THE REMOVAL OF A FIBROID FROM A UTERUS UNICORNIS IN A PAROUS SUBJECT.

By ALBAN DORAN, F.R.C.S.,

President of the Obstetrical Society of London; Surgeon to the Samaritan Free Hospital.

THE case which I am about to relate is of interest owing to its rarity, and to the fact that the half of the uterus opposite to that which bore the tumour was so well developed as to have been twice the seat of pregnancy. It illustrates also surgical considerations of importance to the operator in relation to the management of the pedicle during the removal of such a tumour.

F. B., aged 38, a patient of Mr. W. C. Aylward, of Tunbridge Wells, was admitted into the Samaritan Free Hospital under my care on December 21st, 1898, suffering from a painful pelvic tumour. She was fairly nourished, but weak, and had never been the subject of any serious illness. She had been married for eight years. Five years ago she was delivered at term by forceps, the child is yet alive. The precise reason for the use of instruments could not be ascertained, but under the circumstances atony of the uterus seems very probable. The uterus, after recovery, began to prolapse, then she consulted Mr. Aylward, who applied instruments to support it.

About a year ago he detected a painful swelling in the hypogastrium. Then she once more became pregnant, and on November 14th, 1898, aborted at the second month for no apparent reason. Ever afterwards she suffered from much pelvic pain, and worried because she understood that she had a tumour. The temperature ranged during the last fortnight before operation from 97.4° to 99.8°, the pulse never exceeded 84. The catamenia had always been regular, but recently were accompanied by sharp pain referred to the right iliac fossa. Since the miscarriage one period with very free show had occurred.

The uterus was extremely anteverted; its cervix was small, but fairly long; and its cavity $3\frac{1}{2}$ inches. In the right fornix was a hard oval mass, freely movable, and separate from the uterus, as far as I could detect by bimanual palpation. The vagina was perhaps rather narrow, there was no indication of a septum.

On January 3rd, 1899, I operated, assisted by Mr. Corrie Keep. The patient was placed in the Trendelenburg position. The left appendages appeared healthy, a slight adhesion bound down the ovary; I set it free, and then was able to draw up the anteverted uterus, so as to get a good view of the parts. The right tube and ovary sprang from the outer aspect of a tumour of the size of a hen's egg. A very stout and long round ligament, much larger than its normally attached fellow on the left side, also arose from the outer part of the tumour. Internally the tumour was connected with the uterus by a broad band. This band had a free border above, but was continuous with the broad ligament below. The uterus seemed almost regular in shape, but was slightly truncated to the right; the cervix was quite distinct from the tumour. (Fig. 4 indicates the relations as seen at the operation.)

The ovarian artery and veins were large. On drawing up the right appendages I detected a large, tortuous, pulsating artery running from below into the outer side of the tumour. This was, of course, the right uterine artery. I took especial care to securely ligature these large vessels. I tied the ovarian vessels first, then transfixed the band connecting the tumour to the uterus close to the latter, and threaded one end of the ligature through the serous coat investing the band, lest this inner ligature should slip. I next secured the uterine artery, as in a retroperitoneal hysterectomy, and tied the silk firmly. Then I transfixed the broad ligament below the tumour, and tied, crossing the ends. But the pedicle was evidently very short, so I cut round the capsule of the tumour well above the ligatures, and enucleated it; the ligatures were then all drawn tight except that round the uterine artery, already secured. The vessels were very large for so small a tumour. I sewed the cut edges of the capsule over the raw surface of the pedicle. Some

omentum was then resected. The abdominal wound was closed with deep interrupted silkworm-gut sutures, the anterior sheath of the recti with continuous catgut. Convalescence was rapid. The patient was in good health four months later, and menstruated regularly.

Ligatures round a short pedicle with dilated vessels are especially apt to slip. For that reason I took great care to provide against so serious an accident. The pedicle being thus secured, no other source of peril remained. On that account I sutured the sheath of the recti separately. When an abdominal operation is lengthy or otherwise severe, I dispense with this procedure, as I know that the danger of hernia of the cicatrix when deep interrupted sutures alone are employed is not so great as to justify the increase of risk by prolonging the operation. The wound was well supported by strapping, a precaution which I always take, and it is just in cases like the present where the parietes are unstretched that hernia is most probable, and yielding of the wound during convalescence not improbable.

