When these four sutures are tied (Fig. 3), the anatomy of the part is considerably transformed, the inner shelf of Poupart's ligament being firmly approximated to the conjoint tendon. Hesselbach's triangle is completely obliterated. In some patients, with ill-developed or flabby conjoint tendons, I have obtained benefit by passing the

Fig. 2.—Insertion of first stitch through Gimbernat's ligament and conjoint tendon. A, Poupart's ligament. B, Conjoined tendon. D, Cord retracted inwards. E, External oblique.

hernia needle further inwards through the adjoining sheath of the rectus, so as to afford a good purchase for the loop of the mattress suture.

Finally, the two aponeurotic leaves are united by a continuous catgut suture, and in doing this I make it a rule to insert the point of the needle deep enough to catch hold of underlying muscle in order that no intermuscular dead space may be left. The cord, of course, is left, as in Halsted's operation, superficial to the external oblique.

Fig. 3.—A, Poupart's ligament (lower shelf). B, Conjoined tendon. D, Cord retracted inwards. E, External oblique—external leaf. F, External oblique—internal leaf.

I find this makes an extremely firm barrier, and is equally useful for the radical cure of oblique or direct hernia.

It is obvious that this operation only differs from that of others in the manner of introduction of deep sutures, but I am convinced the modification is important, in that it affords a simple and absolutely safe method of approximating somewhat delicate tissue in a rather dangerous zone.

I wish to acknowledge my indebtedness to my friend Dr. K. Macfarlane Walker for drawings.

A CASE OF URÆMIA WITH AN UNUSUAL DEGREE OF UREA RETENTION.

BY

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I.—Clinical Note by Dr. H. B. Day.

AN Egyptian fireman, aged 36, was admitted to hospital to undergo treatment for scabies in the skin section. He did not complain of any urinary symptoms, but the routine examination of urine revealed a high degree of albuminuria, varying from 0.275 to 0.225 per cent. The specific gravity was low—1008—and the reaction acid. The patient was put on milk diet, and discharged in ten days cured of his scabies.

A month later (January 5th, 1914) he was readmitted to the medical wards for oedema of the feet and eyelids with some cough of ten days' duration. The urine was now found to be alkaline in reaction, with a deposit of pus and phosphates. Albumin was present to the same degree as before; the specific gravity was 1010. The bladder was sounded, with a negative result, and the patient was treated for nephritis and cystitis.

A fortnight later the patient's condition caused uneasiness, although all the oedema had disappeared. He had become weak and apathetic, with a fixed staring expression, though responding readily to questions. The amount of urine averaged 1,000 c.cm. a day, but continued of the same low density. In spite of active treatment, the patient became gradually weaker and less responsive. A week later (January 28th) chattering movements of the jaws set in, the tendon reflexes were exaggerated, clonus, being easily elicited. The pupils were equal and moderately contracted. The urine showed no further alteration in composition and quantity.

Lumbar puncture was performed and a free flow of clear fluid obtained. No albumin was present (nitric acid test), but the quantity of urea was found by Doremus's ureometer to amount to the extraordinary percentage of 0.75, whereas the normal is 0.03 to 0.04. I was naturally sceptical of such a reading, and repeated the estimation twice again, but with a similar result. I therefore requested Dr. W. H. Wilson to estimate the amount of urea present in the blood. He kindly took samples on two occasions and also collected material at the necropsy. His report forms the second part of this paper.

In spite of rectal injections of saline and cupping to the loins, the patient rapidly grew worse and died three days later (January 31st).

Necropsy.

Dr. A. R. Ferguson, Professor of Pathology, made the necropsy and reported as follows:

"The left ventricle was hypertrophied, the right dilated. The lungs were congested and the liver enlarged, but of normal appearance. The brain showed a recent small patch of subdural hæmorrhage on the left side; the ventricles were somewhat dilated and the cerebro-spinal fluid excessive in amount. The bladder was thin-walled and pouched, showing several areas of hæmorrhage in the mucous membrane, both old and recent. There were signs of bilharziosis around the opening of the urethra, but no stricture was present. The openings of the ureters in the bladder were lax and patent, but the ureters themselves were dilated. Both kidneys were largely destroyed by pyonephrosis. The residual renal tissue showed acute inflammation."

