will not give the patient the most speedy recovery, the least risk and the most useful limb.

In compound dislocations, reduction is to be sought, unless the astragalus is entirely detached, or the lacerations are so extensive that suppuration is unavoidable. Otherwise, primary removal of the astragalus or amputation is clearly indicated.

A glance at Figure 1 is sufficient to cause one to agree that this joint was totally destroyed, the vessels and nerves torn, the ligaments and articulating bursæ ruptured, and the astragalus looks not only useless, but dangerous to leave within the joint. It was the primary intention, as before mentioned, to perform an astragalectomy. When the joint was opened, however, everything looked clean and nice, and even the joint fluid was not as bloody as one would expect after a complete rupture of the interosseous ligament; and the ease with which reduction was accomplished after subcutaneous tenotomy of the tendon Achilles, together with an inherent aversion to mutilate a joint, all suggested the plan of letting the bone remain *in situ*.

The extraordinary good results in this case will invite the adoption of the same procedure in similar cases.

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TREATMENT OF SUPPURATION OF RENAL PELVIS AND URETER BY LAVAGE *

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The object of this paper is to record a few personal cases and also to present the literature on the subject of renal lavage, to show the present state of this method of treatment. An endeavor will also be made to give some general conclusions and to indicate what kind of cases are amenable to this form of treatment.

In the list of cases herewith appended, cases occurring in the male have been included. It seemed proper to do this because the method of treatment in the male does not differ essentially from that in the female.

The operation of irrigating the pelvis of the kidney through the renal catheter was first conceived and performed by N. Bozeman,¹ but he performed a deliberate cystotomy before passing the catheter, and this instrument was passed, not through the urethra, but through the cystotomy wound. Bozeman's idea was that the inflammation began in the bladder and travelled to the kidney, and he reasoned that drainage of the bladder was first essential, and that by this free drainage the renal inflammation must be favorably influenced. In order to accelerate the cure he irrigated the renal pelvis. Bozeman never passed a cystoscope and through it a renal catheter for the purpose of irrigating the renal pelvis, and he never advised this method. He did, however (*loc. cit.*, page 555, Fig. 43), do a preliminary cystotomy, pass the catheter through the cystotomy wound, and when the end had reached the renal pelvis drew the other end through the urethra and allowed the instrument to remain *in situ* in the urethra; through this catheter the pelvis of the kidney was subsequently irrigated.

The first published case illustrating the treatment as it is carried on to-day, namely, preliminary passing of

the cystoscope, followed by catheterization of the ureter through the cystoscope, was one by H. A. Kelly.² The case was that of a female who had a stricture of the lower end of the ureter; there was likewise pyonephrosis and pyoureter. Treatment was carried on for three months, and 117 separate catheterizations were performed. The solutions used were boric acid in saturated solution, nitrate of silver, 1 per cent. and corrosive sublimate 1:250,000. The germ was the gonococcus. At the end of three months there was a complete disappearance of the pus, and coincident with this there was a gain of twenty pounds in weight. The record states that six months later there was still a residual urine of 90 c.c. in the kidney pelvis and ureter; but there was no pus, and the patient was comparatively comfortable.

Casper³ gives full credit to Kelly as having been the first to pass a catheter through the cystoscope with the deliberate idea of irrigating the renal pelvis. Casper records three cases in which the method was tried.

Pawlik⁴ recorded a few cases in which he used the method. One patient had been under observation for a number of years, and had been treated during all that time.

TECHNIC OF RENAL LAVAGE

The technic of renal lavage is very simple, but some skill is required in the use of the examining instruments. For the female a good cystoscope is that invented by Kelly, the simple tube. The patient is put in the knee-chest position and the ureteral orifice exposed in the ordinary way. It is well to mention that unless the position is correct the ureteral opening will not appear. Hunner⁵ has particularly called attention to this, and he gives excellent rules which it will be well to follow. "The patient should be placed in the knee-chest, and not a knee-hand or knee-elbow position. She may have a small pillow under the chest. She should be far enough forward so that the entire leg from the knee to the ankle rests on the table. The equilibrium will be a little uncertain when the patient's knees are close together; hence they should be moderately separated. The thighs should slant slightly forward from hip to knee; this will make an acute angle of the thighs and leg. The back should have a downward bow; in other words, the patient should relax. The nurse should be instructed never to leave a tight band of any sort, such as a corset, waist band or abdominal binder about the chest or abdomen. Of course, what is aimed at in this position is to empty the pelvis, not only of the intestines, but of all the pelvic organs, so that the pelvis becomes a potential vacuum to be filled with air when one of its hollow viscera is opened. The vagina is always opened first so that the vesico-vaginal wall balloons downward and carries the ureteral orifice into a position to be found easily when the bladder is opened. It is the non-observance of these little points which makes cystoscopy difficult."

If it is not desired to use the knee-chest position, any of the ordinary water cystoscopes which are in use at the present time may be employed. The best for use in the female is the direct vision cystoscope, and I know of none better than that devised by Dr. F. Tilden Brown, of New York. This instrument may be used in all cases in the female, and in most of those in the male.

An instrument which I have used with satisfaction is one I devised some time ago. It consists of a simple tube

* Read in the Section on Obstetrics and Diseases of Women of the American Medical Association, at the Fifty-ninth Annual Session, held at Chicago, June, 1908.

1. Trans. Intern. Med. Congr., Ninth Session, 1887, ii, 545.

2. Johns Hopkins Hosp. Bull., February, 1895, vi, 19.

3. Allg. Med. Central. Ztg., September, 1895, lxi, 913.

4. Rev. de Gyn. et de Chir. Abd., 1897, i, 801.

5. Inter. Jour. Surg., 1907, xx, 241.

with a magnifying glass of slight power at the outer end of (Fig. 1). This glass is attached to a removable cap through which pass the electric light attachment and also the tube through which the ureteral catheter is passed (Fig. 2). The electric light shaft and the ureteral catheter tube are made of flexible metal so that the cystoscope tubes may be of different sizes, and a small or large size may be used at will (Figs. 3 and 4). A small battery furnishes the electricity. It is

Fig. 1.—Showing instrument as it appears in the bladder. The removable cap, to which is attached the electric light shaft and catheter tube, has been inserted into the outer tube. Each of the four reproductions is slightly less than natural size.

Fig. 2.—Showing the removable cap with lens, also electric light shaft and catheter tube.

either a water or an air cystoscope, and according as the operator desires, either medium may be employed. I have given up the air method, because in most of my patients it has proved to be intolerably painful.

