March 3rd, 7.30 P.M.: 50 c.c. of same mixture. 2 drops acid.
 March 8th, 8.30 P.M.: A few scattered crystals.
 March 13th, 8 P.M.: Crystals enlarging. No general deposit.
 March 22nd, 10 A.M.: Crystals enlarging. No general deposit.
 March 3rd, 7.30 P.M.: 50 c.c. of same mixture + 3 drops acid.
 March 4th, 10 A.M.: Uric acid deposit doubtful.
 March 4th, 4.30 P.M.: Uric acid deposit distinct.
 March 3rd, 7.30 P.M.: 50 c.c. of same mixture + 4 drops acid.
 March 4th, 10 A.M.: General uric acid deposit.

C. (Non-fruit period), more acid urine.

March 4th: 220 c.c. urine (Feb. 25th to 27th), 11 c.c. water. 7.10 P.M., 50 c.c. of mixture + 1 drop acid.

March 5th, 10 A.M.: Uric acid deposition begun.

March 4th, 7.10 P.M.: 50 c.c. of mixture + 2 drops acid.

March 5th, 10 A.M.: General uric acid deposit.

March 4th, 7.10 P.M.: 50 c.c. of mixture + 3 drops acid.

March 5th, 10 A.M.: Uric acid deposit abundant.

March 4th, 7.10 P.M.: 50 c.c. of mixture + 4 drops acid. 8.30 P.M.: Distinct uric acid deposit.

March 3rd, 7.30 P.M.: 50 c.c. of same mixture. 2 drops acid.

March 22nd, 10 A.M.: No deposit.

March 3rd, 7.30 P.M.: 50 c.c. of same mixture + 3 drops acid.

March 4th, 10 A.M.: Deposit doubtful.

March 4th, 4.30 P.M.: Deposit distinct.

March 3rd, 7.30 P.M.: 50 c.c. of same mixture + 4 drops acid.

March 4th, 10 A.M.: General deposit.

D. (Date period), less acid urine.

March 4th: 220 c.c. urine (Feb. 22nd to 23rd), 11 c.c. decinormal H_2SO_4 . 7.10 P.M.: 50 c.c. of mixture + 1 drop acid.

March 5th, 10 A.M.: Uric acid deposit but apparently rather less abundant than in corresponding specimen of Feb. 25th to 27th.

March 4th, 7.10 P.M.: 50 c.c. of mixture + 2 drops acid.

March 5th, 10 A.M.: deposit general.

March 4th, 7.10 P.M.: 50 c.c. of mixture + 3 drops acid.

March 5th, 10 A.M.: deposit abundant.

March 4th, 7.10 P.M.: 50 c.c. of mixture + 4 drops acid. 8.30 P.M.: Deposition begun but amount seems rather less than in urine of Feb. 25th to 27th.

Experiment 2.

A. (Non-fruit period), more acid urine.

April 16th: 220 c.c. urine (Feb. 28th to March 1st), 6 c.c. NaOH decinormal. 9.15 P.M.: 50 c.c. of mixture, 1 drop acid.

April 20th, 9.15 P.M.: No deposit of uric acid.

April 16th, 9.15 P.M.: 50 c.c. of mixture + 2 drops acid.

April 20th, 9.15 P.M.: No uric acid deposit.

April 16th, 9.15 P.M.: 50 c.c. of mixture + 3 drops acid.

April 19th: No deposit. One drop more acid added.

April 20th, 9.15 P.M.: Four uric acid crystals.

C. (Orange period), less acid urine.

April 16th: 220 c.c. urine (March 4th-6th) 6 c.c. H_2SO_4 decinormal.

April 16th, 9.15 P.M.: 50 c.c. of mixture + 1 drop acid.

April 20th, 9.15 P.M.: No uric acid deposit.

April 16th, 9.15 P.M.: 50 c.c. of mixture + 2 drops acid.

April 18th, 5.15 P.M.: 3 uric acid crystals.

April 20th, 9.15 P.M.: 7 uric acid crystals.

April 16th, 9.15 P.M.: 50 c.c. of mixture + 3 drops acid.

April 17th, 8.25 P.M.: Deposition of uric acid begun.

B. (Orange period), less acid urine.

April 16th: 220 c.c. urine (March 4th to 6th), 6 c.c. water. 9.15 P.M.: 50 c.c. of mixture, 1 drop acid.

April 20th, 9.15 P.M.: No deposit of uric acid.

April 16th, 9.15 P.M.: 50 c.c. of mixture + 2 drops acid.

April 20th, 9.15 P.M.: No deposit.

April 16th, 9.15 P.M.: 50 c.c. of mixture + 3 drops acid.

April 17th, 5.15 P.M.: A uric acid crystal here and there.

April 19th: One drop more acid.

April 20th, 9.15 P.M.: Crystals larger; few, if any, fresh ones.

D. (Non-fruit period), more acid urine.

April 16th: 220 c.c. urine (Feb. 28th to March 1st), 6 c.c. water.

April 16th, 9.15 P.M.: 50 c.c. of mixture + 1 drop acid.

April 20th, 9.15 P.M.: No uric acid deposit.