II.—Note by Dr. W. H. Wilson.

At the request of Dr. Day an estimation of the urea content of the blood was made. I also examined the blood and cerebro-spinal fluid obtained *post mortem*; and kindly supplied by Professor A. R. Ferguson.

The method employed was that described by Barcroft,¹ with slight modifications, the apparatus, however, being different. For the samples of which larger quantities were available (c, d, e, f), the dried alcoholic extracts were taken up in 20 per cent. NaOH, and decomposed with hypobromite of sodium in an apparatus of the Dupré type; the usual corrections for temperature and pressure were

made; 354 mm.³ of nitrogen were taken to represent 1 mg. of urea. The evaporation of the alcoholic extract was carried out at a temperature varying between 58° and 62° C.

	Urea per cent.
(a) 84 c.mm. blood taken 2 days before death ...	0.67
(b) 112 c.mm. blood taken 3 hours before death... (This blood was taken from the finger. There being no oedema, the blood was unmixed with serous fluid.)	0.67
(c) Blood from the right side of the heart (chiefly serum) ...	0.738
(d) Serum obtained by centrifuging (c):	
First sample ...	0.745
Second sample ...	0.74
(e) Thick blood from vena cava inf. (chiefly corpuscles) ...	0.53
(f) Cerebro-spinal fluid from lateral ventricle:	
First sample ...	0.85
Second sample ...	0.84

(c) consisted of blood from the right auricle and large veins of the head and neck. Most of the corpuscles had separated out by sedimentation. The specific gravity was only 1037.

(d) was quite free from corpuscles and haemoglobin. Its specific gravity was 1036. Proteins 10.5 per cent. (approximately). The high specific gravity is partly explained by the excess of urea (to the extent of 0.0025), partly by the excess of protein.

(e) This was obtained from the inferior vena cava at the point of entrance of the left renal vein. It was very thick, resembling a magma of corpuscles. The specific gravity was not determined accurately; it was, however, over 1080.

(f) This was faintly cloudy; the specific gravity was unusually high, being 1020. It contained 0.25 per cent. protein.

In the case of the smaller samples—namely, (a) and (b) and the second determinations of (d) and (f)—the apparatus used for the hypobromite decomposition was a modification of a "micro-nitrometer" shown by me at a meeting of the Physiological Society, June, 1912. (No description of this apparatus has yet been published.) The method of extraction was similar to that used with the other samples. The percentage of urea found in the cerebro-spinal fluid by Dr. Day four days before death was approximately 0.75 per cent. Probably the actual amount was a little less than this, as it was determined by direct estimation in the Doremus ureometer.

The points of interest in the above results are:

- The large percentage of urea.
- The fact that the cerebro-spinal fluid obtained *post-mortem* contained more urea than the serum.
- That the red blood corpuscles contained a considerable amount of urea.

As regards the first point, the greatest amount of urea present in the blood in uraemia that I find recorded in the literature at my disposal is 0.585 per cent. found by von Jaksch.² Widal and Javal³ record 4 cases in which the amount varied between 0.3 and 0.5 per cent. In the case of a woman who died in Kasr el Aini Hospital two years ago the nitrogen given off from the alcoholic extract of the blood corresponded to 0.65 per cent. of urea. The blood in this case contained a considerable amount of bile pigment and probably also bile salts; the actual amount of urea was therefore no doubt less than 0.66 per cent. The maximum amount I have found in other cases is 0.4 per cent.

As regards the second point, Widal and Froin⁴ state that the urea content of the cerebro-spinal fluid is the same as that of the blood plasma; they record one case in which the percentage of urea was 0.448 in both fluids. In a case of uraemia recently examined, I found 0.337 per cent. in the blood serum and 0.316 per cent. in the cerebro-spinal fluid. In the case which is the subject of this note, Dr. Day found 0.75 per cent. of urea in the cerebro-spinal fluid, the figure being identical with that found in the blood serum *post-mortem*. In regard to the *post-mortem* material, the serum contained 0.1 per cent. less urea than the cerebro-spinal fluid, namely, 0.745 per cent. as compared with 0.85 per cent. In view of the high specific gravity of the cerebro-spinal fluid obtained *post-mortem*, a possible explanation would seem to be that some concentration of the fluid took place during the twenty-four hours which elapsed after death before the autopsy was performed.