The size of the catheter is of some importance. It should be as small as possible, but not too small. There is no advantage in using a large one; on the contrary, large ones are more liable to cause abrasions and so open up areas through which infection may occur. A special advantage in using a small catheter is the fact that the fluid injected through it, after washing out the renal pelvis, flows back along the outer side of the catheter and is collected in the bladder. If a large catheter is used and reflux is not possible the patients are very apt to experience renal colic from overdistention.

When the catheter is in place the contents of the renal pelvis should be allowed to flow out through the instrument. If the case is one of pyonephrosis and the pus is viscid, some assistance may be afforded by massage of the kidney. Gentle pressure applied to the lower pole will sometimes materially assist in the evacuation of the contents of the sac. Having emptied the pelvis, it is then best to thoroughly wash out the cavity, and the best solution for this purpose is a 2 or 4 per cent. boric acid solution heated to a point a little above that of the body temperature.

The fluid may be injected into the renal catheter either by means of a metal syringe or by means of a funnel attached to a tube; by lowering and elevating the funnel the lavage is easily effected. If a small catheter has been used the fluid may be injected with safety under a fair amount of pressure, but care must be taken not to inject too rapidly. With a new case it is best to begin cautiously, injecting a little at a time and allowing the fluid to return through the catheter itself. If a stricture is present, injection under pressure is not allowable;

in such a case all the fluid injected must return through the catheter, otherwise there is risk of colic.

The amount of fluid injected in any case must depend on the condition of the pelvis. In cases of stricture the amount of measured residual urine gives the surest indication of the amount of fluid to be injected subsequently. If there is no dilatation of the pelvis, not more than 8 or 10 c.c. should be injected at first. If this amount is well supported, further experimentation will determine the amount and likewise the pressure under which it is allowable to inject. The best guide is the sensation experienced by the patient; when the pelvis is beginning to be full, a peculiar feeling of distention and slight pain is felt in the kidney. When this is felt the injection should stop. As the catheter is withdrawn the injection should be continued in order to leave the antiseptic solution applied to the ureter.

The kind of germ appears to make but very little difference in regard to the choice of the medicated solution. The germ usually found in these cases is the colon bacillus.⁶ The gonococcus has also been found in a number of instances, and likewise other germs. The solution which has given most satisfaction in the treatment of cases of pyelitis is a solution of nitrate of silver. This has been used in various strengths. Some prefer the mild solutions of 1:2,000 or 1:3,000, others have used stronger ones. I think it is well to begin with a mild solution of nitrate of silver in the strength of 1:2,000 and gradually increase the strength until much stronger ones are used. I have obtained excellent results with the 2 per cent. and even 2½ per cent. solutions of nitrate of silver. If stronger solutions are used I have found that pain is liable to be caused. Two per cent. solutions have been used by other surgeons. Casper,⁷ André and Illyès⁸ have all employed these strong solutions, and with benefit. It is well to precede the application of the nitrate of silver by a thorough washing out of the pelvis by a boric acid solution. This is a

Fig. 3.—Showing outer tube with plunger; ready to be passed through urethra into bladder.

Fig. 4.—Showing smaller sized tube.

mild antiseptic in itself, and is very cleansing. In a mild case it is sometimes the solution of choice and may be used alone. It has given excellent results.

Bozeman (Case 13), the first to use corrosive sublimate, 1:20,000, got an excellent result. If it is used in strong solution it is very liable to cause pain. Some surgeons have employed it in a 1:5,000 solution.

FREQUENCY OF TREATMENT.

The frequency with which treatment should be given varies with the case. In cases of abundant secretion of pus, every day is not too often, provided the patient

6. Brown: Johns Hopkins Hosp. Rep., 1901, x, 43.

7. Allg. Med. Central-Ztg., 1895, lxiv, 913.

8. Deutsche Ztschr. f. Chir., 1905, lxxvi, 40.

supports it. With the first experience of pain or of irritation of any kind, the treatment should be stopped and a rest given. Most surgeons will, in cases in which there is a moderate amount of pus, prefer to give the treatment every three or four days at first, and later, once a week. The latter class of case appears to support the treatment much less easily than the former; at least, this has been my experience.

Few surgeons will choose to leave a permanent catheter in the ureter with the idea of securing free drainage for a pus sac. If the pus is at all thick, it will not flow through the catheter, and if it does not flow, retention is likely to occur and alarming symptoms may make their appearance. Cases illustrating this danger have been reported (Cases 23, 24 and 26). Nevertheless, so great an authority as Albarran⁹ advises, in case of thick pus, to leave the catheter in. Most surgeons, however, will prefer not to adopt this rule. It is especially dangerous in case there are general symptoms of infection.

In my experience renal lavage is not at all dangerous. I have performed this slight operation many times, and I have never seen the slightest ill effect. I have never seen renal colic following the treatment, nor has there ever been any unbearable pain. This result may be attributed to the fact that the greatest care was taken in the sterilization of the instruments which were used, and also to the fact that no attempt was made to inject a large amount of fluid with the idea of thoroughly irrigating the pelvis; as much good may be accomplished by repeated irrigation, using small amounts at a time, and there is less danger by following this rule than if an attempt is made to inject a large amount under great pressure. Albarran (loc. cit., p. 428) has had the same experience, and has never seen any ill effects. Casper¹⁰ is also of the same mind, and in his experience the method has been absolutely without danger. Casper feared that some irritation of the kidney might follow this method of treatment, but he noted particularly that those cases in which there was albumin before the treatment was instituted the albumin promptly disappeared.

Renal colic has been reported in a number of cases, but I think it is perfectly avoidable. Infection, of course, is to be borne in mind, but with a small catheter, and with extreme care and with clean instruments, it is, I believe, possible to avoid it. It certainly has not been more common, if one may believe the recorded cases, than infection following the use of the urethral sound.

In a few rare cases a slight degree of hematuria has been known to follow the introduction of the instrument. This has occurred once in my experience, but the effect was *nil*. Others have likewise mentioned it. Serious results are liable to occur in those cases in which there is pyonephrosis with general systemic infection. But these cases are not amenable to treatment by this method, and a catheter should never be passed in a case of this kind with the idea of emptying pus and curing the disease by irrigation. Desnos (Case 23) had a fatal result in a case of this kind, but he admits that it was an unsuitable case, and that he resorted to the method only because the patient refused a much needed nephrotomy. A slight degree of fever sometimes follows the treatment, and if it does, no attempt should be made to renew the treatment until the patient again has a lowered temperature.