April 16th, 9.15 P.M.: 50 c.c. of mixture + 2 drops acid.

April 18th, 5.15 P.M.: 1 crystal.

April 20th, 9.15 P.M.: 2 crystals.

April 16th, 9.15 P.M.: 50 c.c. of mixture + 3 drops acid.

April 18th, 8.25 P.M.: Deposition begun.

The precipitation of uric acid evidently runs the same course in specimens containing equal amounts of this substance in both the fruit and non-fruit periods, provided that the degree of acidity is the same. If further confirmation of this were needed it is afforded by a comparison of the amount of acid required to cause precipitation with the normal acidity of the urine in the two periods in those cases in which the amounts of uric acid are exactly or nearly alike (Table III.). In only one case, the last, do the numbers differ from each other by more than corresponds to one drop of the acid used for precipitating (= 1.2 cubic centimetres decinormal); and this correspondence is as close as can be expected to occur. It would be closer in proportion to

the degree of dilution of the acid used for precipitating. In the exceptional case in which the numbers are 11.6 and 10.2 I was in doubt whether to consider the precipitation as caused by one drop or by two drops of acid, for with one drop precipitation had really begun, but there were only five small crystals visible with the pocket lens, while on the following day the precipitation was general—one drop was less than was required and two drops were more. Had I taken one instead of two as the efficient number the figures would have been 10.4 and 10.2. It may be maintained, therefore, that the effect of the several fruits used in this experiment in lessening the precipitability of the uric acid is due essentially, if not wholly, to the diminished acidity of the urine.

Conclusions—1. Pears, fresh figs, grapes, dates, and oranges may be taken not only with impunity but with distinct advantage by those who suffer from uric acid calculus and gravel. 2. The beneficial effect, which will be, *ceteris paribus*, in proportion to the amount taken, is due essentially, if not entirely, to the lessened acidity of the urine. 3. Marmalade does not raise the precipitability of the uric acid, though in the quantity likely to be taken it fails to produce the opposite effect, probably because the amount of fruit pulp is insufficient for that purpose.

If it should be suggested that the effects described above are not necessarily those which would be seen in patients suffering from uric acid calculus and gravel, I would reply that I can produce in myself uric acid gravel at will, not for a day or two only but for long periods, by taking a suitable diet for the necessary time, while experiments on a friend led to a similar result. When fruit disagrees—i.e., deranges the digestion—it would, of course, like any other article of food acting in a similar manner, not be prescribed. The experiment is being extended to other varieties of fruit and to some substances other than fruit.

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EXPERIENCES OF THE TREATMENT OF THE CANCEROUS CERVIX UTERI BY THE ABDOMINAL ROUTE, WITH PELVIC DISSECTION.¹

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IN the treatment of cancer of the cervix uteri a new phase is looming large on the British gynaecological horizon, and I have thereby been encouraged to bring before you shortly my experiences of the so-called radical operation. The brief time at our disposal does not permit of mention of all the problems involved and I therefore propose to consider chiefly the operative aspects of the subject.

In the first place I venture to remind you of certain anatomical details connected with the pelvic course of the ureters and with the lymphatic vessels passing from the cervix uteri to the glands lying in the pelvic connective tissues. The ureter, the pars pelvica, 12 centimetres in length, extends from the pelvic brim to the bladder. It is subdivided into pelvic and vesical portions, but this is of no importance from the operative point of view. The ureter is inclosed in a sheath of loose connective tissue in which course the special nutritive vessels. These vessels are:—1. The superior ureteric artery, which springs from the ovarian artery as it crosses the ureter in the abdomen and runs downwards, dividing into branches. 2. The inferior ureteric artery or arteries, derived either from the uterine as it crosses the ureter or from the vesical artery. These latter pursue an upward course. Having an independent vascular supply the ureter can be separated from its connexions without ill result provided the vascular sheath be left intact.

The ureter can be readily found by its relation to the internal iliac artery. Division of the infundibulo-pelvic ligament close to the brim results in the formation of a diamond-shaped gap. Gentle stroking of the exposed connective tissue with a finger converts this gap into a cavity which is bounded externally by the artery and internally

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usually by the ureter. If the posterior lamella of the broad ligament be hooked up by a finger placed behind it, the ureter will be found running across the palmar surface. From this point its course is mainly forward through the base of the broad ligament at a varying distance from the cervix. It may hug the latter closely or remain at a distance of one and a half inches. In nearly all cases it passes through a well-defined fibrous tunnel to the walls of which it is connected by loose cellular tissue that readily permits the ureter to be shelled out of its tunnel. Even when the broad ligament is infiltrated by cancer it is sometimes possible to turn the ureter with its vascular sheath cleanly out of a tunnel, the outer surface of which is intimately attached to the diseased tissues.

