

Prevention of Urologic Complications from Injuries in Gynecologic Surgery

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THE NUMBER of urologic injuries incurred in the course of gynecologic surgery has increased greatly in the last few years, mainly because of the almost universal acceptance and performance of total rather than subtotal hysterectomy. In the surgery of pelvic cancer the percentage of injuries to the urinary tract is appalling—not only in the course of laparotomy, but also when the vaginal approach is utilized.

While this paper is concerned mainly with injuries to the ureters, injuries to the urinary bladder are not rare and are by no means innocuous. One of the authors⁵ in 1936 published an article in which it was shown that in some series unrecognized and unrepaired bladder injuries resulted in a mortality rate of 45 per cent, and even the most favorable reports of such complications revealed a mortality toll of 12 per cent. Contrasting with these figures, it was shown that when bladder injuries are recognized and repaired at the time of their occurrence, the mortality from the injury to the bladder *per se* is practically nil. A simple method was outlined in the aforementioned paper which would greatly diminish the frequency of these injuries and in the event of their occurrence would afford ready recognition, which, followed by prompt repair, yields most gratifying results. In a few cases during the

intervening years the bladder was inadvertently opened, but the accident was recognized immediately, the rent was promptly repaired, and recovery took place in all instances without any further complications or sequelae.

In the great majority of cases an experienced surgeon can quickly locate and isolate the ureters. At times, however, it becomes a very difficult task. One of us visited a world-famous clinic and witnessed an eminent surgeon with an international reputation search for one ureter for more than 15 minutes, only to realize a few minutes later that the structure he took for a ureter was not a ureter at all. We have seen a long-experienced urologist, who undoubtedly had performed several thousand operations on ureters, vainly search for its abdominal portion. He gave up the attempt after 45 minutes and closed the abdomen.

We know a surgeon who, realizing that he had clamped a ureter in the course of an abdominal hysterectomy, proceeded to cystoscope the patient with the abdomen open in order to assess the extent of the injury and to splint the ureter with a ureteral catheter. All these difficulties and complications, we are convinced, can be avoided by employing the method we advocate.

Corscaden, speaking at a symposium on Cancer of the Uterus at Bellevue Hospital in May, 1952, stated that in the average hospital, including those of international fame, the percentage of ureteral injuries is high. In the discussion, a radiotherapist of a large hospital brought out the fact that, among pa-

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tients referred to his department for post-operative radiation, x-ray examination prior to the commencement of therapy reveals an appreciable number of ureteral strictures, functionless kidneys, and hydronephroses.

Niceley quotes Newell, who reported 15 cases of ureteral injuries from the gynecologic service of the Barnes Hospital, of which 6 were discovered at autopsy. Vaginal hysterectomy, he states, is responsible for large numbers of ureteral injuries, mostly as a result of crushing by clamps.

Robinson, in a symposium at the New York Academy of Medicine, March, 1953, stated that ureteral injuries occurred in 8-16 per cent of radical pelvic operations. Most injuries were near the bladder, and he strongly advocates ureteral catheterization.

At the same symposium, Goldstein of Baltimore reported 800 ureteral injuries, 160 of which were bilateral; the mortality in the bilateral was 30 per cent and in the unilateral 5 per cent.

MATERIALS AND METHODS

The patients in this series were unselected. Table 1 shows the pathologic conditions that were encountered, and Table 2 the operative procedures.