INDICATIONS FOR LAVAGE

This method should not be used indiscriminately; in fact, I believe there are few cases in which it should be tried. Great caution must be urged in the selection of cases. Any ureter, if irritated by a catheter, will shed all kinds of epithelium, caudate, medium sized, and round. Such epithelia, if found in the centrifugized urine, does not mean that a condition of ureteritis or pyelitis exists; the findings are due to traumatism and nothing else. Bierhoff¹¹ also calls attention to this point. The best method of making a diagnosis of pyelitis and ureteritis in the female, is to place the patient in the knee-chest position and to collect the urine by means of a cystoscope directly as it drops from the ureteral orifice. If this urine contains the elements usually found in the inflammatory conditions, a diagnosis of pyelitis or ureteritis may be made.

Cases which are the most amenable to treatment are those in which there is a free discharge of pus, which has existed for a long time without showing much sign of diminution in amount. But these cases are exceedingly rare if there has been free drainage, and if there has been no obstruction to the flow of the urine at any part of its course from the pelvis to the bladder. The greatest care should, therefore, be taken in order to determine if any such lesions do exist; stone in the ureter, stricture of the ureter, kinks due to prolapse of the kidney, and inflammatory conditions of the bladder involving the ureteral opening and causing narrowing must all be carefully looked for.

Chronic pyelitis is often unrecognized and untreated for many years. Many cases of pyelitis, in the female, date from the time of pregnancy and immediately afterward. The majority of them get well, but some do not. Special care should, therefore, be taken to follow a case of pyelitis of pregnancy long after the disease has given any marked symptoms. In this disease the infection is an ascending one, and it is fair to presume that the exciting cause is pressure of the child's head on the ureter as it crosses the pelvic brim. It is curious to note that most of these infections are right sided. The bladder, as a rule, suffers very little or not at all, even if there is an abundant discharge of pus from the kidney. After the first few days of vesical irritability, the bladder ceases to give marked symptoms, and at the end of a week or two there is frequently no indication of disease on the part of the bladder, yet at the same time, there may be quite a considerable amount of pus in the urine. I have known such pyuria to exist for many weeks after the first infection of the kidney. It is in cases like these that the treatment is especially advantageous, but at the same time it should not be instituted too early.

I am decidedly of the opinion that acute pyelitis due to any cause should not be treated by this method, and I believe that most surgeons will bear me out in this point. To pass a renal catheter along a recently infected ureter, appears to me to be a very dangerous proceeding, because it may lead to severe general infection. In most acute cases recovery is the rule. I think it will be found that many of the cases in which this treatment is required are those in which there has been some previous affection of the ureter; either stricture or calculous disease, or else conditions in which the drainage from the kidney has been imperfect. A floating kidney is very apt to be associated with recurrent attacks of pyelitis.

9. Ass. Franç. d'Urol., Paris, 1898, iii, 429.

10. Allg. med. Central-Ztg., 1895, lxi, 916.

11. Am. Jour. Urol., New York, 1904, i, 34.

The displacement of the kidney produces a twist in the ureter, and engorgement of blood in the kidney is very apt to occur; subsequent infection is easy. The urine can not all escape, retention occurs, and we have conditions favorable for long continuance of the inflammatory process. One hesitates to advise nephropexy in such a condition, for fear that the inflammatory condition of the kidney may affect the healing of the wound and failure result, leaving the patient worse off than before. It is better in such a case to apply a well fitting corset, which will hold the kidney in place, and at the same time to irrigate the renal pelvis in an endeavor to cure the infection. When the infection has been gotten rid of, it will be time to consider a more radical operation.

Stricture of the ureter is very frequently responsible for chronic pyelitis and pyonephrosis. The first step is to dilate the stricture with the idea of establishing freer drainage. At the same time lavage may be carried on. In a long standing case, however, such a course does not offer much hope of a permanent cure, although it can not be denied that much relief may result. Kelly's patient (Case 30) illustrates this point. There was a residual amount of urine of 150 c.c. in the kidney sac when the treatment was first begun. Although the stricture was sedulously dilated, and the kidney sac kept carefully cleansed for a period of many weeks, yet in the end there was a residual urine amounting to 90 c.c. The infection, however, was gotten rid of. In this case there was undoubtedly a chronic flaccid condition of the walls of the ureter and of the pelvis of the kidney which did not allow of contraction to the original size, hence the permanent dilatation. In such a case there will be need of continual treatment, and reinfection is always possible. Ayers¹² calls attention to high attachment of the ureter in the renal pelvis, which forbids the thorough emptying of the pocket below, as the cause of long continued pelvic inflammation. Lavage will, in such instances, diminish the severity of the inflammation, but recurrence may be looked for at any time.

CONTRAINDICATIONS

Unsuitable cases are those in which the drainage is imperfect or can not be carried out. In this class are kidneys which have several pus pockets which do not communicate freely with the pelvis. Here obviously lavage will accomplish but little. Results of treatment must be doubtful when a pyonephrosis exists in conditions in which there is a tolerably large sac filled with pus. Of course, when such a condition is associated with marked systemic disturbances, the only relief is a free incision, and temporizing is clearly out of the question. In any pyonephrosis without general symptoms it is impossible to say whether lavage is suitable treatment or not, and the only way to find this out is by trying. If improvement follows, the treatment may be continued. If not, the treatment should be stopped. Inspissated pus in such a sac is very difficult to get rid of, and it may be a question if all the pus is ever entirely evacuated.

Israel¹³ analyzed his personal cases to see in how many of them renal lavage might have been tried when there was pyonephrosis. He had 81 such cases, and in only three of them, or 3.7 per cent., in his opinion, would renal lavage have been proper to consider. In 5 of these 81 cases there was spontaneous cure; in 39 of the remainder there was obstruction of the ureter, which made

the passage of the catheter impossible; in the remainder the nature of the disease would have made treatment unsuccessful. Among these there were 11 cases of tuberculosis and one of syphilitic gumma; in 18 there were calculi; in 13 the parenchyma was infiltrated with small abscesses; in 6 there was an obstruction in the first portion of the ureter; in 2 there was a valve formation; in 3 there were adhesions; in 1 there was a kink in the ureter. In all these cases catheterization with renal lavage would have been useless. In 4 of the cases the contents of the pyonephrosis could not have been evacuated because the pus and shreds were firmly adherent to the walls; in 12 cases the septic condition of the patient demanded rapid removal of the organ. In the other 15 cases the most favorable nephrotomy would not have attained a complete cure, because in two of them the pyonephrosis recurred and demanded nephrectomy; in 11 cases there was a urinary fistula which demanded removal of the kidney. Two of the patients died.

It is hardly necessary to mention that tubercular pyelitis is not amenable to this form of treatment. Instrumentation is painful in this condition and does much more harm than good. Casper¹⁰ does not believe that the treatment is worth trying in paralysis of the bladder with ascending infection. Here the cause of the disease is always present, and renewed infection is more than likely.

All are agreed that in pyelonephritis the treatment is harmful. Here we have an inflammation of the kidney substance, and it is difficult to see how irrigation of the pelvis could be expected to do much good.

