

confirmed by the removal of the calculus, 4 of the patients refused operation, and in 2 no calculus was found. Seventy cases were of ureteral calculi; of them, 43 have been confirmed by the passage or removal of the calculus, in 27 the patients have not been operated on or heard from.

In 46 cases in which an exclusion or negative diagnosis was rendered, the patients were operated on and the diagnosis confirmed. In 7 cases where a negative diagnosis was rendered, operation showed a calculus to be present, while in 2 cases a mass of crystalline debris was found filling the pelvis of the kidney. This makes a total error of 10 cases in a series extending from the formation period of this diagnosis. As has been said, in the last 100 cases the proportion of errors is materially decreased.

There were 28 ureteral and 9 renal cases. In 2 renal cases the patients refused operation and in 7 the diagnosis was confirmed. In 19 ureteral cases the diagnosis has been confirmed by the recovery of the calculus. Of the remaining 9 cases, some of the patients are too recently examined and others have not been heard from. Of the 63 cases in which a negative diagnosis was rendered, 42 have been confirmed by the subsequent history or operation. In 21 cases the subsequent history has not been learned.

## THE SURGICAL TREATMENT OF URETERAL CALCULUS IN THE FEMALE.\*

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The treatment of ureteral calculus in the female differs essentially from that in the male, owing to anatomic considerations. In the male, the comparatively straight course of the ureter from the kidney down to the bladder, and its position on the pelvic wall, make access to it comparatively easy through an extraperitoneal incision. In the female, however, the broad ligament, placed, as it is, directly above the most dependent portion of the ureter, renders access to the deep pelvic portion of the ureter a matter of some difficulty. Stones in either sex, impacted at any portion of the ureter from the kidney to the superior strait, are easy to remove. Stones in the female, impacted at any point between the base of the broad ligament and the bladder, are accessible through the vagina in the majority of instances; but stones in the female lying between the superior strait and the base of the broad ligament are sometimes very difficult to remove.

The object of this paper is to enumerate the different operations which have been devised for the removal of ureteral calculi in the female and to point out the advantages and disadvantages of each one.

The question when to operate in a given case may be difficult to decide. A stone may remain impacted for a considerable length of time, and yet may pass on to the bladder and be voided through the urethra, without having caused any permanent change in the kidney. All calculi do not entirely block the stream of urine, and if a certain amount of urine can pass by, the stone may remain impacted for some time and may not occasion irreparable damage. Incomplete impactions, however,

may give rise to a condition of hydronephrosis; complete blocking causes prompt atrophy of the kidney. It is, therefore, best not to wait too long before operating. The expectant treatment of stone in the ureter is very dangerous. Cabot<sup>1</sup> has shown that the ultimate mortality with expectant treatment is between 72 and 80 per cent.

A secondary complication of impacted stone is ulceration of the ureteral wall, periureteritis, and possibly abscess in the tissues around the ureter; should this occur, the surgical condition is thereby rendered far worse.

In a condition of uremia, should an operation be undertaken, no extended search for stones should ever be made. The most that should be done is to open the kidney on one or both sides, according to indications, and drain through the loin, reserving a radical operation for a later period.

Operations for stone may be classified as follows:

1. Transperitoneal route.
2. Transperitoneal (for diagnosis) and extraperitoneal routes combined.
3. Extraperitoneal route.
  - (a) Israel's incision.
  - (b) Witherspoon's incision.
4. Hypogastric route.
5. Urethrovaginal route.
  - (a) Slitting the ureter.
  - (b) Injection of sterile oil into the ureter.
  - (c) Dilatation of the ureter.
6. Rectal route.
7. Sacral route.
  - (a) Kraske's incision.
  - (b) Pararectal incision.
8. Vaginal route.
  - (a) Vaginal incision.
  - (b) Combined extraperitoneal and vaginal incision.
  - (c) Crushing the stone in the ureter through the vagina.
  - (d) Doyen's incision.
  - (e) Garceau's incision.

1. *Transperitoneal Route*.—No one would willingly select this route from choice. Nevertheless the operation has been done by this method, and with success. Bovée,<sup>2</sup> while operating on a woman, 30 years of age, for an undetermined mass behind the right broad ligament, found on incision that it was a stone embedded in inflammatory tissue. The stone, measuring  $2\frac{3}{4} \times 1\frac{3}{4} \times 1\frac{1}{2}$  inches and weighing 1,310 grains, was successfully removed, the ureter closed, and an incision made through the posterior cul-de-sac into the vagina for drainage. The patient recovered, notwithstanding that urine had escaped when the ureter was incised. Besides Bovée's case, there are several others in the literature on the subject, and cures are reported in a few instances. The dangers of infection of the peritoneal cavity by septic urine, which is not uncommon in these cases, are so great that the route is to be absolutely condemned.