The lymphatics passing from the mucous and muscular coats of the cervix finally unite into two or three main trunks which open into one or more small glands situated in the parametric tissues close to the cervix. Each of these trunks has a diameter equal to that of the uterine artery and is provided with valves the concavity of which is directed outwards. Under pressure these valves become incompetent. After passing through the parametric glands the main lymphatic trunks are joined by the lymphatics from the upper part of the vagina. They then accompany the uterine artery until they terminate in the glands lying along the internal iliac artery. The largest gland lies in the bifurcation of the common iliac and one or more are situated beneath it, whilst below these, in close relationship to the branches of the internal iliac artery, lies the gland which receives the lymph channels from the middle portion of the vagina which course upwards with the vaginal artery. Sometimes a gland is found near the origin of this set of vessels in close relation to the recto-vaginal septum. The cervical lymphatics communicate with the gland lying immediately beneath the entrance to the obturator canal and also with the sacral glands which lie on the antero-lateral aspect of the sacrum. Unless enlargement of these glands exists recognition by vaginal, rectal, or abdominal palpation is not possible. Enlargement of a gland does not necessarily imply that it is cancerous, whilst a cancerous gland is not necessarily enlarged. A notable point is that in quite a number of cases no glands are to be found, normal or otherwise. Döderlein, for example, was unable to find glands in eight out of 26 cases. In my own cases careful search failed to reveal them in four out of ten cases. On the other hand, Wertheim found glands in every one of 80 cases.

Opportunity may be taken at this point to mention that recent investigations have shown that cancerous extension may take place along the lymphatics of the branches of the sacral plexus of nerves. Cancer cells have been found invading peri-, epi-, and endo-neuria, in some cases only fortunately, otherwise operative interference in cancer of the cervix would be wellnigh hopeless.

The abdomen is opened by an incision extending from the pubes to the umbilicus and the patient is placed in the Trendelenburg position, without the aid of which the operation would be impossible. All free intestine is cleared out of the pelvis and retained in the upper part of the abdomen by careful packing with a sterilised towel or pad. Visual and digital exploration of the pelvic organs follows. It is especially advisable to examine carefully the cervico-vesical septum, the utero-sacral folds, and the regions which the pelvic glands occupy. The first is of greatest importance, as while slight involvement merely modifies the procedure somewhat a greater degree would call for abandonment of the operation.

As a rule, the mobility of the uterus proves greater than appears to be the case bimanually and when the assistant makes traction upon it by means of a pair of Museaux forceps the infundibulo-pelvic and round ligaments are in turn readily made tense. With this help each of these ligaments is secured by double ligatures placed as close to the pelvic brim as possible and the portions lying between the ligatures are divided with scissors. The four gaps thus created are connected by division of the intervening peritoneal areas, the incision which passes from one round ligament to its fellow coursing along the bottom of the utero-vesical pouch. The cut peritoneal edges retract inwards and outwards, leaving exposed the lateral and anterior borders of the parametric tissues. The uterus being drawn upwards and backwards, separation of the bladder from the cervix and vagina is effected with the finger. The uterus is then drawn forwards and attention is directed to the ureters.

Generally, the left ureter is first exposed and separated from the internal iliac artery and the connective tissues on its outer aspect; this allows the ureter to be drawn gently inwards. The internal iliac artery is dissected bare of investing tissues and ligatured about its middle. The same steps are carried out on the opposite side, so that under ordinary conditions it is now possible to work freely in the pelvic connective tissues with the minimum of bleeding. Whether one proceeds on the right side or the left is a matter of indifference; I generally select the left.

The left ureter is traced forwards, care being taken not to separate it from the posterior lamella of the broad ligament until it actually turns forward in earnest. With the help of two pairs of dissecting forceps the ureter is shelled out of its tunnel, the peritoneum of the broad ligament being pushed inwards during the process and the connective tissues being torn through in a direction upwards and outwards, so that when the point of entry into the bladder wall is reached the ureter can be simply lifted up and carried out to the pelvic brim. This cannot be satisfactorily done until the parametric tissues have been dissected off the walls of the pelvis and bladder. Beginning on the pelvic wall, partly with the finger, partly with dissecting forceps, the tissues are peeled and scraped off. Theoretically, the aim is absolutely to denude the pelvic fascia; practically, one gets away as much as possible. Sometimes an enlarged obturator gland is encountered; occasionally a branch of the uterine artery is wounded and spouts, despite the ligature of the parent trunk. As the dissection passes more deeply the uterine artery is again encountered, lying close to the pelvic wall, and for safety it is ligatured close to its origin before being divided and swept inwards with the connective tissues. These are being steadily heaped up around the uterus and they are added to by separation of the broad ligament tissues from the bladder. The finger can now be pushed deeply down beneath the parametrium till it lies on the vagina which in its turn is freely separated. These procedures are repeated on the right side and at their termination both ureters are free, the anterior and lateral parametric tissues have been freed and swept inwards, and the interior and lateral aspects of the vagina for its superior half are free. A semicircular incision through the peritoneum is now made across the bottom of the pouch of Douglas, extending from the right to the left infundibulo-pelvic ligament. Through this the posterior wall of the vagina is separated from the rectum and the tissues in the utero-sacral folds are dislodged and added to the central mass. The uterus is now quite free and can be pushed down the vaginal tube until the upper half of the latter is inverted within the lower. The abdominal wound is temporarily closed and the patient placed in the lithotomy position. The cervix, grasped by a pair of volsella, is drawn down until the vagina is almost completely inverted. The vaginal wall is carefully cleansed and then cut through by a circular sweep of the knife. It only remains to pull out the uterus and push a temporary pad of gauze in the reinverted vagina. The Trendelenburg position is resumed, the abdominal wound reopened, and all available peritoneum is used to cover over raw surfaces. If possible the ureters are secured to the lateral pelvic walls by peritoneal flaps, but, as a rule, pressure of the light gauze pack with which the pelvic cavity is filled is sufficient to effect this. The lower end of the pack is brought out per vaginam, the intestines are rearranged, and the abdomen is finally closed.