I have already referred to the difficulty of improving the condition of chronic ureteritis in which there is much thickening of the ureter. Unfortunately, patients affected with this disease suffer intensely and it would be satisfactory to do something for them short of a radical operation. On examination by vagina a thickened ureter is often found; one must be on the lookout, however, not to mistake thickening due to new tissue formation for inflammatory edema. I believe chronic ureteritis in which there are marked tissue changes in the ureter to be incurable, and I do not think that lavage in cases like this is of the slightest avail. The only positive remedy for these patients is nephrectomy.

USE OF OTHER METHODS

If, after having faithfully tried renal lavage in a case in which there is free drainage from the kidney, and if the treatment has failed, the question of other methods comes up. If in such a case there is a severe grade of cystitis, the best method of treatment in the female is a cystotomy and subsequent lavage of the kidney pelvis. It may be well supposed that reinfection of the upper passage may occur in consequence of reflux of urine through the ureteral orifice, which has become dilated in consequence of the inflammatory condition. That such a dilatation of the ureteral orifice does occur can be confirmed by most of those who have had experience in this work, and it can be compared to the dilatation of the cervix uteri always seen in a well marked instance of inflammation of the uterine cavity. That the drainage of both the bladder and of the kidney is infinitely bettered by cystotomy there can be no question, and the only objection to it is the fact that the operation entails so much annoyance and care to the patient.

12. Intern. Jour. Surg., 1907, xx, 136.

13. Berl. klin. Wchnschr., 1899, xxxvi, 33.

We thus come back to Bozeman's original proposition, which was to do a preliminary cystotomy, in the female, before irrigating the renal pelvis. In two of the elder Bozeman's patients (Cases 13 and 15), and in one of his son's (Case 16), the improvement on the part of the kidney was prompt and marked, and ultimate recovery is recorded in two of these. I do not wish to be understood as recommending this procedure in all cases, for I think it is not necessary, but it is certainly an excellent method of treatment when the inflammation is general and affects the kidney and the bladder to a marked degree.

ANALYSIS OF CASES

In estimating the value of a therapeutic method, we have to rely on the experience of a large number of observers. There is necessarily some difficulty in drawing correct conclusions from published reports because it is not always possible to determine just what was meant by the reporter. Nevertheless, it is only by studying a series of cases that we can arrive at any conclusion whatever.

The first thing that strikes us is the fact that with few exceptions there has been an immediate and marked improvement in the nature of the case as soon as the treatment was instituted. This is unequivocal, and can be maintained with assurance. Furthermore, almost all observers agree that the treatment in properly selected cases, is practically devoid of danger, and that the end results are astonishingly good. In the cases which I have examined I have failed to find mention of the serious sequelæ which have been predicted by men who have really not given the method a fair trial, and it seems to me that if there had been bad results I should have found some mention made of them. This tallies with my own experience. Analysis of the thirty-nine chronic cases herewith presented is as follows:

Reported cured	13
Relieved	20
Result not stated	5
Died	1
	<hr/> 39

By cured is meant complete absence of symptoms and total disappearance of every trace of pus in the urine at the time the report was made. Of course, these figures do not, perhaps, represent the true state of the method, and it is probable that they give only an approximate idea. In some of the cases of cure, however, the result was really remarkable, and there seemed to be no question but that the treatment instituted had everything to do with a favorable effect. The cases in which cures were affected are the following: Nos. 5, 13, 15, 16, 17, 18, 19, 20, 22, 30, 33, 35 and 36. The cases in which relief was obtained are as follows: Nos. 1, 2, 4, 6, 7, 8, 9, 10, 11, 14, 21, 25, 27, 28, 31, 32, 34, 38 and 39. Those in which the final result was not stated are: Nos. 9, 14, 26, 31 and 32. Death followed in Case 23.

It is noticeable that in a large number of cases pyuria sometimes persisted a considerable length of time after treatment had been discontinued. These cases are as follows: Nos. 1, 2, 3, 4, 6, 7, 8, 10, 11, 12, 21, 25, 27, 28, 29, 34, 37, 38 and 39. I think that there is a decided tendency for pyuria to reappear even long after the disease has apparently gotten well, and I think also that one must be exceedingly careful in pronouncing the patient cured unless he is perfectly positive that every trace of pus has disappeared, and the only way, in my opinion, to determine this point, in the female at least, is to place the patient in the knee-chest position,

pass the oblique cystoscope of Kelly and collect the urine directly as it drops into the end of the instrument. If such urine is absolutely free from pus and germs the patient may be said to be cured.

A word may be said in regard to the unfavorable cases. They are the following: Nos. 3, 12, 23, 24, 26 and 29. In Case 3, a personal case, the patient had been suffering a long time from double pyelitis, and in addition there was chronic interstitial nephritis on both sides. I am inclined to think that this last complication had a good deal to do with the unsuccessful issue. The patient was thin, sallow, had been suffering a long time, and her powers of resistance were decidedly below the normal. I did not expect much from the treatment, and I was not surprised at the unfavorable result. In Case 12 there was a high attachment of the ureter, and the reporter (Ayres) did not expect much relief from the treatment. Case 23 was one in which operation was clearly indicated, but it was refused and the patient died. In Case 24 a permanent catheter was put in and shortly afterward it became blocked. A chill and high fever followed and the instrument was removed. The treatment was again tried and the same result took place. In Case 26 a permanent catheter was allowed to remain in for four days. The ultimate result was not stated, but the maneuver was followed by a severe chill. In Case 29 there was a distinctly unfavorable result in what appeared, at first sight, to be a case favorable for treatment. The disease was gonorrheal cystitis and pyelitis, and catheterization was followed immediately by a chill and high fever.

CONCLUSIONS

1. Renal lavage is but seldom required, and it should not be used indiscriminately. There must be careful deliberation before resorting to this method of treatment, and the patient should have been under observation a considerable length of time before the treatment is proposed.

2. Acute cases are not suitable for this method of treatment.

3. Thorough free drainage of the kidney through the ureter must be secured before permanent relief can be expected.

4. The most suitable cases are those of simple chronic suppurative pyelitis without obstruction, but these cases are very rare, and, unless the germ is a very virulent one, such patients usually get well in the course of time.

5. The method may be used in an endeavor to cure an inflammation in a hydronephrotic sac as a preliminary to nephropexy, but the kidney should be supported meanwhile by an appropriate apparatus.

6. It will at times get rid of the infection in pyonephrosis, but this rarely occurs. It should never be permitted in severe pyonephrosis with general systemic infection.

7. A permanent catheter in the ureter is very dangerous, especially in the presence of acute infection with general symptoms.