2. *Transperitoneal (for Diagnosis) and Extraperitoneal Routes Combined*.—In a few instances the abdomen has been opened, the stone located and pushed up into the kidney, whence it has been removed through a loin incision. This operation should be condemned because the whole ureter can be easily palpated through a moderately large extraperitoneal incision, and the same purpose accomplished. In cases of doubtful diagnosis the stone will in most cases be discovered by the means of diagnosis at our present command, so that such an incision will rarely, if ever, be called for.

\* Read in the Section on Obstetrics and Diseases of Women of the American Medical Association, at the Fifty-eighth Annual Session, June, 1907.

1. Ann. of Surg., 1903, xxxviii, 506.  
2. Wash. Med. Ann., 1905, iv, 233.

3. *Extraperitoneal Route.*—This operation was first deliberately performed by Bardenheuer,<sup>3</sup> who removed a high stone extraperitoneally from an adult female. Twynam<sup>4</sup> later performed the operation on a child 8 years of age. In Twynam's case an incision was made as for ligature of the common iliac artery, the peritoneum was pushed back, and a stone removed. The wound in the ureter was stitched and the patient got well. Israel<sup>5</sup> was the first to demonstrate that stones below the pelvic brim could be attacked extraperitoneally.

Any one who has done total ureterectomy in the female will agree that exposure of the ureter is easy down to the broad ligament, and even below it. If the operation is properly performed, the bowels are not seen at any time during the course of the operation, and the whole procedure is extraperitoneal. The chief objection to this operation is that the incision may have to be a fairly large one, especially in those cases in which there is doubt as to the exact location of the stone.

Israel's<sup>6</sup> incision is the best for exposing the ureter extraperitoneally. It begins at a point at the anterior edge of the sacrolumbar mass of muscles, a finger's breadth below the twelfth rib. The incision is brought forward parallel to the rib as far as the anterior axillary line; it then turns downward to a point two fingers' breadths from the anterior superior spine of the ilium, and from this point bends downward toward the median line so as to run parallel to Poupart's ligament as far as the outer border of the rectus muscle, in extreme cases beyond this point. It is not necessary to make the whole incision in every case, and, according as the stone is opposite the upper, middle or lower third of this line, so will the line of the incision be determined. The tissues are divided down to the peritoneum. With finger dissection, the peritoneum is carefully pushed back toward the middle of the body, carrying with it the ascending or descending colon and adjoining intestines. The ureter can sometimes be easily identified by reason of the stone, which presents as a hard mass. With small stones, however, this may sometimes be difficult.

It is well to remember that the ureter strips with the peritoneum. Cabot<sup>7</sup> has shown that there are a number of fibrous bands which connect the ureter and peritoneum. Cabot has also shown that the part of the peritoneum which becomes adherent to the spine is, within a slight range of variation, pretty constant, and that the ureter lies just outside the line of adhesion; when the point has been reached at which the peritoneum strips with some difficulty the ureter will usually be found a short distance outside of this location. Occasionally there is some inflammatory tissue around the ureter in the vicinity of the stone, and this may occasion some difficulty, especially in those cases of stone below the superior strait. When possible, particularly in those cases in which the stone is low down in the ureter, it is well to push it up with the finger and thumb, get it out of the pelvic cavity, and remove it at a higher level. An additional reason for doing this is that the ureteral wall at the seat of impaction is apt to be much thinned, and it may be difficult on this account to insert sutures.

Stones situated near the renal pelvis should, if possible, be pushed up into the kidney and extracted through

an incision into the organ. Should the stone not be easily found, it is well to seek the kidney, follow the ureter down with thumb and finger, and locate the stone in this way. The incision into the ureter should be as small as possible, but not so small that the stone will lacerate it while it is coming through. After removal, the ureter must be catheterized both ways with a wax-tipped bougie in order to determine the presence or absence of other stones. Most surgeons prefer to suture the ureteral cut, using for this purpose fine catgut with a small needle. Care should be taken not to include the mucous membrane for fear of subsequent stone formation. Many operators do not suture the ureter, and abandon it with drainage. A permanent fistula rarely results in these cases. Leaving a stone in the ureter is attended with some risk. I have in mind a woman, 30 years of age, on whom I did nephrotomy; persistent vomiting followed this operation, from which the patient died eighteen days after operation. At the autopsy a small stone was found impacted in the ureter, which had undoubtedly caused the reflex vomiting. Urine had passed both ways, through the lumbar wound and through the bladder, after the operation. The opposite kidney had been treated for tuberculosis and was known to be inactive.

