The effect on the heart is much more clearly shown in the next tracing (Fig. 2). In this cat we used, in place of the intestinal plethysmograph, Barnard's cardiometer attached to a Hürthle's piston recorder (c); the downstrokes represent systole; here the fall of arterial pressure was greatly prolonged; the heart is slowed; its output is increased, and there is considerable dilatation of the heart.

It is difficult to be certain of the dose of toxic material injected; so far as we were able to judge, the effect is more pronounced than what one usually obtains with choline. We made a chemical examination of the blood, and attempted to identify choline by the characteristic crystalline form of its platinum double salt. We only obtained some ill-formed crystals of a light yellow tint. The amount of material at our disposal did not enable us to do more than this. We thus obtained no positive chemical evidence of the presence of choline.

Specimens of beri-beri blood are, however, so rarely obtained, that we think it not altogether devoid of interest to record our imperfect observations; no doubt the subject will

Photomicrograph of section of heart after staining in Marchi fluid. Magnification 280 diameters.

be taken up by others whose opportunities of seeing such patients are more extensive. The disease is a nervous one, accompanied by great cardiac failure, vascular depression, and oedema. Later on, in the present case, when the patient died, a *post-mortem* microscopical examination of the tissues performed by one of us (F. W. M.) showed extensive degeneration of peripheral nerves and fatty degeneration of the muscles, including the heart. It is therefore not to be wondered at that the blood should contain a toxic material producing vascular depression, nor (remembering the nerve degeneration) that the toxic substance should be similar in its action to choline.

The accompanying photomicrograph shows the fatty degeneration of the heart in beri-beri. This specimen was obtained from the heart of a Chinaman who died of the disease. At the *post-mortem* examination there was great venous congestion and distension of the right side of the heart with dark blood. The liver, stomach, and intestines were greatly congested, and numerous hæmorrhages throughout the substance of the liver were found microscopically.

NOTES.

¹ An abstract has already appeared in the *Proceedings* of the Society, 1899. ² Naturally the alcohol was evaporated off, and the residue, dissolved in normal saline solution, was then injected.

PRESENTATION.—Dr. D. P. Fitzgerald was on July 3rd presented with an illuminated address and a travelling dressing case by the students of the Anatomy Classes of the Queen's College, Cork, with whom he had been identified for the past two years as Demonstrator. Dr. Fitzgerald has been re-appointed Demonstrator of Anatomy for the coming session.

REMARKS ON THE TREATMENT OF IMPERMEABLE STRICTURE OF THE URETHRA BY EXCISION OF THE STRICTURED SEGMENT AND SUTURE OF THE DIVIDED ENDS.*

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THE treatment of impenetrable stricture of the urethra is one of the oldest of surgical problems, for the condition to which it gives rise is grave and urgent, and the impotence of internal medication to relieve it is sufficiently obvious. The most reluctant of patients and the most sanguine of physicians are equally driven to adopt surgical measures of some kind. The object of the present remarks is to criticise the measures usually adopted, and to describe a method of treatment practised with the most satisfactory results in a case recently exhibited before the Staffordshire Branch of the British Medical Association at Wolverhampton. Although the principle of the operation is not absolutely novel, for it has already been carried out frequently on the Continent and a few times in this country, it is sufficiently little known to make it worth while to call the attention of surgeons to what is undoubtedly a more perfect and satisfactory treatment of certain cases of stricture than the operations generally practised.

Whether any stricture of the urethra is ever completely impervious to fine instruments in skilful and experienced hands is, perhaps, doubtful, although in the case related below this certainly seemed to be the case. At any rate it is a good working maxim that when urine still continues to issue through the urethra, however small the stream, given time, patience, and skill, a catheter can always be passed into the bladder. For many cases, however, the element of time is lacking, for, if there is complete retention of urine, it must be speedily relieved, or the uncontrollable expulsive efforts of the bladder will burst the dilated urethra behind the stricture, and urine will become extravasated into the loose tissues of the scrotum and abdomen.

Temporary relief of the bladder may be effected by suprapubic puncture—sometimes called suprapubic aspiration, although the use of an aspirator to relieve a violent positive pressure is absurd—or by incising the membranous urethra in the perineum behind the stricture by what is known as Cock's operation. The latter operation is now little practised, and suprapubic puncture, on account of its greater ease and certainty, is certainly to be preferred. Both these procedures are, of course, merely designed to give temporary relief.