This case was clearly an instance of uterus unicornis, with a rudimentary second cornu connected by an impervious band with the well-developed side which had twice borne a foetus. The rudimentary cornu had become the seat of a

myoma. For recent theories on malformations of this kind and their association with fibromyomatous growths, Dr. Falk's recent contribution should be consulted.

The specimen which I removed is preserved in the Museum of the College of Surgeons. The appended drawings (Figs. 1 and 3) are from photographs of the specimen. The diagrams (Figs. 2 and 4) will serve to make them clearer. The tumour forms an almost spherical body. The Fallopian tube runs into it; anterior to the tube and a little lower the stump of the right round ligament is seen attached to

Fig. 1.—The tumour and the right appendages seen from the front.

the outer aspect of the tumour. The ovary, well-developed, hangs from below and behind the cut surface of the broad ligament. No trace of the band which connected the tumour with the uterus is seen, as it was cut away, with part of the capsule of the tumour itself, during the process of enucleation already described. In the lower part of the tumour laid bare by the enucleation the uterine vein and artery are visible. It is difficult to understand why they were so large. Posteriorly the ovarian ligament runs into the tumour. The cut surface of the tumour, where a piece was excised for examination (Fig. 3) presents the naked-eye appearances usually seen in a section of a uterine fibroid.

The sections of the tumour prepared for examination showed that it was almost entirely made up of plain muscle cells. The fibrous tissue between the bundles of cells was scanty. The walls of the blood vessels were well-developed. The muscle cells were arranged very regularly in large bundles, more as is seen in the normal uterine wall than in a uterine "fibroid." This feature is interesting when the seat of the growth in this case is remembered.

Strictly speaking, the above case should be described as myoma in the undeveloped cornu of a "uterus unicornis." I

apply the term as defined by Dr. Ballantyne in his article on Malformations of the Genital Organs in Woman.² This condition "may exist with or without a rudimentary second horn." The well-developed cornu, in my case, not only opened into a normal vagina, but proved capable of bearing a foetus to term. The undeveloped cornu bore no cavity; it consisted of a mere band in which the fibroid developed. Possibly the tumour arose in a thickening of the cornu, which had always existed; as I have observed in a specimen³ where the right cornu is reduced to a small fusiform structure, to which the round ligament, ovarian ligament, and Fallopian tube are attached. Had there been a cavity in the cornu, communicating with the Fallopian tube, a foetus might have developed in it. Luschka, Turner, Remfry, Campbell Pope and others have described abnormal gestation in an undeveloped cornu of a uterus unicornis. The presence of the round ligament on the exterior aspect of the tumour or foetal sac distinguishes this condition from myoma or ectopic pregnancy in the Fallopian tube. The existence of an impervious band between the tumour or foetal sac and the well-developed cornu distinguishes the condition under discussion from fibroid or pregnancy in one cornu of a uterus bicornis unicollis. By that term it should be understood that there are two distinct cornua, both usually well developed, with cavities opening into a common cervix. Hence the malformation was "uterus unicornis," and not "uterus bicornis unicollis" in the four cases of abnormal gestation quoted above. In each of the well-known drawings of Luschka's and Turner's cases the band between the foetal sac (which is the undeveloped cornu) and the more developed half of the uterus is clearly represented, and the relation of the sac to the round ligament carefully indicated. In Remfry's case the foetal sac was

attached to the remainder of the uterus by a pedicle "no thicker than that of an ordinary ovarian cyst. On passing the hand down into the pelvis the right portion of the uterus, with its Fallopian tube and round ligament, was felt curving towards the right side." The relations of the sac to the round ligament and Fallopian tube settled the nature of the malformation. Campbell Pope's case, which I examined, is classed as "uterus bicornis unicollis." But the foetal sac was "connected to the left side of the uterus by a pedicle $1\frac{1}{4}$ inch in length." Again, "From the lower part of the anterior surface of the cyst hung the left appendages, which appear to have no direct connection with the uterus."