Stricture below the seat of impaction is a possible complication that should be dealt with. Young<sup>8</sup> records a most interesting case of this kind, in which a stricture near the vesical ending of the ureter was detected by filling the ureter with fluid and noting that it could not be milked into the bladder.

Some operators trust to their sutures holding and close the wound without drainage, but this seems an unnecessary risk. Others have thought it necessary to pass a catheter into the ureter through the bladder and allow it to remain there for several days. The catheter is not to be recommended unless there is an inflammatory reaction around the ureter. Albarran<sup>9</sup> was the first to use this method in a case of calculus impacted at the pelvic brim. An abscess and fistula followed impaction of the stone, and the pus was discharged through the loin. The calculus was removed by incision, but the ureter could not be sutured on account of the inflammatory tissue. A catheter was, therefore, passed into the ureter through the bladder, and was allowed to remain ten days. At the end of this time, no urine having come out through the iliac opening, the catheter was removed and the patient got well.

It is astonishing what a large incision may be made into the ureter and still be followed by healing. Thus Fiori<sup>10</sup> records a case in which the extraperitoneal operation was performed, and the ureter split for a distance of 16 cm., 12 cm. above the superior strait and 4 below. Eleven or twelve calculi were extracted, the largest of which weighed 5 grams. The ureter was reconstructed by sutures passed over a sound as a guide. A fistula followed, which closed in a few days, and the patient got well.

In exceptional instances it may be necessary to remove the entire ureter. Israel<sup>11</sup> has performed this operation three times. Complete disorganization of the kidney with marked pathologic changes in the ureter demand ureterectomy. In one of Israel's<sup>12</sup> cases a very large ure-

3. See Thelen, *Central. für. Chir.*, 1882, ix, 186.

4. *Brit. Med. Jour.*, 1890, i, 240.

5. *Berl. klin. Wochschr.*, 1896, xxxiii, 844.

6. *Chirurgische Klinik der Nierenkrankheiten*, Berlin, 1901, p. 358.

7. *Am. Jour. Med. Sci.*, 1892, ciii, 44.

8. *Am. Medicine*, 1902, iv, 216.

9. *Ann. des Mal. des Org. G. U.*, 1894, xii, 845.

10. *Policlinico*, Rome, 1905, xii, Sez. Chir., 49.

11. *Chirurgische Klinik der Nierenkrankheiten*, Berlin, 1901, p. 362.

12. *Loc. cit.*, p. 374.

teral stone, which measured 17 cm. long and 19 cm. in circumference, had so damaged the ureter as to make its removal imperative.

Witherspoon's<sup>13</sup> incision for removal of stones in the ureter applies to those cases in which the stone is definitely located near the bladder. An incision four inches long is made over the lower end of the rectus muscle, beginning at a point over its insertion into the pubic bone and extending upward in a direction parallel to its fibers. The rectus is divided through its muscular fibers and the peritoneum is reached. Dissection is then done with the fingers, pushing back the peritoneum from the ilio-pectineal line. The vas deferens is isolated and followed onward from the point of crossing the obturator vessels, and the ureter is found just behind it. Witherspoon asserts that three or four inches of the ureter can be located and operated on through this incision. The objection to it is that, if there be other stones higher up, the incision is a very unfavorable one because it can not be prolonged upward except at great disadvantage.

4. *Hypogastric Route*.—This method of operating is particularly applicable to males, and consists simply in making an opening into the bladder above the pubis and extracting the stone if it happens to be in that part of the ureter within the vesical walls. It will seldom be found necessary to perform this operation on the female. Nevertheless, Noble<sup>14</sup> did it in an adult female who had undergone the menopause; the vagina was so small in consequence of postclimacteric changes that the stone was inaccessible by the vaginal route. Noble did a suprapubic cystotomy and extracted the stone with ease by incising the ureter.

5. *Urethrovessical Route*.—With the advent of the Kelly cystoscope, which makes the bladder so accessible, many stones situated in that part of the ureter which traverses the bladder walls can be removed. The urethra is first dilated and a large-sized cystoscope passed. If the stone is immediately underneath the mucous membrane of the ureteral eminence, it may be possible to remove it by forceps or hook or by slitting the ureter with a pair of bladder scissors. Kelly<sup>15</sup> advises passing a finger in the vagina behind the stone, pushing it forward, passing a hook into the ureter behind the stone and pulling it forward.

Injection of sterile oil through a ureteral catheter passed up behind the stone has been recommended by Schmidt.<sup>16</sup> He reports a successful case by using this method.