It should be mentioned that in the first eight cases the vagina was divided from the abdomen. This method, however, seems to carry with it the risks of septic infection and of cancerous inoculation of sound tissues. With the combined method the chances of either occurring are much diminished. No forceps, however powerful, seem to be strong enough to clamp satisfactorily the vagina before dividing it from the abdomen.

CASE 1.—The patient, married, aged 49 years, who had been attended by Mr. W. J. R. Dunn, was admitted to the Hospital for Women on June 6th, 1903. She had been married 26 years. She had had one child and three abortions; the menopause occurred at 41 years of age. The duration of the symptoms was seven months; at their onset the patient consulted a medical man who did not make an examination but suggested that she "should go home and prepare to die"—advice which certainly offers ground for reflection. Later she consulted Mr. Dunn who sent her into hospital. The local conditions were as follows. The cervix was excavated and the mobility of the uterus was diminished.

There was some infiltration of the right broad ligament but none in the utero-sacral folds. Under anæsthesia the mobility of the uterus was found to be considerably greater than at first seemed the case.

Operation was performed on June 9th, 1903. The ureters were traced forward without previous examination of the cervico-vesical septum—a tactical error. The tunnel of the right ureter passed through the growth in the right broad ligament and its outer surface was involved by it; the ureter, however, shelled out easily. The left was cleared without any sign of disease being found. The bladder was firmly united to the cervix by the growth. As much as possible was scraped off, as at that time I did not feel justified in excising the part of the vesical wall involved. No glands of any kind could be found. Recovery was uninterrupted. The patient was discharged at her own request on the fourteenth day.

CASE 2.—The patient, married, aged 44 years, was admitted to hospital on June 20th, 1903. She had been married 16 years. She had had four children and two abortions. The duration of the symptoms was six months. The local conditions were as follows. The cervix was enlarged, indurated, and irregular; it bled freely on touch. The uterus was freely moveable.

Operation was performed on June 23rd, 1903. Both in this and the preceding case the operation was entirely abdominal, the vagina being clamped between two large pairs of compression forceps before division. No trouble was experienced with the ureters. The anterior vaginal wall was sewn to the peritoneum of the bladder; this was found afterwards to limit the capacity of the bladder. Three right and one left iliac glands were found and removed; in size all were apparently normal. The lower end of the abdominal wound suppurated but speedily recovered. On the sixteenth day urine escaped per vaginam. Examination disclosed a small opening on the left of the vaginal apex. The incontinence gradually ceased and had disappeared at the end of six weeks. No evidence of enlargement of the left kidney was discovered at any time. Examination of the glands microscopically did not reveal the presence of cancerous disease. On Oct. 23rd the patient was seen in the out-patient room. A large indurated area was found in the abdominal wall around the cicatrix. From two or three small openings a thin watery fluid escaped. It was evident that the abdominal wound had become infected by cancer cells at the time of operation. A sweeping removal was carried out but recurrence speedily took place and death occurred five months later.

CASE 3.—The patient, aged 36 years, married, had been attended by Dr. W. G. Williams. She was admitted on

FIG. 1.

Showing invasion in Case 3 of a parametric gland by cancer.
× 250 (nearly).

by a well-known gynaecologist who considered that the disease was too extensive for any radical operation. A palliative operation was performed and for some months the patient was much relieved of her symptoms and gained in weight. Gradually the bleeding came on again and the patient sought further relief. The local conditions were as follows. The cervix was represented by an irregular thick mass with a dirty sloughing surface which bled on touch; friability was marked. The vaginal walls were not involved; induration was felt along the bases of both broad ligaments. The mobility of the uterus itself was surprising and it was this circumstance that determined me in giving the patient another chance.

Operation was performed on July 11th. As a preliminary step the cervix was separated from the bladder and as it peeled off freely the operation was proceeded with. The ureters were dissected out with some little difficulty on account of the extreme depth of the pelvis. The thickened right parametrium showed no signs of malignant infiltration and the left was not even indurated. Small iliac glands were removed from both sides. After the usual gauze pack had been placed the sigmoid colon and its mesentery were carefully arranged so as to roof it in. Examination of the glands established the presence of cancer in the right iliac glands. Uninterrupted recovery followed and the patient remained in excellent health without sign of recurrence until June, 1904. She had reported herself regularly every month until that time and although requested to continue doing so she became over-confident and did not reappear until August, when it was ascertained that wide recurrence had taken place at the top of the vaginal canal. Examination under anæsthesia was made and showed such extensive disease that further interference was out of the question.