8. The treatment does little or no good in a case of ureteritis with marked tissue changes in the ureter leading to sclerosis and thickening.

9. Renal lavage is seldom followed by any serious harmful sequelæ.

10. Enough cases have not yet been reported to give a definite standing to the treatment.

11. Further trial is needed.

REPORT OF PERSONAL CASES

CASE 1.—History.—The patient, a female, 40 years old, was operated on two years ago for calculus of the lower end of the ureter. The operation was performed through the anterior cul-de-sac, and a large stone was removed. A fistula remained which lasted several weeks and then closed spontaneously. She was quite well for several months, and at the end of that time returned complaining of frequent micturition. The right ureter was catheterized and a considerable amount of pus was found in the urine. The ureter and kidney were then washed out several times with a solution of 1:2,000 alphozone at intervals of a few days. She took urotropin in the meantime. This treatment cleared the urine a good deal, and she experienced much relief. The treatment was discontinued.

A few months later she began to have considerable pain in the right kidney, and this was followed by fever, chills and general prostration, and there soon appeared a swelling under the right ribs. The condition growing worse, nephrotomy was advised and accepted. A large amount of pus was evacuated through an incision in the loin, and a careful search was made for stone, but none was found. An x-ray photograph by Dr. Percy Brown made previous to the operation was negative. The nephrotomy wound closed at the end of a few weeks, and she was in much better condition. There still remained a considerable degree of pyuria, and it was proposed to irrigate the kidney at regular intervals. Before doing this, a careful examination of the ureter was made for the purpose of determining the caliber of the canal. A number 15 F. bougie was passed through a cystoscope into the right ureter well beyond the site of impaction of the calculus which had been removed by operation. There was no stricture. It was evident, therefore, that the case was one of long continued pelvic suppuration, not dependent on stricture or stone. A bacteriologic examination of the urine showed the bacillus mucosus capsulatus. The case seemed a good one for trying this method of treatment.

Treatment.—At the time the treatment was begun, which was shortly after the nephrotomy, she was suffering from numbness in the right thigh and arm; there was much pus in the urine, a quarter of an inch on standing; she was urinating eight or ten times a day, and once at night, and her general condition was one of considerable weakness. Irrigation of the pelvis of the kidney and ureter was done every few days at first and later every week. The solutions used were a 2 per cent. boracic acid solution, and later a 2 per cent. and sometimes 2.5 per cent. solution of nitrate of silver. A stronger solution of silver produced so much pain in the kidney that it seemed inadvisable to continue its use. Altogether she had twenty treatments. There was no reaction and there never was any colic or unusual, unbearable discomfort. The patient always came to the office and returned home unaided. From the very first relief was experienced.

Result.—The amount of pyuria rapidly diminished, and at the last examination, made a short time ago, the right ureteral urine was almost clear, was acid in reaction, and the sediment contained only a very small amount of pus, a little blood, and a few small cells. It is evident, therefore, that the process is not at an end, and that the patient must be watched in the future. Her general condition, however, is much more satisfactory. She has gained in weight, the appetite is good, she sleeps well, and the bladder does not bother her at all, although there is still a considerable degree of injection of its mucous membrane, and the bladder urine, drawn with a catheter, contains a considerable amount of pus. It is thought that the bladder inflammation is kept up by the constant discharge of slightly purulent, bacteria-laden urine from the right side.

CASE 2.—History.—The patient was a woman 52 years old who had had gonorrhea many years previously. Since the infection she had always been troubled with her bladder. After the first violence of the inflammation had subsided, there remained a constant desire to urinate, which never left her night or day. The chief symptom was a constant irresistible desire to pass water, especially bothersome at night. The urine was apparently clear, but on careful examination the right ureteral urine was found to contain microscopic quan-

ties of pus, blood and a few casts. The renal catheter discovered a stricture on the right side about three inches from the ureteral orifice. The stricture allowed a catheter $1\frac{1}{2}$ mm. in diameter to pass.

Treatment.—The stricture was dilated until it admitted a No. 11 F. catheter, then an attempt was made to cure the pyelitis and ureteritis by means of injections of fluids into the renal pelvis. Several treatments were given and it was thought that there was some improvement at first, but the attempt was finally abandoned because the improvement was not marked. The solutions used were a $\frac{1}{2}$ and a 1 per cent. solution of nitrate of silver, a 2 per cent. boracic acid solution and a 5 per cent. ichthyol solution.

Result.—It can not be said that much benefit resulted from the treatment of this case, and it is my impression that in cases similar to this one, in which there has been a long continued inflammation affecting the pelvis, and especially the ureter, in which undoubtedly marked changes have occurred in the ureter, the treatment had better not be tried. It is difficult to see how the injection of a mild solution every few days, when at best only the superficial areas are reached, can favorably affect a long standing disease with deep seated lesions. In my opinion, a case like this had better be treated by palliative means, and if the suffering is intolerable and can not be endured any longer, I believe that it is justifiable to remove the kidney. The latter course, however, will be declined by most patients in view of the severity of the operation.

CASE 3.—History.—The following case is very similar to Case 2, and had a like result. The patient was a woman, 55 years of age, who had the uterus removed seven years previously. Since that time there had been a good deal of bladder irritation which had resisted all kinds of treatment. On examination there was some tenderness over the right kidney, and there was also tenderness of the left ureter on pressure through the vagina. The separated urines showed pyelitis on both sides, and there was also in addition chronic interstitial nephritis. There was a slight trace of albumin in each urine. The germ present in this case was the colon bacillus. The bladder was markedly inflamed, and there was general redness and an unusual amount of sensitiveness of the mucous membrane of the bladder. It was an extremely irritable cystitis.

Treatment.—On several occasions at intervals of a few days, the ureters were catheterized and the pelvis of the kidney irrigated. After each treatment the patient was made distinctly worse, and the treatment was abandoned. The injection of a specially prepared vaccine made from the germs in her case was likewise unsuccessful. The vaccine was persistently used for a period of six weeks, without appreciable result. There remains nothing else except a cystotomy for the relief of the intolerable suffering which the patient is now enduring. It is proposed to irrigate the renal pelvis after this operation has been performed, with the hope that a cure may be effected. The long duration of the case, however, makes this result somewhat doubtful, especially in view of the fact that there is a well-marked condition of chronic interstitial nephritis, which may prevent reparative processes.

CASES FROM LITERATURE

CASE 4.—ALBARRAN¹⁴ Female, aged 29, for five or six years had pains in both lumbar regions and symptoms of cystitis; pyuria; both kidneys large and sensitive. Lavage of left kidney every second day, for fifteen days with boric acid followed by nitrate of silver, 1:1,000. A month later the same treatment five times. **Result:** The patient was much improved, the pains were less severe, and the urine was much clearer. (The right kidney seems to have given little trouble.)