TABLE 1. INDICATIONS FOR AND PATHOLOGY FOUND AT OPERATION

	<i>No. of Cases</i>
Fibromyoma uteri	46
Carcinoma of corpus uteri	9
Prolapse of uterus with cystocele and rectocele	4
Intraligamentous cyst of ovary	2
Granulosa cell tumor of ovary	1
Cervical carcinoma in situ	1
Sarcoma of uterus	1
Endometriosis	1
Twisted ovarian cyst	1

Patients were brought to the operating room and anesthetized. A Brown-Buerger concave cystoscope was introduced and a careful examination of the bladder and

ureteral orifices made. Urine from the bladder was sent to the laboratory for culture and routine examination. In nearly all instances #6 ureteral catheters were employed for ureteral catheterization. The

TABLE 2. OPERATIVE PROCEDURES

	<i>No. of Cases</i>
Total abdominal hysterectomy	46
Bilateral salpingo-oophorectomy	37
Vaginal total hysterectomy	7
Appendectomy	6
Unilateral salpingo-oophorectomy	6
Ovarian cystectomy	3
Subtotal abdominal hysterectomy	3
Herniorrhaphy	1
Marshall-Marchetti operation	1
Multiple myomectomy	1

cystoscope was then withdrawn and the catheters left *in situ*. A #18 French 5-cc. Foley catheter was introduced into the bladder and attached to a bottle of the type used for intravenous solutions containing a sterile solution of weak methylene blue in distilled water. The upper opening in the bottle was stoppered with a plug of sterile gauze and the bottle placed in a pail underneath or by the side of the operating table, so as to be out of the field of operation. When the surgeon desired to outline the bladder, the nurse simply raised the reservoir bottle above the level of the bladder and it was delineated readily and accurately. Replacing the bottle in the floor receptacle promptly emptied the bladder. Should the bladder be injured at any stage of the operation an escape of blue fluid or the appearance of the catheter would be an immediate signal.

After the peritoneum was incised, the abdominal cavity was explored and the ureteral catheters located. The catheters were frequently palpated during the course of the operation, especially when they were close to the operative area.

On completion of the operation, the ureteral catheters were withdrawn. Ready

removal, we believe, is adequate proof that the ureters have not been ligated. Whenever possible, we obtained pre- and postoperative excretory urograms in order to obtain visual proof of the state of the urinary tract.

The urine, after withdrawal of the ureteral catheters, was nearly always blood-tinged,

TABLE 3. CYSTOSCOPIC FINDINGS

	<i>No. of Cases</i>
Cystitis	18
Trigonitis	11
Marked trigonal distortion	7
Irregular bladder neck	4
Papilloma of bladder	3
Stricture of urethra	3
Dome of bladder distorted	2
Polyposis of bladder neck	2
Postradiation cystitis	2
Adhesion band, possible urachal remnant between dome of bladder and umbilicus	1
Hypertrophied interureteric ridge	1

and the Foley catheter was allowed to remain until the urine appeared clear, usually a matter of two or three days. The Foley catheter was connected to a tube which continually drained into a bottle by the side of the bed. The patients were examined daily with a special view to discovering signs and symptoms of urinary tract pathology. In this entire series no evidence was found of any injury to the bladder or ureters.

Abnormalities found on cystoscopic examination are shown in Table 3.

Table 4 shows the findings of the cultures of the urine.

There was no mortality, and the morbidity was what was expected and usually observed in patients who have undergone the operations described in Table 1.

There was one case of pyelonephritis, in which an enterococcus was cultured at the initial cystoscopy; this condition yielded readily to antibiotics.

COMMENT

One of us (S.S.R.) felt for years that a simple way to prevent ureteral injuries was to catheterize them prior to operation. However, he was dissuaded from putting this idea to the test by objections raised by colleagues. For instance, a professor in one of our prominent postgraduate teaching institutions, who practiced gynecology and female urology, advised against ureteral catheterization on the grounds that he thought that the ureter could more easily be injured when distended by a catheter. A prominent pathologist was of the same opinion. An experienced urologist objected, reasoning that infection was likely and that reflex anuria might occur. Another colleague, who catheterized the ureters on one occasion, stated that he could not feel them. However, when the reports from the literature and our own observations revealed the extent of urinary tract injuries, it was felt that the objections raised were in the main not valid and that the procedure ought to be given a trial.