CASE 4.—The patient, aged 53 years, married, had been attended by Mr. J. Singleton of Kendal. She was admitted on Sept. 10th, 1903. She had been married 20 years but had never been pregnant. The menopause came on at the age of 38 years. The local conditions were as follows. The cervix was small and irregular; the anterior lip was ulcerated and bled on touch. A piece of tissue was removed and examined microscopically; it proved to be squamous-celled carcinoma.

Operation was performed on Sept. 22nd. The omentum was adherent to the anterior half of the pelvic brim. The left appendages were adherent to the floor of the pelvis; these were freed with difficulty. The body of the uterus was small and soft; when grasped with the volsella pus gushed out through a tear caused by the teeth of the forceps. At this stage the disadvantages caused by a layer of abdominal fat, two inches in thickness, and by a very deep pelvic cavity impressed themselves forcibly on me. The difficulty was increased by the impossibility of drawing the uterus up, on account of infiltration at the base of the left broad ligament. The patient took the anæsthetic badly and strained a good deal. This was the first case in which an internal iliac artery was ligatured. The left artery was doubly ligatured and divided between the ligatures; the right could not be satisfactorily exposed, and the uterine artery was therefore ligatured at its origin. The infiltration of the left broad ligament was continued into the utero-sacral fold of the same side and during the clearing out of the latter free venous bleeding occurred, easily checked, however, by pressure. Adrenalin chloride solution was applied to make certain that it was permanently stopped. There was no difficulty in freeing the ureters, bladder, and connective tissues. No glands were to be found. The patient's condition was now a serious one. The ureters were dealt with as usual and, be it noted, they were quite intact. The abdomen was then quickly closed. The after-condition was never satisfactory, although the patient rallied well. She did not sleep, she talked incessantly, and passed very little urine. During the first 48 hours only four ounces were voided, but this amount gradually increased during the following three days. In spite of this the condition steadily grew worse, nothing gave sleep, and the patient slowly sank and died, presumably from sepsis.

CASE 5.—The patient, aged 35 years, married, had been attended by Mr. T. H. Summerhill of Rhyl; she was admitted on Oct. 14th, 1903. The duration of the symptoms was four months. The local conditions were as follows. The cervix was excavated; there was infiltration of the anterior wall which apparently involved the bladder. The body of the uterus was only slightly moveable. The left broad ligament was thickened and fixed. The patient was kept in bed for

July 6th, 1903. She had been married 14 years. She had had two children and six abortions. The duration of the symptoms was two years. She was seen a year previously

a week, during which time hot douches and glycerine pledgets were employed. At the end of the week the mobility of the uterus had considerably increased, so I decided to explore the condition of matters.

Operation was performed on Oct. 20th. The peritoneum at the bottom of the utero-vesical pouch was puckered and adherent to the underlying growth. Both internal iliac arteries were ligatured. The right ureter was freed without trouble; the left was shelled out of a mass of carcinoma in the left broad ligament. As a matter of fact, the tunnel only was adherent to the growth, the loose tissue surrounding the ureter itself being apparently unaffected and the ureter when freed was seen to be covered by a thin layer of fat in which the ramifying vessels were distinctly visible. To ascertain the extent of bladder involvement an opening was made in the viscus and its cavity was explored by the finger. The infiltration was too widespread to justify any resection of the bladder, so the wound was closed. All disease that could be cut and scraped away was removed and after the usual peritoneal stitching the abdomen was closed. No glands were found. Recovery was normal. The patient was discharged on Nov. 14th, healing being complete except for the small crateriform ulcer at the summit of the vagina. The disease steadily advanced, metastases formed in the liver, and death took place on Jan. 25th, 1904.

CASE 6.—The patient, aged 50 years, married, had been attended by Dr. J. D. R. Munro of Nantwich. She had been married 20 years. She had had eight children and two abortions. The duration of the symptoms was four and a half months. The local conditions were as follows. The cervix was indurated; the os admitted the tip of the forefinger which passed into an irregular excavated cavity. There was some induration on the left of the uterus. The uterus was perfectly moveable.

Operation was performed on Nov. 7th. Both internal iliac arteries were ligatured. The ureters and bladder were freed. The vagina was divided with a knife, the upper

FIG. 2.

Section in Case 6 of cancerous obturator gland of the right side.
× 45 (nearly).

end being guarded with a gauze pad and the whole being lifted out together. A gauze pack was placed in the lower vaginal end. A large mass of glandular tissues was found immediately below the right obturator canal. A few small glands in a similar position were found on the left side. None were discovered along the iliac vessels of either side, although one was found in the base of the right broad ligament. Recovery was normal. This patient is still alive and well. The right obturator gland was found to be invaded by cancer.

CASE 7.—The patient, aged 55 years, under the care of Dr. R. Lucius Wood of Huyton, was admitted on Nov. 16th, 1903. She had been married for 35 years, had had 13 children, and had aborted twice. The menopause occurred

at 44 years of age. The symptoms had lasted for three or four months. She had lost much blood and looked blanched. The cervix was excavated and the uterus was moveable. She was operated upon on Nov. 21st, 1903.