Stones situated at some distance from the vesical entrance of the ureter may sometimes be treated by dilatation of the ureteral opening. Crawford<sup>17</sup> dilated the lower end of the ureter with his finger, the dilatation taking an hour, and removed a stone  $1\frac{3}{8}$  inches in diameter, impacted in the vesical wall of the ureter. Kelly<sup>18</sup> cocaineized the ureter through the vagina in a female 38 years old. After cocaineizing the bladder and ureter as well, he passed dilators on the affected side, dilated a stricture which was present, passed a wax-tipped bougie and detected stone; nineteen hours later a small calculus was passed, with complete relief to the patient. This was the first time that a stone has been released in this way. Kelly recommends the procedure in subacute cases only.

6. *Rectal Route*.—A stone has been removed through the rectum once only. This was Ceci's<sup>19</sup> case, in which the stone had almost ulcerated into the rectum. A slight incision released the calculus, but the patient died, as the opposite kidney was likewise affected. The method is applicable only in similar cases, namely, when there has been periureteritis, with subsequent abscess formation and softening of the rectal wall.

7. *Sacral Route*.—When Cabot<sup>20</sup> first mentioned the feasibility of the Kraske incision for removal of stones well back in the ureter near the pelvic brim, it seemed that there was much to recommend this method, but since the advent of the extraperitoneal route this method is no longer thought of. Cabot advised a long incision, as for the Kraske operation, removal of the coccyx and lower part of the sacrum on the affected side, with division of the sacroiliac ligament. He stated that it was difficult to find the ureter, and that the peritoneum in this situation was extremely thin and was in danger of being wounded. Ferria<sup>21</sup> did the operation and removed a stone successfully. Cabot<sup>22</sup> also did the operation, but he found that there was a great deal of hemorrhage from the hemorrhoidal vessels which was very difficult to control. He concluded in his article that the iliac incision was much to be preferred. Morris<sup>23</sup> has twice removed stones in the female by employing a straight incision parallel with the median line, an inch from it, and five inches in length, beginning two inches above the border of the gluteus maximus muscle and extending nearly to the transverse level of the anal aperture. The field was exposed by dividing the great sacrosacral ligament, and the stone removed. Morris called this a pararectal incision.

8. *Vaginal Route*.—Many stones are found in front of the broad ligament, between it and the termination of the ureter. Operation for their removal through the vagina is a comparatively simple matter. The field is exposed with a retractor and a cut is made directly over the ureter where the calculus is impacted. The ureter is seized with blunt hooks, and an incision is made large enough to push the stone through without tearing. Care should be taken not to allow the stone to slip back in the ureter above the site of impaction; this portion of the canal is dilated in consequence of urinary pressure, and the stone may easily slip back and escape above. A finger in the vagina behind the stone will guard against this, and, if there should be difficulty about extracting the stone, a small blunt hook may be slipped past it and the calculus hooked out. A catheter is run up to the kidney to make sure that there are no further stones, and it is also well to catheterize the ureter through the bladder to make sure that there is no stricture. The ureteral wound is sewed, if possible, with fine catgut, and if there is no infection the vaginal wall may be closed over it; otherwise it is best to drain. If it is impossible to sew the edges of the incision in the ureter it will have to be left alone. Some operators have advised passing a catheter through the bladder into the ureter up beyond the incised portion and allowing it to remain for a time. This does not seem necessary if the urine is not infected and the incision is a clean one; if, however, there is periureteritis with dense inflammatory tissue around the ureter it may be well to pass the catheter as first advised

13. N. Y. Med. Jour., 1904, lxxix, 973.

14. Am. Med., 1902, iv, 501.

15. Operative Gynecology, 2d ed., 1906, p. 541.

16. THE JOURNAL A. M. A., 1904, xlii, 708.

17. Am. Med., 1904, viii, 972.

18. THE JOURNAL A. M. A., 1900, xxxiv, 516.

19. La Riforma Medica, Sept. 5, 1867, p. 1214.

20. Trans. Med. Soc. State of New York, 1892, p. 102.

21. Ann. des Mal. des Org. G. U., 1894, xli, 652.

22. Boston Med. and Surg. Jour., 1905, lli, 655.

23. Surg. Dis. Kidney and Ureter, London, 1901, ii, 526.

by Albarran,<sup>24</sup> and later by Kelly.<sup>25</sup> If preferred, a stylet may first be run up into the ureter, over which a catheter tube is slipped; the open hole at the kidney end collects the urine better than a catheter with a hole in its side.

Kelly,<sup>26</sup> operating extraperitoneally on an adult female, with stone impacted just behind the broad ligament, was unable to safely remove it owing to dense adhesions. He, therefore, displaced it by thrusting it forward until it could be felt through the vault of the vagina. A small incision in the vaginal vault safely removed it.