We surmise that the surgeon who was unable to palpate the catheters introduced catheters of too small a caliber, for with #6 catheters we have never failed to locate the ureters. We have never cut a ureter, but,

TABLE 4. URINE CULTURES

	<i>No. of Cases</i>
Sterile	32
Not reported	9
<i>B. coli</i>	5
<i>Staph. albus</i>	4
Enterococcus	3
<i>B. proteus</i>	2
Hemolytic streptococcus	2
Nonhemolytic streptococcus	2
Yeast	1

should that accident occur with a catheter *in situ*, repair and splinting would be a rather simple matter. We have thus far never encountered a case of reflex anuria. As to infection, we all know that hundreds

of patients are subjected to cystoscopic examination every day in private offices and dispensaries where asepsis is certainly not as well assured as in an operating room of an approved modern hospital, and yet comparatively few infections result. Antibiotics play a significant role in the prevention of infection and we employ them prophylactically in every case.

After this series was begun two articles appeared in the *Journal of Urology*, the first by Aschner and the second by St. Martin, *et al.*, commenting on and describing the great number of ureteral injuries that they observed and treated after gynecological operations. In Aschner's experience, these injuries were not the private domain of tyros, but occurred as well in the hands of chiefs of departments. He advocated catheters in every case. St. Martin's article was abstracted in the *Obstetrical and Gynecological Survey* and the editor's comment is interesting: "Total hysterectomy is said to be just as easy and as safe as the subtotal; I just don't believe it."³

Parsons and Uhlfelder, in their volume of operative gynecology, state that the majority of vesicovaginal fistulae encountered in gynecology today come not from poor obstetrics, but from injury to the bladder in the course of total hysterectomy.

Ureters are not only injured during abdominal operations but also in those operations performed via the vaginal route. We know of a case where both ureters were ligated in the course of a vaginal hysterectomy and another in which the same accident occurred in the performance of a Manchester operation.

We are convinced that the benefits of ureteral and bladder catheterization and filling the bladder with a colored solution far outweigh the possible dangers, and furthermore that the risks involved are in the main hypothetical. We feel that the bladder and ureters should be catheterized in abdominal hysterectomies performed for benign and,

especially, malignant conditions. This preventive procedure is also of great value in cases of intraligamentous tumors.

When performing vaginal hysterectomy, we advocate catheterizing the ureters, but we do not leave a catheter in the bladder, for it interferes with the necessary dissection.

In all operations performed via the vaginal route, we advocate ureteral catheterization whenever one suspects that the ureters are situated abnormally low.

The surgeon gains a feeling of confidence and equanimity in knowing that the possibility of dangerous complications is almost nil and that the patient will leave the hospital with an intact urinary system.

CONCLUSION

Injuries to the urinary organs can be eliminated or certainly greatly decreased in number by catheterization of the bladder and ureters, preliminary to either abdominal or vaginal operations on the pelvic organs.

SUMMARY

A series of 60 cases is described in which the ureters and bladder were catheterized and the catheters left *in situ* in abdominal operations, and the ureters alone thus managed when vaginal hysterectomy was performed. The results were eminently satisfactory:

1. Neither the bladder nor the ureters were injured in any case.
2. No case of reflex anuria was encountered.
3. Cystoscopy and cultures of the urines revealed pathology which could have been discovered in no other way.
4. There was one case of mild postoperative pyelonephritis in a patient whose preoperative urine contained enterococci.

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American Board of Obstetrics and Gynecology

The next scheduled examination (Part I), written examination and review of case histories, for all candidates will be held in various cities of the United States and Canada, and in military centers outside the continental United States, on Friday, February 4, 1955.

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Candidates are reminded at this time that lists of hospital admissions must accompany new applications and requests for reopening. Please send applications, requests, and Case Abstracts to: ROBERT L. FAULKNER, M.D., *Secretary*, 2105 Adelbert Road, Cleveland 6, Ohio.