The case is an example of the difficulty that may be encountered during the performance of this operation. The general condition of the patient was bad; the subcutaneous fat was dirty looking, oedematous, and friable; and the rectus muscle resembled the pale muscle of the rabbit. The preliminary steps were carried out in the usual manner, and then occurred trouble with the anæsthetic. The patient took both chloroform and ether badly, fluid collected in the trachea, and cyanosis became marked. After some improvement the pelvic connective tissues were opened up and then the venous plexuses in the broad ligaments were seen to be enormously congested. Veins one centimetre in diameter twined and twisted in great bunches and concealed only too effectually the underlying ureters and vessels. After some manipulation the left internal iliac artery was found and tied, but during the tracing forward of the ureter one of these veins was wounded. The pelvis was immediately flooded with blood but the bleeding was checked by packing with a sterilised towel. Its withdrawal was followed by similar alarming hæmorrhage and it was only at the slow and careful removal of the pack for the third time that the bleeding point was secured. The large veins had now collapsed and the freeing of the ureter was accomplished. Rather than risk a similar occurrence on the right side I contented myself with ligaturing down the broad ligament, removed the uterus, and sent the patient back to bed as rapidly as possible. She was very much collapsed, never rallied, and died in 18 hours.

CASE 8.—The patient, aged 48 years, who had been under the care of Dr. A. MacLennan of Runcorn, was admitted on Nov. 20th, 1903. She had been married for six years and had had two children. The menopause had occurred at 44 years of age. The symptoms had lasted for four and a half months. The cervix was excavated; the uterus was slightly moveable laterally, but it could not be drawn down to the vaginal ostium. After a week's rest and treatment the mobility of the uterus was found to be increased, but there was now felt clearly a large mass in the right broad ligament. This case was not one in which vaginal hysterectomy could be carried out, but I decided to attempt the abdominal operation as the patient was very anxious to have something done.

The operation was performed on Dec. 1st, 1903. The bladder was found to be adherent to the cervix, but the connexion was tough, suggesting inflammatory rather than malignant tissue. After dealing with the internal iliac arteries and the left ureter the mass on the right side of the uterus was investigated. Its size was about that of a bantam's egg and it was firmly attached to the uterus and to the bladder. The right ureter dived into its centre and careful dissection was required to free it. After tedious and difficult work, involving much handling of the ureter, that tube was cleared, but unfortunately minus its nutritive vessels. Next, the muscular wall of the bladder to which the malignant lump adhered was stripped off the underlying mucous membrane of the bladder and cut away. The mucous membrane bulged, thinned, and threatened to burst under the pressure of the little urine in the bladder, but the catastrophe was averted by the immediate use of the catheter. The healthy edges of bladder muscle were then sutured together. Shortly afterwards, in drawing the fundus uteri to the left, a loud crack was heard, caused by a split between body and cervix. The opening rapidly increased but no discharge was allowed to ooze up. However, the uterus and most of the cervix soon broke off, leaving the right-sided mass still attached to the vagina. The removal of this concluded a long operation. No glands were found. The recovery was uneventful until the seventh day, when urine escaped from the vagina. On Jan. 4th, 1904, two sloughs were found lying in the upper end of the vagina. One resembled a piece of tube laid open along its long axis; the other was indefinite in shape. It was ascertained that the urine was coming down a funnel-shaped opening on the right of the upper end of the vagina. Progress was good until the 27th, when a rigor occurred with a temperature of 103.8° F., and pus was found in the urine. The disturbance passed off and the patient returned home on Feb. 3rd, urine still being passed per vaginam. The incontinence ceased a few weeks after the patient's return home. The general health was fair until the beginning of June,

1904, when all the symptoms suggestive of recurrence appeared and the patient gradually sank.

CASE 9.—The patient, aged 54 years, was admitted on May 27th, 1904. She had been married for 18 years but had never been pregnant. The menopause occurred at 49 years of age. The symptoms had been of three months' duration. The following were the local conditions: the cervix was excavated; there was marked induration in the left broad ligament interfering considerably with the mobility of the uterus; the utero-sacral folds were apparently free. On May 28th the cervical ulcer was curetted, after which a 60 per cent. solution of zinc chloride was applied.

On June 7th operation was proceeded with. The left side of the bladder was adherent to, and dragged backwards by, the sigmoid colon and there were numerous omental adhesions to the bladder. After these had been dealt with and the pelvis emptied of intestine it could be seen that there were large deposits of fat in the pelvic connective tissues. As usual, the mass in the left broad ligament was much larger than had previously appeared; it was adherent to the bladder and involved the utero-vesical septum. The right ureter was dealt with but as I wished to run no risks with it the uterine artery alone was tied. The left internal iliac was then ligatured, a mass of enlarged glands cleared out, and an attempt made to expose the ureter. This was very difficult and ultimately part of it had to be traced from its anterior end. The whole of the posterior wall of the bladder was resected with the exception of two tongues carrying the ureteral openings and the bladder wound was sutured with

FIG. 3.

Section in Case 9 of cancerous left iliac gland, showing degenerating lymphoid tissue surrounded by cancer cells. $\times 45$ (nearly).

catgut. The remaining attachments of the uterus were freed, the vagina was separated, and removal was carried out per vaginam. To do this incision of the vagina was necessary. The operation was concluded in the usual way and a drainage-tube was placed in the bladder. The patient recovered steadily, but on the sixteenth day urine escaped per vaginam. The bladder remained quite sound, but it has been ascertained that the left ureter sloughed; the result has been that a uretero-vaginal fistula has formed. Two attempts have been made to close it, but a small opening still exists in place of one that easily admitted the finger-tip. This patient is still alive and well. The left iliac glands were extensively involved by cancer.