If the stone is soft and can be easily crushed with the fingers, this may be tried, though without much hope of success. If it crushes easily it may pass *per vias naturales*. Young<sup>27</sup> refers to some of Rovsing's cases in which this method was used.

Stones impacted near the ureteral orifice in the bladder which can not be removed by incision of the ureter through a cystoscope may be approached, as shown by Kelly,<sup>28</sup> through a vesicovaginal incision. The patient is placed in the knee-chest position, the bladder distended with air, a rapid cut made through the septum, which exposes the field, and the stone is easily picked out of its bed.

Doyen's<sup>29</sup> operation consists in incising the anterior cul-de-sac of the vagina, using the same incision as for vaginal hysterectomy. The bladder is dissected away from the uterus as high up as the vesico-uterine cul-de-sac, using gauze sponge and finger dissection. If a catheter has previously been passed into the ureter, there will be no difficulty in identifying it and no danger of injuring it during the operation. The stone is extracted and the ureter immediately sutured. If fistula follows, operation for cure will be much more difficult than if the vaginal route had been selected. The method is not applicable for stones behind the broad ligament, on account of the difficulty of dissecting beneath the ligament, as well as on account of the great danger of wounding the uterine artery which lies in this vicinity. The distance between the cervix and the pelvic wall at the level of the cervix is very short, being only 4 cm., a rather narrow space for delicate operations on the ureter. It would seem that the operation must have a narrow application because stones in front of the broad ligament are best treated by simple vaginal incision.

*Garceau's Incision.*—I devised this operation a few years ago in an urgent case in which there was necessity for a rapid operation. At the time this operation was performed I did not know of Doyen's method. The patient,<sup>30</sup> 34 years of age, had been suffering excruciating agony for a whole week in an endeavor to pass a stone impacted in the left ureter. The stone was felt on vaginal examination at a point 3 cm. posterior to the transverse midline of the cervix and well behind the broad ligament. The patient's condition was serious, and a long operation was out of the question. She had just been delivered of a child, and an extensive operation involving considerable loss of blood, which seemed not unlikely to happen in view of the congested condition of the parts, was out of the question. A vaginal incision seemed impracticable in view of the distance of the stone from the vaginal outlet. It occurred to me that if the

stone could be pushed down toward the vagina and kept there while the vagina was being incised the cut would be a small one and the stone would serve as a guide on which to make the cut. An endeavor to accomplish this was made by pressing down through the abdominal walls, but this was not satisfactory; the stone slipped. The thought then occurred to me to incise the anterior cul-de-sac, push back the peritoneum between the bladder and uterus as far as the broad ligament, then evert the broad ligament backward with the tip of the finger, catch the stone with the tip of the finger, crooked at the last joint, force it down toward the vaginal outlet, cut on it with a very small incision, and squeeze it out. If hemorrhage occurred, it could be easily controlled by pressure from above with the finger, and sutures could be passed without trouble. Hemorrhage from the anterior cul-de-sac was not feared, as it could be easily controlled.

The operation was performed as planned, without the least difficulty. The anterior cul-de-sac was quickly opened, the peritoneum pushed back and the broad ligament everted. The stone was plainly felt, was pushed down toward the vaginal vault and delivered through a vaginal incision 1½ cm. long and a ureteral incision a little shorter. It was like squeezing a cherry stone out of a ripe cherry. Immediately on delivery the vaginal incision was closed with silver wire sutures. Some hemorrhage occurred in the anterior cul-de-sac, and as it was not desired to take any more time, a few clamps were left on the vessels. The whole operation took ten minutes and the stone was delivered in five minutes. The convalescence was not remarkable and there was no fistula. Subsequent catheterization showed both ureters to be free. The stone in the dry state weighed 7 decigrams, was 1 cm. long and nearly 1 cm. wide.

The finger behind the stone prevents it from slipping back into the dilated ureter above when the ureter is incised. To avoid wounding the ureter while the cul-de-sac is being incised it is best to pass a catheter into it, tying it in by adhesive plaster strips so that it will not slip out. This should be done before the operation begins. When the stone is removed absence or presence of a stricture can be determined with ease by this catheter, which may likewise be run up into the kidney in search for other stones. It is not necessary to endeavor to find the walls of the ureter in order to sew them. The incision being so small when closed acts as a splint which holds the cut ureter together. Should leakage occur the urine will easily find its way into the vagina. If the urine is infected, however, it is best to leave the incision open.