Wheelhouse's operation, which not merely relieves the retention but deals with the stricture as well, is the operation most generally recommended and practised. It consists of an external urethrotomy, passing through the stricture from before backwards. The urethra is opened on a staff immediately on the distal side of the stricture, and a fine probe is then passed through the latter under the direct guidance of vision. The stricture is then split open backwards along the probe into the dilated urethra behind, and a full-sized catheter is then passed into the bladder and tied in.

Wheelhouse's operation is as simple in principle as it is difficult and unsatisfactory in practice. It is no easier to find the orifice of the stricture by vision than it is by touch, and cases in which the probe is easily passed could certainly be catheterised in the ordinary way. Generally the operation ends by tunnelling or cutting a passage through dense tissue until the proximal end of the urethra is reached. Even when the operation is successfully accomplished it merely leaves an artificial passage through dense cicatricial tissue, which has to be kept open by the frequent passage of dilating instruments as long as the patient lives.

For these reasons it is far better, wherever practicable, to per-

* Read before the Staffordshire Branch of the British Medical Association.

form a radical curative operation by excising the whole segment of the urethra involved by the contracting process, and to bring together and suture the normal-calibred healthy ends which are left, just as is now done in enterectomy for stricture followed by end-to-end union of the bowel. This procedure was carried out without difficulty, and with the best results in the following case.

W. G., gasfitter, aged 52, had suffered from a tight stricture for many years. About 20 years ago he underwent external urethrotomy in the Wolverhampton and Staffordshire General Hospital, and had subsequently passed catheters himself. On May 18th, 1898, he was again admitted to the hospital, having passed no urine by the urethra for 48 hours, but two pints had been drawn off by suprapubic puncture the previous day, after which the state of his tongue and pulse had improved. On admission his pulse was good, and general condition pretty fair. The finest urethra instruments, both soft and metallic, were tried, but could not be made to even enter the stricture, which began abruptly at the bulbous portion. Under ether a median incision was made from the root of the scrotum nearly to the anus, and the bulb exposed after splitting and drawing to each side the bulbo-cavernosus muscle. The stricture could then be easily felt between the finger and thumb, as a hard gristly mass about half an inch in length. The urethra was now separated from its attachment on each side, and traced back between the layers of the triangular ligament. As the membranous portion was considerably dilated and thickened behind the stricture it was easily isolated and followed back. Rather smart hæmorrhage was controlled by forceps. It was now easy to make a small longitudinal cut into the membranous urethra immediately behind the stricture, and through this a soft rubber catheter, No. 8 English size, passed at once into the bladder, and evacuated over a pint of fairly clear urine.

A second opening was now made into the urethra just in front of the stricture, and attempts were made to pass a fine probe through the stricture, but although the strictured portion was held between the finger and thumb while this was being done, it was quite impossible to find any passage. The contracted part of the urethra and about a quarter of an inch of healthy urethra at each end of it was now dissected off the triangular ligament and bodily excised with scissors, the hinder cut passing through the longitudinal cut in the membranous part. The soft catheter was then passed through the whole urethra into the bladder, and the divided ends accurately brought together by about six silkworm gut sutures, the first passing through all the coats of each end in the median dorsal line and being cut short; the remaining sutures were passed through the fibrous and spongy coats, without including the mucous membrane, and the ends were left long and brought out through the perineal wound. The bulbo-cavernosus muscle was sutured, but the skin left partly open. A Cathcart's exhausting apparatus was rigged up by the patient's bedside and attached to the end of the rubber catheter. By this means not a drop of urine escaped through the perineum for ten days, when the catheter was left out, and the patient taught to pass it himself every time he wished to relieve himself.

Convalescence was uninterrupted and free from pyrexia. The sutures gradually came away, but some only after several months, when the wound had healed all but a small sinus. A single suture still remains and keeps open a small sinus, but gives rise to no trouble, and there has never been any leakage of urine. The remaining suture is probably that which was first inserted, and cut short inside the urethra; and in any future case it would be wiser to leave all the ends long. The most satisfactory feature of the case is the complete absence of any stricture. Although there has been no passage of dilating instruments since the operation, at the present date—over twelve months since the operation—a full-sized urethral sound passes into the bladder with perfect ease.

The segment of urethra removed was preserved and exhibited. Allowing for shrinkage due to the preservative fluid, it consists of nearly an inch of the urethra at the junction of the bulbous and membranous parts. Even with the specimen in the hand, it is only with difficulty that a fine probe can be passed through the dense fibrous mass which represents what should be a tube of nearly a-quarter inch calibre.