CASE 5.—ALBARRAN¹⁵ Female, aged 37. Right floating kidney was anchored in 1896. Two years later pyuria on right. Three treatments by lavage, two in July, 1898, two in April, 1899, with boric acid, followed by nitrate of silver, 1:1,000. (There was dilatation of the pelvis of the kidney in this case. The pelvis held 12 c.c.) Six months after the last treatment patient was reported well.

CASE 6.—ALBARRAN¹⁶ Female, aged 74, had pains in left lumbar region. Cystitis. Lavage of left kidney, every two days, five times, with boric acid, followed by nitrate of silver, 1:1,000. The patient is much better and insists on interrupting the treatment to go to work.

14. Ass. Franç. d'Urol., Paris, 1898, III, 421.

15. Id., 422.

16. Id., 423.

CASE 7.—ALBARRAN :¹⁷ Female, aged 68, had pains in left lumbar region. Catheterization shows slight pyuria on the left, but a good deal to the right. One lavage with boric acid, followed by nitrate of silver, 1:1,000. This patient did not return for several months, having felt better in the meantime. Catheterization then showed some pyuria on the right.

CASE 8.—ALBARRAN :¹⁷ Female, aged 26, had severe pain on right side for a year. Abundant pyuria at times, and a good deal of fever. The right kidney can be felt three inches below the ribs. There was retention in the kidney of 15 c.c. Lavage of right kidney four times in two months with boric acid. The right kidney is much less painful, but is still quite large. The patient is able to work.

CASE 9.—ALBARRAN :¹⁸ Female, aged 30, had pains in left lumbar region for two years. Lavage of left kidney seven times in one month with boric acid. The patient is very much better; can eat with good appetite, has no fever and sleeps well. Final result not stated.

CASE 10.—ALBARRAN :¹⁹ Female, aged 52, in May, 1896, was operated on for calculus of left kidney; four stones were removed. The wound healed and the urine became clear. Six months later she returned with abundant pyuria. Left kidney somewhat large. The catheter evacuated thick pus from the left kidney. Number of treatments not stated, but it is said that she was treated twice a week for some time. The pus was thick, and great difficulty was experienced in evacuating all of it. Solutions: boric acid, followed by nitrate of silver, 1:1,000. The urine is much clearer, and the patient states that she is very much better.

CASE 11.—AYRES :²⁰ Female, aged 72, had renal calculi in left kidney for 15 years. Nephrectomy by Dr. Bremmerman. One month later pain in the right side with pyuria. Four lavages; solution not stated. Nearly normal urine, but there was a return of the calculus disease on the right at a later time.

CASE 12.—AYRES :²¹ Female, aged 46, had postpuerperal pyelitis 16 years previously. Pyuria and hematuria. Had been suffering pain in the left side for a year when seen by physician. Pyuria both sides, especially left. Lavage, left side, number of times not stated, with nitrate of silver in weak solution. Result, not stated. The author diagnosed high attachment of ureter on the left in this case from absence of floating kidney and from presence of residual urine in the kidney. Result unfavorable. Nephrectomy advised but refused.

CASE 13.—BOZEMAN, N. :²² Female, aged 34, had pain in left lumbar region before delivery. Vesico-vaginal fistula. Ill 4 months. The left ureter washed out daily through the fistula for six weeks, and at less frequent intervals for six months, with bichlorid of mercury, 1:20,000. At the end of six weeks the urine contained only a trace of pus; at the end of six months pyuria had disappeared. At the end of the year the fistula was closed and the patient had no further symptoms.

CASE 14.—BOZEMAN, N. :²³ Female, aged 32, had suffered for six years with symptoms of cystitis. Cystotomy had been performed by another surgeon five years previously. The drainage was insufficient. A history of pains in the right lumbar region for a long time, followed by pains in the left lumbar region. The left ureter was catheterized through the cystotomy wound, and the kidney washed out on three occasions with corrosive sublimate, 1:20,000. End result not given.

CASE 15.—BOZEMAN, N. :²⁴ Female, aged 34, had pains in right kidney for three years with symptoms of cystitis; gradually lost weight; abundant pyuria. Cystotomy was performed, and the right ureteral orifice was exposed. Later, when the edges had healed, a catheter was passed into the right ureter. Daily lavage for three weeks with corrosive sublimate, 1:20,000. At the end of three weeks the urine was clear. At the end of nine months the fistula was closed and the patient was well. She had gained twenty-five pounds in weight.

CASE 16.—BOZEMAN, N. G. :²⁵ Female, aged 26. Great prostration, fever, chills and abundant pyuria, with pains in right kidney region. A cystotomy was performed, and later the right ureter and pelvis were washed out several times in three weeks with corrosive sublimate, 1:20,000. "Immediate improvement," but no other details given. Nine months later the patient was well and the fistula was closed.

CASE 17.—BREMERMANN :²⁶ Male, aged 29, had gonorrhea 8 years previously. Recurrent attacks of pyuria. Catheter showed pyelitis on both sides. Seventeen lavages with nitrate of silver, 1:5,000. Cured. Examined one month later and cure persisted.

CASE 18.—CASPER, L. :²⁷ Male, aged 34, pyonephrosis on right side, held 300 c.c. Evacuation aided by massage. Treatment repeated two days later and catheter allowed to remain permanently. Six treatments in all. Urine clear but microscopically contained a few leucocytes. Solution, nitrate of silver, 1:1,000. Patient was kept under observation and was reported well, with clear, normal urine.

CASE 19.—CASPER, L. :²⁸ Female, aged 28, pyonephrosis following childbirth. Right kidney affected. Right ureter catheterized. Kidney sac held 150 c.c. Later the pelvis was irrigated. Three days later a diminution in volume of the tumor. Pelvis irrigated for six weeks at intervals of a few days. The urine from the right kidney was then clear. Kidney was somewhat prolapsed, but not enlarged. Solution, nitrate of silver, 1:1,000. Patient followed for nine months, and continued well. Urine was clear and free from pus.

CASE 20.—CASPER, L. :²⁹ Male, aged 28, left chronic gonorrheal pyelitis. Kidney pelvis with 60 c.c. Lavage every two days for twenty treatments, with nitrate of silver, 1:1,000. After the

second treatment a marked improvement was noticed. Less pus and less albumin. By the sixth treatment the urine was entirely clear and was free from cells with the exception of some epithelium from the ureter. The subjective symptoms also improved. At the end of four months the patient was discharged as completely cured. Free from all symptoms and urine clear. No pus and no albumin.