As a contrast with these four cases I may note Dr. M. Handfield-Jones's "Case of Double-Bodied Uterus," where "the cervix was wide and bulky.....with its upper margin two distinct corpora uteri were continuous. The left corpus uteri was that in which pregnancy had occurred." Thus we here have a true sample of "uterus bicornis unicollis."

I find that a case precisely like that which is the subject of the present paper is very rare. The best example is Dr. Amand Routh's.⁴ The history was very obscure, the patient, pregnant for the first time, passed a decidual cast after sym-

ptoms of shock. Two tumours were detected in the lower part of the abdomen, and they diminished in size after rest. The patient lived for over two years after the shedding of the cast and died of phthisis.

As in my own case, there was a distinct band between a large firm tumour and the half uterus. The relations of the Fallopian tube and round ligament settled the question of the nature of the malformation. Some doubt remained, however, in the opinion of Dr. A. Routh as to the nature of the tumour. He suspected that it might be a foetal sac in the malformed cornu, the solid matter in its interior being products of conception altered by time. Dr. Walter Griffith, however, found that it was a myo-fibroma.⁵ The acute symptoms probably signified abortion from the opposite cornu of the uterus. I shall return to the subject of a parous single cornu.

Gebhard notes that, though a malformed uterus is not rarely the seat of a myoma, this condition has only been once recorded in uterus unicornis. He refers to Snegurief's case. Nine cases of myoma in uterus bicornis⁶ (1 in uterus didelphys and 1 in uterus subseptus) have been observed. Pick and Falk have dwelt on the liability of malformed uterus to myoma.

Snegurief's case occurred in a married woman, aged 40, with

atresia. A fibromyoma of the size of a foetal head was removed by operation; it grew in the right cornu, and Eberlin's drawing shows the relations of the growth to the rest of the uterus and the Fallopian tube and round ligament. But the left segment of the uterus was even less developed. Hence the malformation was far greater than in mine. It was rather "uterus bipartitus," a more rudimentary type than "uterus unicollis." Mangiagalli's case was very similar, a tumour was enucleated, a tube and rudimentary ovary sprang from its capsule. On the side opposite

Fig. 3. The tumour and the right appendages seen from behind. The ovarian ligament runs into the outer aspect of the tumour, into which a section has been made more internally to show the structure of its interior.

to the tumour was a fibrous cord, a rudimentary cornu, also bearing an ovary and tube. The patient died from hæmorrhage on the second day. The case is classified as "fibroma in a uterus unicornis."

The condition is clearly very rare. My own case and Dr. Routh's seem the only examples where the oppos. and Dr. was capable of gestation; my patient had twice b. ovum nant, once to term. een preg-

Uterus unicornis, as has been shown, is more often associated with pregnancy in the cavity of the ill-developed cornu. But in my case there was no such cavity. Over eighty years ago Dr. Granville described a case of gestation in the well-formed cornu of a uterus unicornis. The drawing, which was published with his report, has been freely copied in more modern works. Frank,⁷ of Altona, has just recorded a case of uterus unicornis in a parous woman. The left cornu, ovary, and tube, were absent and the left kidney lay on the pelvic brim.

The new growth in my patient was so small that I should have watched the case rather than operate when I did had it not been for the painful dragging sensations which harassed the patient. The prolapsing of the well-formed cornu was

probably due to the defects in development of the supporting structures which were insufficient to keep it up after the first pregnancy. At the operation I observed that it was completely anteverted and thick-walled. Its cavity measured three and a-quarter inches. Many a normally developed uterus in this condition cannot be maintained at its right axis and level by its well-developed supports.

It is easy to understand that the catamenia were regular, for one cornu had proved competent to bear a child to term, and to deliver it with a little assistance. Uterus unicornis is so rare and its variations (from almost total absence of any trace of the suppressed cornu to the presence of a cavity in that cornu) so indefinite that no sound conclusions can be drawn from the collected catamenial histories of recorded cases. The cases where atresia vaginæ is associated with hæmatometra of one cornu are in this respect the gravest.