Admitting the superiority of this operation over that of Wheelhouse or any other mode of external or internal urethrotomy, is it always practicable? I am inclined to think that there are few cases of single stricture which cannot be treated in this way, but multiple strictures situated at some distance from each other are obviously unsuited to this treatment, and the same may be said of cases in which the strictured portion of the urethral tube exceeds 2 inches in length. Such cases are, however, rare. When multiple strictures exist the actual obstruction is always at the most posterior one, which seldom involves the membranous part, or at any rate more than the anterior half inch of the latter. The membranous part is fixed by the triangular ligament, and cannot be mobilised or stretched except to a slight extent; but any part of the urethra anterior to the triangular ligament can be freed from its attachments and carried backwards sufficiently to close a gap of at least 2 inches or even more.

Even if excision of the urethra be found impracticable, it is better to seek the urethra behind the stricture by deliberate dissection and tracing back of the unopened urethral tube (a sufficiently large and recognisable anatomical structure) rather than by following a probe or sound passed through what may be, and often is, a false passage, or by trusting simply to the direction of the knife, as in Cock's operation. It is very desirable to have the whole length of the stricture and part of the urethra behind it accurately

exposed before traversing or dealing with the stricture itself. In the case related above a soft rubber catheter was passed with ease from the perineum into the bladder without any guide but moderately good eyesight and an elementary knowledge of anatomy.

NOTE ON A CASE OF OBLITERATION OF THE MALE URETHRA.

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"OBLITERATION," Sir Henry Thompson says in his work on *Stricture*, "is a different condition occasioned by different causes to that of stricture, usually, indeed, by some severe traumatic lesion. It is not common, but it is not so rare as some writers seem to have supposed who have quoted single cases by Chopart, and another by Cruveilhier, to illustrate the observation." And again he observes: "But you may have complete obliteration of the urethra, which, as before said, is not stricture. This is a very unusual condition, but it occasionally happens, and chiefly after injury in the perineum, as by perforation or severe bruise, or any wound dividing or lacerating the urethra. If the opening remains pervious, and gives exit to all the urine, a cicatrix may follow, sealing the anterior opening of the divided urethra, and obliterating the canal for a short distance in front of the fistula." This very clearly indicates the distinction which is to be drawn between the so-called impassable or impermeable strictures and the condition of obliteration.

Liston's opinion on the subject of "impermeable" stricture is too well known to need repetition. He seems to me to assume that complete obliteration results only from traumatism. As has already been stated, before obliteration can take place a fistula must have been established; nevertheless, fistulae may exist for long without the urethra becoming completely obliterated. A case is quoted by Sir H. Thompson in which no urine had passed "for years" except by numerous fistulae, yet in which the obliteration of the urethra was not complete. Erichsen cites that of a man with a very tight stricture and extravasation, on whom no catheter had been passed for eight years, and yet at the *post-mortem* examination a very minute urethral canal was found.

I use these cases to illustrate the point that the urethra stoutly and for long resists obliteration rather than to show the extent to which its resistance may be overcome, which would appear to have been the principal object of the authors.

The patient, J. W., aged 48 years, from whom I obtained the genital organs represented in the sketch, was admitted to the Park Hill Hospital, Liverpool, on December 26th, 1897, suffering from dysentery.

Condition on Admission.—He was a sailor on a steamer trading with the Southern States, and was accompanied by three shipmates all "in the same boat" as regards the dysentery. He was received in the afternoon. He made no complaint of trouble or difficulty in micturition. The day following his admission I was told that no specimen of urine could be got from him; that he was passing his water in bed. On examining him I found his penis was cedematous and swollen; there was brawny infiltration of the perineum, and on the left side of the penis an inflamed area with a dark centre, which had given way and was oozing. He said he had suffered for many years, and had been treated for stricture the result of gonorrhœa. There were some scars in the perineum, but he denied ever having had fistula, or any operation performed on him. He stated that while leaving the ship he slipped, and though he did not fall, felt a severe pain in the perineum. No instrument could be passed. The dark slough increased rapidly, and the amount of oozing increased, while factor became marked.

Operation.—The same afternoon an incision was made in the middle line of the perineum. A sound passed down to the stricture was made protrude through the perineal wound. The proximal portion of the urethra could not be found, the difficulty of its identification being aggravated by the condition of the tissues, and by the fact of its being no longer distended. Several incisions were then made on both sides of the first, and the patient was put back to bed. He expressed himself as much relieved.

Death.—The combination of dysentery with urinary extravasation was, however, too great a strain on his vital forces, and he died on January 9th, 1898.

On removing the lower urinary tract I was able to pass a catheter down to the stricture and out through the opening which had been made at the operation, and with some difficulty to pass another through the proximal portion of the urethra from the bladder out through the rupture. Anxious to see what the lumen of the urethra was like at the stricture, I cut the corpus spongiosum across in front of the proximal