CASE 10.—The patient, aged 43 years, was admitted on Jan. 7th, 1905. She had been married 25 years and had had 13 children. The duration of the symptoms was eight months. The local conditions were as follows. The cervix was excavated and the uterus was freely moveable; no extension beyond it could be discovered.

The operation was carried out on Jan. 14th. The pelvic connective tissues appeared to be quite free from disease and as there was but little oozing of blood the internal

iliacs were not tied. With this exception the procedure did not vary from the description given above. The uterine arteries were ligatured at their origins and a large vesical artery required tying on the left side. On the left iliac vessels a large gland measuring one and a half inches in length by half an inch in thickness was removed. A small one lay along the right artery. Search for others

FIG. 4.

Section in Case 10 of cancerous left iliac gland. $\times 250$ (nearly).

was futile. This operation was by far the most easy of the whole ten but most unfortunately the patient died from sepsis on the sixth day. At the necropsy general peritonitis was found.

Of the ten operations three were incomplete, one because the patient's condition necessitated speedy termination of the operation and two because of extension of the disease to the bladder wall. It has been borne in upon me that ruthless excision is necessary for the success of this operation. Involvement of the bladder implies either abandonment of the operation or free removal of the affected area. Involvement of the ureters in a cancerous broad ligament calls for resection with fresh implantation into the bladder.

With regard to the pelvic connective tissues any attempt to remove them cleanly must necessarily be out of the question. Even in lean individuals a surprising quantity of fatty tissue is found beneath the pelvic peritoneum and complete removal of it is a task better suited for the dissecting rather than the operating room. In most cases I was struck by the small amount of tissue contained in the utero-sacral folds; in no instance was anything resembling a gland turned out of them, nor could any sacral glands be discovered. Perhaps this is not surprising, since in no single one of the cases was any induration behind the uterus detected previously to operation. In this connexion it is interesting to bear in mind the dictum of Wertheim: "Infiltration does not necessarily imply carcinoma, nor does a soft condition exclude it."

The modes of advance of cancer are either by direct continuation of growth from the cervix into the parametrium, or, the cervix being surrounded by intact connective tissues, the metastases are found principally in the glands, or there may be a combination of both these modes. Kundrat has investigated the condition of the parametrium by serial section cutting in 80 cases and he found it was affected in 55 per cent. of them: on one side only in 23·75 per cent., on both in 31·25 per cent. In 22 cases the parametrium alone was diseased, the glands being normal; in eight the parametrium was uninvolved, whilst the glands were diseased. In a number of cases in which the parametrium was indurated no sign of cancer could be detected and, inversely, disease was discovered in soft parametria. As causes of non-cancerous infiltration Kundrat suggests changes in the vessels—proliferation of the intima, closure of the lumen, and thrombosis—which probably have some relation to the new growth. The accompanying exudation and

infiltration of the surrounding tissues lead to stiffening and induration. Under treatment this diminishes, hence the increase noted in the mobility of the uterus. The improvement following the use of Doyen's serum has been ascribed to a similar effect.

The pelvic glands.—In four cases (Nos. 1, 4, 5, and 8) no glands could be found, despite a thorough search for them. Dr. J. H. Willett, who assisted me, bears me out in this. In Case 7 the operation was abandoned and the glands were not sought for. In the remaining five cases iliac glands were found on both sides in three (Cases 2, 3, and 10) and on one side in one (Case 9). In Case 6 the obturator glands on both sides were enlarged.

Microscopical examination has resulted as follows:—Case 2: no disease found on either side. Case 3: Right iliac glands cancerous. Case 9: Left iliac glands cancerous. Case 10: left iliac glands cancerous. Case 6: right obturator glands cancerous. Out of ten cases the glands were found to be cancerous in four—i.e., 40 per cent. It should be stated that sections of these glands were not taken by the serial method—the only trustworthy one—but merely from parts of the glands which appeared suspicious. Possibly, therefore, further investigation of Case 2 might result in the finding of diseased areas. Wertheim estimated that the glands were diseased in 35 per cent. of cases and his figures have been confirmed by Döderlein, Zweifel, and Kleinhaus. Von Rosthorn puts his figures as high as 57·5 per cent., while those of an American observer (Wakefield) are only from 25 to 30 per cent. Wertheim states that of 35 cases in 100 two-thirds show cancer cells arranged in alveoli. In the remaining third there was no alveolar arrangement, but instead tube or bag-shaped formations, lined by high cylindrical epithelium, often possessing cilia. He was inclined to believe that these appearances were to be regarded as having a connexion with carcinoma of the cervix until Meyer of Berlin found similar changes in the pelvic glands of patients who had died from eclampsia or peritonitis. Since this Wertheim has found the same appearances in glands from a patient whose death was attributed to multiple pelvic abscesses. His figures therefore require considerable modification.