The bulky uterus, which seemed to be well-developed when examined bimanually, and the history of two pregnancies ending without any phenomenon more abnormal than an abortion deceived me as to the true nature of this case. The hard mass puzzled me. Altogether it seemed very like the myoma of the ovary which I had removed over a year pre-

Fig 2

Fig. 2.—Diagram explanatory of Fig. 1. T, tumour; Ut. ped., portion of the capsule of the tumour divided in separating it from the uterus; B. t., base of tumour enucleated from the lowest part of its capsule; R. ut. ves., right uterine vessels; R. r. l., right round ligament; R. f. t., right fallopian tube; Ov. f., ovarian fimbria of tube; R. b. l., right broad ligament; the layers are seen separated by much connective tissue in which the dilated ovarian vessels run; R. ov., right ovary.

viously.⁸ This, like the tumour in the present case, caused severe bearing-down pains. In cases of this kind of uterine malformation complicated with atresia, a fibromyoma of a cornu has been taken for a hæmatometra and a hæmatometra of a cornu for a pelvic tumour (Eberlin).

Whilst for reasons given above a fibroid of an undeveloped uterine cornu is rarely if ever accurately diagnosed, there should be no hesitation about recognising its true character when it is exposed by an abdominal incision. Contrary to what is the case with so many other types of pelvic tumour, the larger it grows the more evident do its relations become, nor are they likely to be obscured by inflammatory changes. Its firm texture and its relation to the uterus indicate that it is pathologically a myoma before the fact is proved by microscopic examination. When the operator has recognised the teratology of his case, all that remains for diagnosis is to be sure that the cornu is not the seat of a hæmatometra or of a foetus and its membranes.

When there is a distinct band between the tumour and the other half of the uterus, as in my case, that other half should be saved and the band treated as the pedicle in ovariectomy. This has been successfully done in one case, at least, of gestation in an undeveloped cornu, though the patient died from another cause. In my case I left behind a cornu which had already been twice impregnated, and which bore a normal tube and ovary.

The operation, however, though not difficult, is not safe if treated as a trifle on the mere fact that it is relatively easy. Mangiagalli lost his patient from hæmorrhage on the second day; yet the opposite cornu was very ill-developed, so that specially large arteries were not to be expected. In my case the opposite cornu functioned naturally, and a very large serpentine uterine artery with big veins ran into the lower part of the tumour externally. I saw at once that simple ligature and division of the pedicle, unusually broad for so small a tumour, would be very unsafe.

The tube and ovary should certainly be removed in a case of this kind, as they are useless and a source of danger from possible future ectopic gestation due to extrauterine migration of the ovum from the opposite side, a well-known phenomenon in cases of pregnancy in a cornu unconnected with the cervix. When atresia of the opposite cornu is detected, it is probably best to amputate the entire uterus above the cervix, as Sutton recommends in all cases of hæmatometra.

In conclusion, this operation of retroperitoneal hysterectomy is safest when a myoma in a "uterus bicornis unicollis," properly so-called, is detected. Gow successfully performed this operation in his case. The fold of peritoneum which sometimes passes between two well-formed and well-separated cornua (recto-vesical ligament) may give trouble. Neither in a case like this nor in a case of tumour in uterus unicollis like mine, is panhysterectomy advisable. The malformation may involve displacement of the ureters, and other important

Fig 4

Fig. 4.—Sketch showing the relations of the tumour as seen at the operation. T, tumour; L. 1/2 ut., left half of uterus; P, pedicle connecting tumour to half uterus; R. f. t., right fallopian tube; L. f. t., left fallopian tube; R. r. l., right round ligament; R. ut. a., right uterine artery; its serpentine course is indicated; the dotted line shows the outline of the tumour in the broad ligament whence its base was enucleated (see Fig. 2, B. t.); B. l., bladder.

structures out of sight, to an extent impossible beforehand to determine, thus rendering that operation very perilous. In retroperitoneal hysterectomy the operator can see what he is about to divide with the knife.