The chief advantages of this method over the abdominal extraperitoneal are the extreme rapidity with which the operation can be performed and also the comparatively slight trauma. Patients suffering with impacted ureteral calculus may be desperately ill, and time is an element sometimes not sufficiently considered. There should be less danger from fistula with this operation than with Doyen's, because the healing of the vaginal incision tends toward closure. A fistula in the vagina is a less serious matter than one in the anterior cul-de-sac, with reference to subsequent operation for closure. Hemorrhage is always under perfect control. Comparatively high stones can be operated on by this method because the finger reaches behind the broad ligament and pulls the stone forward. Certainly stones impacted at the paraischial bend of the ureter can be reached, for this was

24. Ann. des Mal. des Org. , U., G 1894, xli, 845.

25. Schenk: THE JOURNAL A. M. A., 1901, xxxvi, 1303.

26. Am. Jour. of Obstetrics, 1902, xli, 67.

27. Am. Medicine, 1902, iv, 215.

28. THE JOURNAL A. M. A., 1902, xxxix, 291.

29. Morris: Surg. Dis. Kidney and Ureter, London, 1901, ii, 530.

30. Boston Med. and Surg. Jour., 1904, cl, 426.

the position of the stone in the case reported. Unless, however, the vagina is a roomy one considerable difficulty may be experienced. It is distinctly not applicable in patients in whom natural atrophy either has taken place or is taking place, for in these patients the vagina is narrow, there is little room for pelvic manipulation, and there is great danger from hemorrhage. In these cases the extraperitoneal abdominal operation must be done. The following case will illustrate this:

The patient was a nulliparous female, 38 years old, with beginning genital atrophy, and she had a stone impacted in the right ureter about 7 or 8 cm. from the vesical end. The stone was found on vaginal examination, and it could be just reached with the tip of the finger. An incision was made in the anterior cul-de-sac, and the bladder and peritoneum were dissected away from the uterus. The finger passed along this cavity could just reach the stone. An attempt was made to press the stone toward the vagina, but it was found impossible to do so, owing to the shortness of the vagina. After the greatest difficulty enough space was made by dissecting through the base of the broad ligament, so that with the aid of a pair of forceps grasping the lower end of the ureter the stone could be pulled down far enough to be cut on and extracted. A few hours after the operation there was a severe secondary hemorrhage. The patient had to be put on the table again, have ether administered, and have the broad ligament clamped. The stone was a very large one, irregular in shape, measured 2 cm. in length, and 1½ cm. in width. It had given little trouble.

This patient had never borne children, and she had an unusually small, narrow vagina which had undergone some atrophy. She recovered well from the operation, and the wound in the ureter, which was not sutured, it being altogether too high up, closed, and no fistula resulted.

The case illustrates very well the limitations of the Doyen operation; the broad ligament is apt to be seriously lacerated; hemorrhage is likely, and the ureter can not be sutured if the wound is too far up.

The choice of routes for the removal of stone below the pelvic brim will depend on the nature of the case. A stone in front of the broad ligament can be removed by vaginal incision or by some operation performed through the Kelly cystoscope. It will be rarely necessary to open the anterior cul-de-sac for any stone situated in front of the broad ligament. Stones situated between the pelvic brim and the base of the broad ligament are more difficult to remove than stones in any other part of the urinary tract. In the female, stones are very apt to become impacted in this situation, being arrested at a sharp turn in the ureter, called by Young<sup>31</sup> the para-ischia bend, because it is opposite the spine of the ischium. In both my cases this was the seat of impaction. It has been plainly shown that an extraperitoneal incision will reach stones situated in this portion of the ureter. This operation, however, necessitates a long incision through the abdominal wall, and it is not always successful in cases in which there are dense adhesions. In such cases Kelly's method of pushing on the stone toward the vagina through an extraperitoneal incision in the iliac region may make it accessible through the vaginal vault. But cases in which this can be done must be rare. A stone situated directly under the broad ligament and a little behind it may be reached in roomy vaginas by the operation I devised. The sacral route involves a mutilating operation and has become obsolete. The rectal route will seldom find favor, and then only in those cases in which the stone has practically ulcerated through.

Stones situated above the pelvic brim must be attacked through an extraperitoneal incision, and most surgeons will prefer to follow Deaver's<sup>32</sup> rule in these cases, which is to explore the kidney first through a loin incision, pass a ureteral sound down the ureter, locate the stone and enlarge the incision according to need.

## DISCUSSION

ON PAPERS OF DRs. LEONARD AND GARCEAU.