Of my own cases, the most striking instances are Cases 6 and 10. Both were typical examples of cases suitable for vaginal hysterectomy. The disease appeared to be limited entirely to the cervix and the mobility of the uterus was normal in each case. Yet in Case 6 the right obturator gland was cancerous and from Case 10 was removed the largest cancerous gland I have yet seen. In both these cases the performance of vaginal hysterectomy would have been futile so far as eradication of the disease was concerned. Improvement succeeding removal of the primary growth would speedily have vanished as the secondary untouched focus advanced. Extirpation of cancerous glands is no guarantee that all disease has been eliminated. Experience may show that the presence of infected glands should be a contra-indication to radical operations, but in the present state of knowledge a "radical" operation, to deserve its title, should include removal of all possible areas which are commonly diseased. In four other cases (Nos. 2, 3, 4, and 7) the local conditions were such that vaginal hysterectomy would unhesitatingly have been performed. In only one of these the glands were found involved by cancer, so that out of six cases in which vaginal hysterectomy would ordinarily have been selected as the operation of choice the pelvic glands were cancerous in three. There were four cases (Nos. 1, 5, 8, and 9) in which the vaginal operation could not possibly have sufficed. Its performance would probably have been attempted in Case 1, but in the other three the interference with uterine mobility was too great even to justify the attempt. In three of these cases no glands were to be found at the operation (Nos. 1, 5, and 8).

Ligature of the internal iliac arteries produced no after-effects at all beyond some temporary lividity of the skin area supplied by its branches. That it is not without its risks is shown by the case recorded by Cullen in which there occurred gangrene of the leg necessitating amputation. In the same case it was noted later that "it appeared as if all the pelvic organs were sloughing away." Ligature of the artery is invaluable in some cases, absolutely checking the oozing of blood which obscures the field of a difficult operation and which thereby increases both its duration and its risks. After the ligature has been tightened the veins seem to collapse entirely; they were never tied for the reason

that they were never seen. The only cases in which hæmorrhage was severe were those two (Nos. 4 and 7) in which venous plexuses were wounded. The bleeding in Case 7 was alarmingly free but it was readily checked by pressure, as in a similar case related by Cullen.

Mortality.—Three deaths occurred out of ten cases, a rate of 30 per cent. It is scarcely necessary to recall the heavy mortality which led to the abandonment of Freund's operation—one of 76 per cent. Since 1895 this percentage has been steadily diminishing. Between 1900 and 1902 Wertheim operated on 31 cases with six deaths—18·2 per cent. Jonnesco's first series of ten cases had a mortality of 30 per cent.; his second series of 60 per cent.; and of the third series of ten cases every patient recovered. As he remarks, there seems to be a direct relation between the mortality on the one hand and experience in selecting cases and acquired operative skill on the other. This is perhaps, at present, the keynote of the matter. The operation, radical as it is and dangerous as it may be, requires that only selected cases be submitted to it—cases in which there is the possibility of removing the diseased uterus surrounded by a clear zone of sound, or apparently sound, tissues. Further desiderata are absence of much fat on the abdominal wall, a fairly roomy pelvis, and a good general condition of health. The anatomical position and relations of the mamma and of the uterus differ too much to render any comparison between them of great value but there is a striking similarity between the histories of the surgical progress in the treatment of the cancerous affections of each. First, removal of part, then of the entire organ; finally the organ *plus* its surrounding tissues, lymphatics, and glands. Extensive operations for cancer of the breast are practised now with but trifling mortality and are followed by more prolonged periods of subsequent immunity than were known in the past. Lessened mortality is largely due to modern asepsis but prolongation of immunity can only be due to freer excision. What has proved of value in the case of the cancerous mamma can at least be tried for the cancerous cervix uteri. Whilst routine removal by the vaginal operation ignores the possibility of outlying disease the results can only be disappointing. Is it not time to face the facts, to recognise that in every 100 cases submitted to vaginal hysterectomy diseased areas remain untouched in at least a fourth of the number? Surely the procedure is only palliative in these cases, and as such should be limited in its applications.

It is possible that the clearing up of the mystery surrounding the etiology and pathology of cancer may establish a rational basis for treatment. It is also possible that the abdominal operation may prove to be inadequate. In the meantime my inclination is to regard the combined radical operation as the one which seems to offer a reasonable chance of success, provided that its application be restricted to suitable cases.

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FIVE FATAL CASES OF ACUTE MENTAL DISORDER, PROBABLY ACUTE DELIRIUM.

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THE following cases appear to me to be worth recording on account of their rarity and severity, their rapid and lethal course, the obscurity of their pathogenesis, and, in three of them, the comparative insignificance of the naked-eye cerebral changes. As regards rarity, I find but five instances in a series of 451 necropsies, and undoubtedly the very great majority of such cases come to necropsy. Having regard to our ignorance of the nature of the disorder which these cases illustrate, I am of opinion that all such should be brought forward with a view to stimulate inquiry. The notes in these cases are not so full as could be wished, for reasons beyond my control; nevertheless, they serve to give a fairly good picture of the conditions observed. In the record of post-mortem appearances only positive (morbid) conditions are noted for reason of space.

CASE 1.—The patient was a married woman, aged 43 years. This was her first attack and she was admitted