NOTES AND REFERENCES.

¹ Abnormal development of the round ligament on the undeveloped side appears to be the rule in uterus bicornis. ² Allbutt and Playfair's *System of Gynecology*, p. 79. ³ No. 367A. Museum of St. Bartholomew's Hospital. As in my case the left half of the uterus is normal. Meyer, Pick, and Falk dwell on the part which the ligament appears to play in producing this malformation. ⁴ A good drawing of the specimens is to be found in *Trans. Obst. Soc.*, vol. xxix, p. 58; the specimen itself is in the museum of St. Bartholomew's Hospital, No. 300A. ⁵ *Loc. cit.*, pp. 2-4. ⁶ See also Gow's case, Cystic Intraligamentous Myoma with double Uterus (Uterus bicornis, the cornua communicated at the os internum). *Trans. Obst. Soc.* vol. xl, 1898, p. 134. ⁷ *Centraltbl. f. Gyn.*, May 20th, 1899. ⁸ Ovarian Tumours simulating Inflamed Ovaries including a case of Ovarian Myoma. *Edin. Med. Journ.*, vol. lxxiii, N.S., 1898, p. 449. (The myoma is represented at pp. 455-456.)

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THE SOLVENT ACTION OF CERTAIN BRITISH AND FOREIGN MINERAL WATERS ON THE BIURATE OF SODIUM.

By WILLIAM BAIN, M.D., M.R.C.P.,

Harrogate.

[From the Physiological Laboratory, St. Thomas's Hospital, London.]

ADMITTING the therapeutical value of biurate solvents in cases of gout, it seems reasonable to test the solvent power of accredited remedies *in vitro*. Experimenting on these lines, Sir Wm. Roberts, and more recently Dr. Luff, found that the admixture of a small quantity of sodium salts with blood serum containing biurate diminished the solubility of the latter. Dealing with 100 c.cm. of distilled water containing an excess of biurate, it was shown that less biurate was dissolved in the presence of a sodium salt than in its absence. The inference drawn from these experiments was that mineral waters containing the smallest percentage of sodium salts were the most beneficial in the treatment of gout. There is, however, a consideration which makes it necessary to accept such an inference with caution. It should be remembered that mineral waters are not simple saline solutions, but may contain one or more substances counteracting the influence of the sodium salts on the solubility of the biurate. This objection is exemplified by the action in the laboratory of the mineral ash of spinach, as indicated by Dr. Luff, such ash being specially solvent, although its percentage of sodium salts is high. Dr. Luff, in his suggestive book, has given a list of mineral waters considered by him to be most suitable for the removal of the biurate deposited in the tissues in cases of gout, and has arranged them according to the proportion of sodium salts they contain.¹ To such a list this objection, if valid, must apply.

To test its validity I have carried out a series of experiments closely following the methods adopted by Dr. Luff:

The biurate of sodium was prepared in accordance with Sir William Roberts's instructions: 10 grams of uric acid and 10 grams of bicarbonate of sodium were added to a litre of distilled water. The mixture was boiled for half an hour, filtered, and the filtrate allowed to stand for twenty-four hours. The precipitate was then collected, washed with cold distilled water, and dried at 38° C.

In the first set of experiments six stoppered bottles, each having a capacity of 200 c.cm. were used, the size being important owing to the necessity for agitation.

No. 1 contained 100 c.cm. distilled water.

No. 2 contained 0.5 per cent. of a mineral water, plus 99.5 per cent. of distilled water.

No. 3 contained 1 per cent. of a mineral water, plus 99 per cent. of distilled water.

No. 4 contained 3 per cent. of a mineral water, plus 97 per cent. of distilled water.

No. 5 contained 5 per cent. of a mineral water, plus 95 per cent. of distilled water.

No. 6 control similar to No. 5.