In regard to the third point, it is generally stated that the urea of the blood is normally contained entirely in the plasma. Some figures given by Barcroft⁵ show this; I

have also found it to hold good for blood containing as much as 0.09 per cent. of urea. On the other hand, Hedin⁶ has shown that in blood to which urea has been artificially added the permeability of the corpuscles to urea is almost complete. In the case under discussion the blood corpuscles undoubtedly contained a considerable percentage of urea. In fluid (e), consisting mainly of corpuscles, there was 0.53 per cent. of urea, which is far more than could be accounted for by the small amount of plasma present. The blood taken shortly before death contained 0.67 per cent. of urea, while the serum (d) contained 0.745 per cent. Assuming that the ratio of corpuscles to plasma was the normal—namely, 40 to 60—the distribution of urea in the blood would be 0.447 parts in the serum and 0.223 in the corpuscles, giving a percentage of 0.557 in the red blood corpuscles, which is in close agreement with the amount actually determined in the magma of corpuscles (d).

The discrepancy between what is known of normal blood, the corpuscular content of urea in this case, and the permeability of the corpuscles to urea as determined by Hedin and others, is probably to be accounted for by the fact that Hedin was working with urea solutions of much higher concentration than are ever found in the blood. It is at least possible that the intrusion of urea into the corpuscles is dependent on a concentration of urea in the plasma much above the normal.

A fact of considerable interest in this case is that the blood contained apparently less than the normal amount of uric acid, certainly no more; whereas in two other cases of uraemia recently examined (in which the urea content of the serum was respectively 0.33 per cent. and 0.25 per cent.) the amount of uric acid was greatly in excess of the normal, being present to the extent of approximately 0.02 per cent. in the first of these two cases. (Both these cases were under Dr. Day's care, to whom I am indebted for the material.) Whether this fact is connected with the difference in pathological conditions present in these three cases is worthy of further investigation.

The case here detailed was one of hydronephrosis with a somewhat acute secondary inflammation of the remaining kidney substance following septic infection of the urinary tract, whereas the condition of the other two was that of contracted granular kidney with a toxic exacerbation shown by considerable albuminuria.

A fact which may also be related to the lack of uric acid in the blood was that coma was completely absent in this case of latent uraemia at the time when a specimen of blood was taken a few hours before death. In the other two patients convulsions and coma had developed, yet in the first case the serum contained no less than 0.75 per cent. of urea as compared with 0.25 and 0.33 per cent. in the latter two. I had no opportunity of personally examining the urine in either case.

The determination of the presence and a rough estimate of the amount of uric acid in the blood was made by the phosphomolybdic acid reaction with an alkaline solution of the dried alcoholic extract. The estimate was formed by comparison with a solution of uric acid of known strength treated in the same way. It is here assumed that the substance present in the blood which gave the reaction was uric acid. It may be mentioned that the only other substances present in the urine (and so conceivably present in the blood) that give this reaction are the aromatic sulphates.

REFERENCES.

- Barcroft, *Journ. of Physiology*, vol. xxix, p. 181.
- Von Jaksch, *Zeitsch. f. Heilkunde*, 1903, vol. xxiv, p. 401.
- Widal and Javal, *Semaine médicale*, 1905, No. 27, p. 313.
- Widal and Froin, *Comptes rendus de la Soc. de Biol.*, 1904, p. 282.
- Loc. cit., table on p. 186, assuming that blood and serum were from the same case.
- Hedin—quoted from *Hamburger-Osmotische Druck und Ionenlehre*, vol. i, p. 214.

DR. LÉON LABBÉ, Senator for the Orne, has again been elected Chairman of the inter-parliamentary group of members of the French Legislature (Senate and Chamber of Deputies).

At the annual meeting of the American College of Surgeons, held in Philadelphia on June 22nd, a movement was set on foot for the establishment of a permanent home of surgery in Washington, for which an endowment fund of £100,000 will be required. More than £20,000 was promised by those present within an hour. The college has now a membership of 3,200, having admitted 1,000 surgeons to fellowship at the meeting.