DR. G. L. HUNNER, Baltimore, Md., emphasized the importance of the differentiation of the locality of the stone by careful examination. He thought that too often we are satisfied with the mere fact that the patient has signs or symptoms of stone, and go ahead with the operation, without proper differentiation. He agreed with Dr. Leonard that all methods of precision should be made use of in the diagnosis of stone. He is never satisfied with the Roentgen ray method alone, nor with the waxed catheter method of diagnosis, but uses both in every case. The Roentgen ray sometimes misses large stones when they are encysted in a kidney of fibrous degeneration. It misses small stones when they are very minute and encased in fibrous tissue in the lower end of the ureter. Unfortunately, too, the Roentgen ray finds stones in the ureteral tract when they are not present; in other words, it takes pictures of phleboliths of the broad ligament and of calcareous deposits in the ovary. In such cases the use of the waxed catheter is most valuable. In connection with Dr. Garceau's paper, Dr. Hunner mentioned Israel's incision which starts just below the rib and extends forward and downward into the groin. He thought that Dr. Kelly was the first to make two incisions out of the one long incision still unnecessarily used, leaving the broad bridge of muscle between. The usual lumbar incision made for the kidney and extended farther forward enables one to examine the ureter to the pelvic brim; and then turning the patient partially to the back, the Bardenheuer extraperitoneal incision is made in front. Dr. Hunner finds it advantageous to make the gridiron incision an inch and a half from Poupart's ligament. From this lower incision, even with the gridiron method, a perfectly satisfactory examination can be made and the operation done in any part from the pelvic brim to the bladder. Dr. Garceau, he said, is to be congratulated on his five-minute operation if those stones are up in the ureter, but he did not believe he will be as fortunate in the majority of his cases. The stripping back of the broad ligament from the incision, just as Dr. Garceau describes, is a simple matter if the stone has not been there a good many years and has not attached the ureter to the broad ligament by dense adhesions.

DR. PERCY BROWN, Boston, Mass., emphasized the importance of a proper preparation of the patient, what might be called the ante-operative preparation of the patient in cases where the Roentgen ray method of diagnosis is to be pursued. That preparation, he said, can not be too thorough. Examinations of the ureteral tract can not be made on the spur of the moment. Preparations should be made twenty-four hours beforehand. The patient should be instructed to take cathartics, and the lower bowel should be thoroughly cleaned out, if possible. In this way the task set for the Roentgenologist will be rendered very much simpler, and the results will be very much more valuable. If this method be followed, the question of previous urinary findings in the sediment may be put to one side. The question of whether the stone is of pure uric acid constituency can be ruled out in this way; partly because there is a better field to operate in, and because of the fact that the pure uric acid stone is seldom found in the adult. If it is found in the child, the proposition is an easy one on account of the relative thickness of the child's abdominal wall. When phleboliths appear in one of the venous plexuses of the pelvis, they should be considered very seriously. An experienced observer will, however, be on his guard at a glance.

DR. BRANSFORD LEWIS, St. Louis, Mo., was glad to see that Dr. Leonard, while claiming for the Roentgen ray the tremendous advantages it has given, allows room for mistakes that the ray may make, even in master hands. The interpreta-

31. *Am. Medicine*, 1902, iv, 213.

32. *Surgery, Gynecology and Obstetrics*, 1906, ii, 270.

tion of Roentgen ray plates, he said, is, of course, a very large feature in the work, and mistakes will arise. They may come, not only from the machine or operator, but also from anatomic deviations and pathologic sources. This was well illustrated in a case recently observed in the practice of a friend, Dr. Seelig, of St. Louis. There was shown a spherical body in the line of the right ureter in a female. Although catheterization was attempted, it was not carried out successfully. A diagnosis of ureteral calculus was made. Israel's incision was made and the ureter exposed, but no calculus was found in it, although the ureter was exposed for several inches. Dr. Seelig finally detected a little body that proved to be a concretion in the end of the appendix. He made an incision through the peritoneum, took out the appendix with the concretion, which had been taken to be a ureteral calculus. The Roentgen ray and ureteral catheterization, Dr. Lewis said, should be used together, not one to the exclusion of the other. If it is necessary to remove calculi by cutting operations, he thought Dr. Garceau's method an admirable one, but, he asked, what is the use of making an incision and subjecting the patient to two or three weeks' invalidism if the ureteral calculus can be removed without any cutting at all? Manipulation through the cystoscope does not reach all cases, but many stones in the lower end of the ureter may be removed by means of the operative cystoscopic outfit, which Dr. Lewis has been using with gratifying success for several years on operative work. By this means he has removed several ureteral calculi that would otherwise have required cutting operations.

DR. CHARLES P. NOBLE, Philadelphia, Pa., agrees with those who say to use both the Roentgen ray and the ureteral catheter. He considered Dr. Garceau's use of Deaver's suggestion to do an exploratory nephrotomy in order to look for the stone which is in the urethra like going back to the dark ages. The stone should be located with the Roentgen ray or catheter and exploratory and unnecessary nephrotomy avoided. Dr. Noble agreed with Dr. Hunner that it is an advance in surgery not to make an incision from the spinal column to the pubes, but to divide the operation into two incisions. He advises making the lower incision through the rectus muscle. The operation as done by Dr. Hunner has the disadvantage that if one wants more room, he can not get it without cutting through the transverse muscles.