An excess of biurate was added to the first five bottles. They were then placed in a warm chamber in pairs, at intervals of twenty minutes, and agitated an equal number of times; No. 6 was not agitated. The chamber was kept at a temperature of 38° C. by a gas regulator. When the door of the chamber was opened there was a temporary fall of about 2°. After a period of five hours the bottles were removed in the same order, the successive intervals being taken up by the processes of filtration and titration. Their contents were passed through double filters until clear solutions were obtained and refiltered; 50 c.cm. were then taken and made up to 100 c.cm. with distilled water. To this 20 c.cm. of sulphuric acid were added, and the mixture titrated with 1 in 10 normal standard permanganate solution.

In no two experiments did the distilled water dissolve exactly the same amount of biurate. This was anticipated, as it is next to impossible for the conditions to be precisely similar in any two of these experiments, but the variations lay within narrow limits. Proportionate variations in the same direction occurred with the mineral waters; that is to say in a given experiment when the result with distilled water was above the average, the result with the mineral water

was above the mean and *vice versa*; consequently the average of the figures obtained with distilled water has been taken as a basis and the other results brought into uniformity. Finding that the higher percentages of all the waters used diminished the solubility of the biurate, 1 per cent. has been selected as being the most appropriate for illustrative purposes. Objection may be raised to this percentage as being too high, but taking magnesia water as an example it should be noted that it only contains 2 per cent. of total solids, an amount reduced experimentally to 0.002 per cent.

TABLE I.—Showing the Solubility of Sodium Biurate in 100 c.cm. of Distilled Water, at a Temperature of 38° C., and in Distilled Water containing 1 per cent. of the different Mineral Waters.

Solvent.	Sodium Biurate Dissolved.
	Per 1,000.
Distilled water	1.110
Magnesia water, Harrogate	1.100
Beckwithshaw water, Harrogate	1.080
St. Ann's well, Buxton	1.075
Source Pavillon, Contrexéville	1.068
Teplitz	1.060
Celestin spring, Vichy	1.050
Mild Montpellier, Harrogate	1.020
Morrison well, Strathpeffer	1.010

It should be stated that the quantity of permanganate solution required to produce the end reaction in a control experiment was deducted in due proportion from the amount reduced in the titration process of the experiments with 1 per cent. of the different mineral waters before the figures in the above table were computed.

Several experiments were undertaken to determine the effect of agitation upon the solubility of the biurate. Considering what a very insoluble substance biurate is, the influence of agitation was very marked. Providing the temperature did not vary, it was found that as much biurate was dissolved in five hours with frequent agitation as in ninety-three hours without agitation.

In a second series of experiments distilled water was replaced by artificial blood serum which reacts with biurate similarly to natural blood serum. One per cent. only of the waters was experimented with and the bottles were left in the warm chamber for 20 hours, otherwise the experimental conditions were similar in the two series. A bottle containing artificial blood serum alone was always placed with each set of bottles in the warm chamber. As the artificial blood serum nearly always varied slightly in its solvent effect in the different experiments the average has been again taken, and the solvent power of each mineral water estimated accordingly. The results obtained with this medium showed even less comparative variation in the solvent power of the mineral waters used than with distilled water. With both media most of the experiments were repeated.

TABLE II.—Showing the Solubility of Sodium Biurate at a Temperature of 38° C. in 100 c.cm. of Artificial Blood Serum, and in Artificial Blood Serum containing 1 per cent. of the undermentioned Mineral Waters.

Solvent.	Sodium Biurate Dissolved.
	Per 1,000.
Artificial blood serum	0.104
Magnesia, Harrogate	0.102
Beckwithshaw, Harrogate	0.100
St. Ann's Well, Buxton	"
Sulis Water, Bath	"
Royat	"
Source Pavillon, Contrexéville	"
Elizabeth Brunnen, Homburg	"
Gichtwasser, Wiesbaden	"
Vittel	"
Ems	"
Teplitz	0.099
Bakocz, Kissingen	"
Celestin Spring, Vichy	"
Choussy-Perrière, La Bourboule	0.097
Marienbad	"
Morrison Well, Strathpeffer	0.096
Carlsbad	"