CASE 21.—CASPER, L. :³⁰ Male, aged 34, subacute gonorrheal pyelitis, severe case. Patient had been treated by a permanent catheter in the ureter, but no benefit resulted. A large amount of pus was evacuated. Lavage every day. During withdrawal of the catheter from the kidney fluid injected along entire ureteral canal. Much pain and tenesmus following the treatment. At the end of the second treatment the patient was much better. The urine was more nearly normal than for four months past. After this there was rapid improvement. One and two per cent. solutions of nitrate or silver were used. One month after treatment the urine was examined and was found to be nearly normal. There were only a few pus corpuscles in the sediment. Six weeks later an examination was again made, and the same findings were noted. The patient reported himself perfectly comfortable and apparently well.

CASE 22.—CASPER, L. :³¹ Male, aged 28, gonorrhea one year previously. Severe cystitis; left pyelitis. Lavage of renal pelvis six times with boric acid, followed by nitrate of silver, 1:1,000 and 1:500. Cured.

CASE 23.—DESNOS :³² Female, aged 28, cystitis and left pyelonephritis. Large tumor. Nephrotomy was refused, although clearly indicated. A catheter was introduced into the kidney and allowed to remain. A severe chill followed, with alarming symptoms. No attempt to wash out the kidney. Death on the fourth day.

CASE 24.—DESNOS :³³ Female, aged 48, one year's cystitis and right pyonephrosis. A permanent catheter was placed in the ureter, and this was removed immediately by a chill and high fever. While the catheter was in place the pus in urine suddenly ceased to flow. The instrument was left in for twenty-four hours. Six days later the operation was repeated, and again a chill and high temperature followed within three hours. No attempt at irrigation. Result, not stated.

CASE 25.—DESNOS :³⁴ Adult, pyelitis (sex and side not stated). Lavage four times, at intervals of eight or ten days. After each introduction a rise in temperature. Solution not stated. There was an improvement, but the pyuria returned as soon as treatment was discontinued.

CASE 26.—DESNOS :³⁵ Male, aged 45, stricture, cystitis, right pyelitis. No general symptoms. A catheter was introduced into the ureter, and this was followed by a severe chill. The catheter was left in for four days. No lavage attempted. Result not stated.

CASE 27.—FURNISS :³⁶ Female, aged 41; 23 years previously postpuerperal cystitis and pyelitis on the left side. Suffering was severe during the last five years. The catheter was passed into the left kidney, and a large amount of pus and urine evacuated from it. Seven treatments were given with boric acid, followed by nitrate of silver, 1:5,000. Great improvement followed, but no cure is recorded.

CASE 28.—ILLYES :³⁷ Male, aged 24, ectopia of bladder, bilateral pyelitis. Catheter inserted into the right ureter, pelvis irrigated with one liter sterile water, and afterward nitrate of silver injected. This was done for four successive days. There was great improvement, and six further treatments were given. The left ureter was similarly treated for ten days, and the urine then became clear on both sides. Solution, nitrate of silver, 1 and 2 per cent. Three months later urine again became cloudy. End result not stated.

CASE 29.—ISRAEL :³⁸ Adult, sex not stated, right gonorrheal cystitis and pyelitis. Ureter was catheterized, and this was followed by a chill and high fever, which lasted two or three weeks. There was no attempt at lavage. The urine became more cloudy, and for the next two or three years the patient was subject to chills and fever.

CASE 30.—KELLY :³⁹ Female, aged 31, symptoms of cystitis for some time. Abundant pyuria. On examination stricture of lower end of ureter was found. The patient was treated for a period of three months, during which time 117 separate lavages were given. The capacity of the kidney sac was 150 c.c. The inflammation was gonorrheal. Solution, boric acid, nitrate of silver 1 per cent., and bichlorid of mercury 1:150,000. There was a complete disappearance of the pus in the urine, and coincident with this the patient was greatly improved in her general health. She gained twenty pounds in weight, and felt better and stronger than she had for many months previously. She was seen six months later, and there was then a residual urine in the kidney sac of 90 c.c., but the urine was clear and contained no pus. The symptoms were insignificant.

CASE 31.—KELLY :⁴⁰ Female, aged 52, left nephrectomy; right pyelitis; colon bacillus infection. Cystotomy followed by irrigation of right kidney. Number of treatments not stated. Solution, nitrate of silver (strength not stated). Vigorous treatment almost caused bacilli to disappear, but not quite. The patient was much relieved, however, and was able to work. Final result not stated.

CASE 32.—KELLY :⁴¹ Female, adult, large right kidney with pyuria. A catheter was passed. This was followed by a chill. Later the attempt was resumed, and the kidney was washed out later at short intervals for three weeks. There was a good deal of pus in this kidney. Solution not stated. There was a gradual improvement, and patient finally went home. A year and a half later she was reported as well.

CASE 33.—KELLY :⁴² Female, adult, colon bacillus infection, cystitis and left pyelitis of four years' standing. Cystotomy; drainage. The bladder was curetted. (No treatment appears to have been

17. Id., 424.

18. Id., 425.

19. Id., 426.

20. Intern. Jour. Surg., 1907, xx, 138.

21. Id., 134.

22. Trans. Inter. Med. Congr. Ninth Session, 1887, ii, 545.

23. Med. Rec., New York, 1888, xxxiv, 117.

24. Am. Jour. Med. Sci., 1888, clv, 257.

25. Am. Gyn. and Obstet. Jour., 1897, ii, 33.

26. Am. Med., 1905, x, 997.

27. Berliner klin. Wehnschr., 1899, xxxvi, 28.

28. Berliner klin. Wehnschr., 1899, xxxvi, 28.

29. Allg. Med. Central Ztg., 1895, lxi, 915.

30. Allg. Med. Central Ztg., September, 1895, lxi, 913.

31. Wien. med. Presse, 1895, xxxvi, 1463.

32. Ass. Fr. d'Urol., 1898, iii, 434.

33. Id., 433.

34. Id., 432.

35. Post-Graduate, New York, 1906, xxi, 337.

36. Deutsch. Ztschr. f. Chir., 1905, lxxvi, 40.

37. Berliner klin. Wehnschr., 1899, xxxvi, 34.

38. Johns Hopkins Hosp. Bull., February, 1895, vi, 19.

39. Med. Rec., 1905, lxxvii, 523.

40. Id., 522.

given to the left kidney.) The fistula was finally closed, and after its closure the right kidney was treated seventeen times in all by lavage. Solution, nitrate of silver, 1:1,000. Cured and has remained well.

CASE 34.—KELLY:⁴⁰ Female, adult, left kidney inactive. Right kidney was secreting 2,250 to 2,400 c.c. in twenty-four hours. There was pyelitis besides. This patient was treated persistently for two years by lavage of the kidney. Solution, not stated. Great benefit resulted from this method of treatment, and the patient felt very much better. She died suddenly, presumably as a result of complications.

