suddenly and sharply pressed forward. If the kidney is tender this blow upon it will evoke pain. If it is enlarged or movable it will be thrown forward against the fingers of the right hand, which recognises the impact, the ballottement of a solid body. This examination should be repeated several times to preclude the possibility of error, positive or negative.

If an enlarged or a movable kidney is thus identified, further information may be gained by making the patient take long deep breaths, and endeavouring, at the beginning of expiration, just as the abdominal wall relaxes, to catch the kidney between the two hands. If the kidney is freely movable deep inspiration may send it wholly below the surgeon's hands, and he may feel its size, shape, and tenderness by gentle pressure as it slides back again during inspiration. Similarly if it is merely enlarged or only slightly movable, the examining fingers can detect the contour and tenderness of more or less of the organ. Many surgeons claim that by this method it is sometimes possible to feel even the normal kidney.

When the kidney is notably enlarged it may be examined by simple abdominal palpation and percussion. A movable kidney may usually be satisfactorily examined by the method above described, though Israel and Morris prefer that the patient lie on his side with the loin to be examined uppermost. Occasionally a kidney is displaced downward so far that it never returns to its place in the loin. The patient complains of a tumour or of a tender spot in the iliac or the lateral umbilical region, and the movable kidney, which can be returned towards or into the loin, is recognised by deep palpation with the flat of the fingers.

I have not found palpation advantageous with the patient in the erect, sitting, stooping, or knee-elbow position. Exploration by means of the ureteral catheter and the X-ray need not be dwelt

upon here. Exploratory laparotomy has been almost entirely abandoned in favour of lumbar nephrotomy. This operation will be described elsewhere (p. 637).

ABNORMALITIES OF THE KIDNEY

The abnormalities of the kidney are either—

1. Abnormalities of Form (Congenital Malformations).
2. Abnormalities of Number, or
3. Abnormalities of Position (Misplaced Kidney).

Since operations upon the kidney have become so frequent each variety has assumed a practical importance.

Frequency.—Abnormalities of the kidney are very rare. Morris [1] has collected the records of 11,168 post-mortem examinations at the Middlesex Hospital and Guy's. Excluding floating kidneys, 16 cases of double ureter, and 53 cases of acquired atrophy and small cirrhotic kidneys, his cases may be tabulated thus:

Congenital atrophy (unilateral)	11 cases.
Fused kidney	1 case.
Horse-shoe kidney	16 cases.
Lobulated kidney (4 bilateral)	9 cases.
Malformed kidneys (1 bilateral)	6 cases.
Misplaced kidneys	10 cases.

About 1 case in 211.

Congenital Malformations

Variations in the size of the kidney are interesting only when they amount to atrophy. Apart from these malformations, we may consider malformations without union and malformations associated with fusion or union of the two kidneys.

Simple Malformation.—Slight irregularity in the shape of the kidney, a greater or less persistence of fetal lobulations, is not uncommon and has no surgical interest. Considerable malformation of the kidney is usually associated with displacement, and is of interest in the latter connection. Bergmann [2] states that malformed kidneys are peculiarly subject to tuberculosis.

Fusion.—(See Abnormalities in Number.)

Abnormalities in Number

Morris recognises five subvarieties—viz.:

A. Single, or unsymmetrical kidney, where one is entirely absent.

[1] Surgical Diseases of the Kidney and Ureter, 1901, i, 32.
[2] Deutsch. Chir. von Billroth u. Lücke, 1896, lii, i, 113.

B. Solitary or fused kidney, where the two kidneys are massed together.

C. Imperfect development, or atrophy of the kidney.

D. Absence of both kidneys (no clinical significance).

E. Supernumerary kidneys.

In each of the first three subvarieties there is but one kidney, yet embryologically the conditions differ widely. In class *A* one kidney is entirely absent; in class *B* both kidneys are more or less fully developed and united; in class *C* one kidney is never sufficiently developed to perform its functions.

Single Kidney.—Single kidney is very rare. Morris has collected records of 10 instances among 24,542 autopsies. The kidney is hypertrophied and may be situated normally or displaced downward. The ureter is wanting on the opposite side. The absence of one kidney is not necessarily a great evil, for Newman has recorded 17 cases of patients with this abnormality living beyond the sixtieth year. But it is of paramount importance should the question of nephrectomy arise.

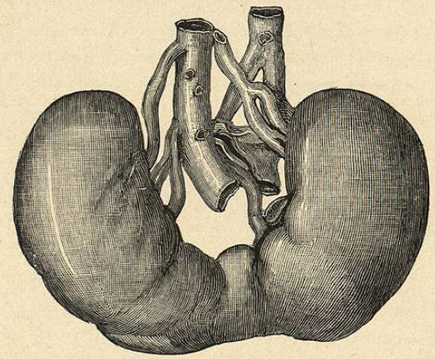

Fig. 137.—Horse-shoe Kidney (Morris).