DR. L. G. COLE, New York City, after making about 1,500 radiographs for the diagnosis of renal calculus and a number of experiments with various kinds of calculi, felt justified in saying that any stone of sufficient size to justify an operation may be shown by a radiograph when the following detail is present: The spine; the transverse processes of the vertebrae all the way to their tips; the outer border of the psoas muscle and the outline of the kidney. This detail may be obtained in about 95 per cent. of the cases. A person having enough experience in reading radiographs to differentiate the shadows of renal calculi from flaws in the plates and other things which cause shadows similar to calculi, may make an absolutely positive or negative diagnosis of renal calculus.

DR. CHARLES L. LEONARD, Philadelphia, has seen many of the best operators operate for the stones that he found. The operations have usually been by different methods than those described; that is, it is very seldom that he found a stone in the parasacral portion of the ureter. Dr. Lewis, he said, asked what is the use of operating for stone in the ureter when one can get it through the urethra by dilating? Dr. Leonard asks, What is the use in operating at all, if the patient will pass the stone by Nature's methods. He has had 31 cases of ureteral stone in which he said the stones were small enough to pass, and all of these patients have passed the calculi. The wax-tipped bougie he considers one of the most accurate methods for detecting ureteral stone, but the Roentgen ray is better than the wax-tipped bougie. Is a case in which Dr. H. A. Kelly examined a patient he found a stone on one side, but on passing the waxed bougie he found none on the other. He asked Dr. Leonard to make a Roentgen ray picture, and a stone was found in the left kidney as well as the one in the right ureter which Dr. Kelly had found. Dr. Leonard agreed with Dr. Cole that the matter of finding phleboliths and calculi is a question of accurate interpretation. The finding of one

phlebolith is very difficult. Multiple ones can readily be seen as to their position. In one case Dr. Kelly detected a single phlebolith in the left vaginal wall.

DR. E. GARCEAU, Boston, Mass., agreed with Dr. Lewis that many stones can be removed through the bladder. This is particularly so, he said, in the case of the female, for with the Kelly cystoscope the field is practically before us, and the ureter can be dilated with the greatest ease. This method should be tried if there is time. Naturally, it is not applicable in very acute cases. The ureter is capable of very great dilatation.

Regarding Deaver's method, Dr. Garceau said he did not mean to give the impression that Deaver's method is the best one, but merely mentioned it to illustrate the point which Deaver made, that there might be stones in the kidney. In these cases the Roentgen ray is of great help in diagnosis before operation.

## THE EARLY DIAGNOSIS OF TUBAL PREGNANCY.\*

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Twenty-nine out of every thirty cases of ectopic gestation present symptoms by which a presumptive, if not a reasonably certain, diagnosis may be made prior to the patient's arrival at a condition which is alarming.

There are instances in which the first complaint and the first symptoms are of such a nature as to excite the greatest alarm in the minds of physician and friends, because the patient is, without previous warning, brought at once to the verge of death, yet such cases are very exceptional.

To simplify the detection of ectopic gestation and to aid in an early diagnosis of the condition, I wish first to direct your attention to what I consider two distinct stages of the disease: the non-tragic stage and the tragic stage.

### THE NON-TRAGIC STAGE.

Since most cases present a group of symptoms preceding the tragic stage of the disease sufficiently distinctive to warrant a diagnosis, and since these symptoms are in no way alarming, I refer to them in this paper as the non-tragic symptoms of ectopic gestation.

In order better to illustrate the importance and value of such a division in the symptomatology of this affection, I wish to make the following assertions, based mainly on a study of more than one hundred and thirty patients operated on, and a few additional ones who died without operation and in whom diagnosis was confirmed at autopsy:

(a) More than 90 per cent. of the 130 patients consulted a physician on account of symptoms referable to the pelvis before the tragic stage was reached.

(b) Many of them received medical advice or attendance for a term of several weeks before tragic symptoms presented. Many of this 90 per cent. of all patients only consulted a physician once before the occurrence of tragic symptoms.

(c) In consequence of failure of the physician consulted to attach proper value to the symptoms, many such patients were wrongly assured, and, although the patients continued to exemplify the symptoms of the non-tragic stage of ectopic gestation, they relied for days or weeks on false hopes until the tragic symptoms occurred.

(d) Of the 90 per cent. of all patients who consulted a physician a very large proportion were told that an (ordinary) abortion was threatened, was occurring, or had occurred.

(e) Of the 90 per cent. of all patients who consulted a

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