CASE 35.—KELLY:⁴¹ Sex not stated, adult. Patient had typhoid 30 years previously, and following this disease there was pyelitis, which had existed during thirty years. The patient was treated by lavage of the kidney (side not stated). The infecting organism was the bacillus typhosus. Solution not stated. Cured.

CASE 36.—LEWIS:⁴² Male, aged 28, gonorrhea two years previously. No local signs or symptoms on the part of kidneys, but on catheterizing it was found there was a slight pyuria on the left side. The left kidney was treated by lavage. Five treatments in all were given at short intervals with hot boric acid. Examined two months after the treatment, the patient was found to be well.

CASE 37.—PAWLAK:⁴³ Female, aged 43, first seen in 1895, had been ill fourteen weeks, suffering from double pyelitis. The kidney was treated by lavage three times. She then disappeared for several months. Death took place a few months later. Solution, nitrate of silver, 1:1,000 and 1:5,000. Improvement followed the treatment, and the urine became clearer on the right, but not on the left side. The left kidney was the one most affected, and there was a severe pyonephrosis, which undoubtedly caused death.

CASE 38.—PAWLAK:⁴⁴ Female, aged 47, had pains in right kidney, vomiting, general weakness, symptoms of cystitis. The right kidney was treated by lavage thirty-three times during seven months. During the first four months there was an improvement, and at the end of this time there was only slight pyuria. The treatment was then partially discontinued, and there was a relapse. The germ was the streptococcus. The general condition was good. Solution, corrosive sublimate, 1:20,000 to 1:40,000, boric acid, 2 per cent., and nitrate of silver, 1:3,000 and 1:1,000. On the whole, the patient was much improved, and was in fairly good condition while under treatment. She was seen 3 years after the treatment had been discontinued, and she was then in the same state. The urine when examined, always contained pus. Her general health is very good.

CASE 39.—WOSE:⁴⁵ Male, aged 28, gonorrhea 5 years before. Three years ago had a fall from a house. This was followed by tubercular spine, with ischio-rectal abscess. There was left pyelitis, with a heavy deposit of pus in the urine. The kidney was treated by lavage (number of treatments not stated); solution, boric acid. Result, "Did well."

THE EXPECTANT TREATMENT OF URETERAL CALCULUS

ITS INDICATIONS AND RESULTS *

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The Roentgen-ray method of diagnosis has fully demonstrated its accuracy and advantages in urinary lithiasis, so that the best surgical opinion holds that no operative procedure is complete or should be undertaken, even in obvious cases of stone, without the complete data which it affords.

In this paper the value of Roentgen-ray diagnosis in operative cases will not be discussed, and only those cases considered in which it renders non-operative treatment feasible and rational. Since the demonstration of a calculus in the kidney is an indication for immediate operation, only those cases of ureteral lithiasis uncomplicated by a renal calculus will be considered.

Can the indications for and against operation in ureteral lithiasis be determined with sufficient accuracy by known methods of diagnosis to justify non-operative, *i. e.*, expectant treatment in a well-defined group of cases?

The accurate determination of the size, position and number of all urinary calculi by the Roentgen method made this seem possible. In a paper read before the Section on Surgery and Anatomy in 1901,¹ I pointed out the concomitant symptoms derived from other

methods of diagnosis, which, when taken in conjunction with an accurate Roentgen-ray examination, formed the basis for rational expectant treatment.

In that paper I said:

It is the Roentgen method of diagnosis that has shown the greater frequency of ureteral calculi. Their detection does not, however, constitute an indication for operation. The increased ratio of ureteral to renal calculi is due to their detection and recognition. They must have existed in the same relative proportion previously. The absence of symptoms, that would lead to their recognition, shows how tolerant the ureters must be. It shows that these calculi may be allowed to remain in the ureter, under certain conditions without grave danger. It therefore sanctions a conservative method of treatment, when that method is rendered safe by accurate knowledge of the condition that is present. The accuracy and detail afforded by the Roentgen method of diagnosis from this safeguard, and the rational basis for a differentiation between the cases demanding immediate operation, and those in which an expectant conservatism, under strict supervision, will often result in the passage of a calculus and complete recovery. It makes it rational to leave to natural methods, what has been recognized as possible for nature to accomplish without injuring the kidney.

The soundness of this procedure and its value in treatment has been demonstrated by the passage of thirty-one calculi in cases in which it was suggested and employed, as compared with fifteen cases in which operation was employed for ureteral stone.

By expectant treatment, as employed in these cases, is meant the careful medical supervision of the patient, with frequent examinations of the urine and estimations of the amount of urea passed.

The indications on which this course of treatment was based were the Roentgen-ray examination and the symptoms and signs as derived from other clinical methods. Without the accurate data furnished by the Roentgen-ray diagnosis such a course of treatment would not only be irrational but dangerous. There is little difference in symptomatology between the quiescent calculus in the kidney or ureter and that of an impacted calculus producing a unilateral anuria. The onset of symptoms is the same, and yet the anuria will result in the destruction of the kidney if unrelieved, for the symptoms subside and only clear urine flows from the sound kidney. Operation under such circumstances is imperative, but the exclusion of detection of a calculus in the ureter and the persistence of a bilateral urinary flow relieves the situation. The determination of a bilateral urinary flow by the cystoscope excludes anuria, but does not tell whether a calculus is present or not, and, if present, its position and size. Without such definite knowledge explanatory operation was necessary. On the other hand, the detection of a small ureteral calculus is not an indication for operation unless urgent symptoms are present, since its size makes it possible and probable that Nature will expel it. Without such definite knowledge, it is preferable to permit Nature to accomplish the expulsion, rather than to submit the patient to the risks of operation. The symptoms are in no way proportionate to the size of a calculus, nor can it be accurately located by them, or by palpation.

The Roentgen-ray method by itself does not furnish data on which a rational course of treatment can be based, unless it shows a calculus in the kidney or one too large to be readily passed in the ureter, when operation is indicated. It is only when the knowledge it affords is taken in conjunction with the clinical his-

41. *Id.*, 521.

42. *Ann. Surg.*, 1903, xxxvii, 24.

43. *Rev. de Gyn. et de Chir. Abd.*, 1897, 1, 805.

44. *Id.*, 787.

45. *Inter. Jour. Surg.*, 1906, xix, 229.

* Read in the Section on Obstetrics and Diseases of Women of the American Medical Association, at the Fifty-ninth Annual Session, held at Chicago, June, 1908.

1. The Indications for Operation in Calculous Nephritis and Ureteritis," *THE JOURNAL*, Nov. 30, 1901, p. 145.