Fused Kidney.—Fused kidney may be horse-shoe-shaped, completely fused, or irregular in shape. The two latter forms are extremely rare. In each the kidney has two ureters running from it into opposite sides of the bladder, and may be situated normally, displaced downward, or lying in the median line.

The horse-shoe kidney (Fig. 137) is the most common of all renal abnormalities. Morris noted it 19 times among 18,244 autopsies; Preindlsberger [1] 6 times among 1,344 autopsies; and Socin [2] 5 times among 1,630 autopsies—in all, 30 cases among 21,218 autopsies (1 in 707). The fused organ is made up of two fairly normal kidneys lying low in the loin, and more or less intimately united by a band of renal tissue running across the median line and connecting the lower poles of the two organs. (In one of Socin's and one of

[1] Wien. klin. Rundschau, 1901, xv, 197, 215.
[2] Quoted by Bergmann, *op. cit.*, p. 117.

Preindlsberger's cases the upper poles are united instead of the lower ones.) The great vessels habitually lie behind the central mass, while, as a rule, the ureters descend in front of it. There are usually two separate and normal pelves and ureters, but ureteral and vascular abnormalities often occur. Since the possibility of partial nephrectomy has become generally recognised, the horse-shoe kidney has lost its terrors. A contemplated nephrectomy need not be abandoned if this condition is encountered. Resection of the affected half of the organ may be performed, although, of course, the other half must be spared.

Atrophy of the Kidney.—Atrophy of one kidney may be congenital or acquired. Congenital atrophy is infrequent, while acquired atrophy, the result of interstitial nephritis or of ureteral obstruction, is common. The existence of this condition enforces the rule, *Never perform nephrectomy unless you are sure that the opposite kidney is present and functionating* (p. 640).

Supernumerary Kidney.—Supernumerary kidneys are most uncommon. Morris records 3 cases, of which 2 were examples of small accessory organs lying near one of the kidneys. The third case, reported by Watson Cheyne,[1] is unique in that the supernumerary kidney lay at the pelvic brim and was found during a laparotomy.

Misplaced Kidney

A misplaced kidney is by no means a movable or floating kidney, though the two conditions may coexist. A fused kidney is usually misplaced, a misplaced kidney often misshapen. Usually only one kidney is affected. The misplaced organ commonly lies near the sacro-iliac synchondrosis, exceptionally in the true pelvis or the opposite loin. The condition is usually congenital, though a movable kidney may become fixed in an abnormal position.

The clinical features of misplaced kidneys are: (*a*) the danger of mistaking them for abdominal tumours, and (*b*) the painful and pathological effects of pressure upon the misplaced organ itself as well as upon the adjoining organs. Hochenegg[2] records 9 nephrectomies for this condition. Buss[3] reports an additional nephrectomy, and Dewis[4] a nephrotomy.

[1] Lancet, 1899, i, 215.
[2] Wien. klin. Wochenschr., 1900, xiii, 4.
[3] Zeitschr. f. klin. Med., 1900, xxxix, 439.
[4] Boston Med. and Surg. J., 1901, cxlv, 35.

CHAPTER XXXIV

MOVABLE OR FLOATING KIDNEY—NEPHROPTOSIS

The kidney is naturally endowed with a certain degree of mobility. Like the other abdominal viscera it moves with respiration and its position is influenced by the attitude of the subject. Yet this condition is entirely normal. Such a kidney is not distinctly palpable. A movable kidney, on the other hand, is one that is subject to downward displacement to such an extent that it may be distinctly palpated by the usual methods of examination. English authors distinguish between movable kidney and floating kidney. The former is subject to downward displacement only behind the peritoneum; the latter may also be displaced forward towards the anterior abdominal wall, and often possesses a mesonephron. Continental writers distinguish mobility of the first degree (the fingers can grasp the kidney), the second degree (the fingers can be brought together above the organ), and the third degree (the kidney can be depressed into the iliac fossa).

Frequency

The recorded frequency of movable kidney varies with the point of view of the author and the delicacy of his sense of touch. The widely divergent opinions of various writers may be tabulated thus:

	Women.		Per cent.	Men.		Per cent.
	Cases examined.	Movable kidney.		Cases examined.	Movable kidney.	
Bergmann[1]	905	40	4.41	828	4	0.48
Einhorn[2]	543	112	20	772	14	1.81
Idem[3]	832	240	28	1,080	42	3.88
Mathieu[4]	306	85	25	...	..	....
Godard-Danhieux[5]	603	212	35	268	6	2.33
Suckling[6]	100	42	42	100	6	6
Harris[7]	126	71	56	...	..	....

[1] *Op. cit.*, p. 134.
[2] Med. Record, 1898, liv, 220.
[3] *Ibid.*, 1901, lix, 561.
[4] Le bull. méd., 1893, vii, 1113.
[5] Guyon's Annales, 1901, xix, 197.
[6] Edinb. Med. J., 1898, iv, 228.
[7] J. of the Am. Med. Ass'n, 1901, xxxvi, 1527.