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LAPAROSCOPIC MANAGEMENT OF INTENTIONAL AND UNINTENTIONAL CYSTOTOMY

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ABSTRACT

Purpose: We assessed the laparoscopic closure of intentional or unintentional bladder lacerations during operative laparoscopy.

Materials and Methods: Retrospective review of operative reports revealed 19 women who required bladder repair. The defect was repaired laparoscopically in 1 layer using interrupted absorbable polyglycolic suture (17 patients) or polydioxanone suture (2) and followed by 7 to 14 days of transurethral drainage.

Results: Complications were limited to 1 vesicovaginal fistula that required reoperation. After 6 to 48 months of followup all patients were well with a good outcome.

Conclusions: In select cases the bladder can be repaired safely and effectively during operative laparoscopy by an experienced laparoscopic surgeon.

KEY WORDS: laparoscopy, bladder, wounds and injuries

With advanced laparoscopic procedures, such as treatment of extensive pelvic adhesions and severe endometriosis, hysterectomy or retropubic urethropexy, there is a risk of bladder injury. The conventional approach to intraperitoneal bladder injury is celiotomy and repair of the perforation in multiple layers.[1] This complication can be treated successfully at laparoscopy regardless of whether partial cystectomy was done intentionally to treat endometriosis or remove ovarian remnants,[2–5] or the bladder injury was incidental.[6,7] We summarize the outcome of 19 cases of bladder injury treated laparoscopically.

MATERIALS AND METHODS

A total of 20 cystotomies occurred in 19 women 27 to 61 years old (mean age plus or minus standard error 41 ± 9.2) undergoing different laparoscopic procedures (see table). Gravidity ranged from 0 to 7 (mean 1.7 ± 1.9) and parity ranged from 0 to 3 (mean 1.0 ± 1.1). The cystotomies were unintentional in 6 patients and intentional in 13. Unintentional entry occurred during ancillary suprapubic trocar insertion in 1 case, sharp dissection of the bladder from the uterus in preparation for hysterectomy in 2, development of the space of Retzius for bladder neck suspension in 1, myomectomy in 1 and resection of an ovarian remnant in 1. Of the intentional procedures bladder entry was required for complete removal of endometriosis in 3. Full thickness partial cystectomy was necessary for complete removal of deeply infiltrative endometriosis in 7 patients and embedded ovarian remnants in 2, and to repair a vesicovaginal fistula in 2 (1 following laparoscopic resection of an ovarian remnant and 1 following abdominal hysterectomy elsewhere for a benign pathological condition).

All women were placed in a modified dorsal lithotomy position. Cystoscopy was performed to identify the location and dimensions of the defect, and its relationship to the ureteral orifices. When the lesion or injury involved the posterior vesical wall ureteral catheters were inserted. In all patients the bladder was mobilized around the opening using a carbon dioxide laser or scissors and hydrodissection, which allowed the defect to be closed without tension. Using intracorporeal or extracorporeal knot tying techniques, multiple interrupted 1-zero polyglactin sutures were placed in 1 layer incorporating the serosa, muscularis and mucosa at 0.5 cm. intervals, so that closure was watertight while avoiding tissue strangulation. In our first 2 cases we used 4-zero polydioxanone sutures.[4]

The cystotomies were 0.5 to 4 cm. large, and 1 to 8 sutures were placed. Cystoscopy was repeated at the completion of the procedure to assess adequacy of the closure and verify that the ureteral orifices were not obstructed. A transurethral Foley catheter was left in place for 7 to 14 days. All women received intravenous, prophylactic antibiotics perioperatively, and they took prophylactic antibiotics orally as long as they were catheterized. A cystogram was performed before discontinuation of the catheter to ensure complete healing and rule out extravasation.

RESULTS

Repair of the defects lasted approximately 5 to 30 minutes. Additional blood loss was minimal, and there were no adverse effects attributable to the increased operative time or cystotomy repair.

There was 1 major complication (5.3%). A vesicovaginal fistula developed in patient 8 after resection of an ovarian remnant and extensive ureterolysis, and a stent was required postoperatively. Cystoscopy at diagnosis of the fistula revealed that the tail of the ureteral stent was resting on the repaired cystotomy site. The fistula did not resolve with bladder drainage and was repaired successfully via secondary laparoscopy. This case and the technique used for repair have been described previously.[8] Cystotomy and ureterotomy occurred in patient 3 during hysterectomy for multiple myomas, including intraligamentous myomas. A ureterovaginal fistula developed and a stent was placed. The fistula resolved spontaneously as confirmed by excretory urography. Minor complications included mild incisional erythema in 1 patient, urinary incontinence that resolved spontaneously a few weeks after discontinuing the catheter in 1 and bladder spasms without infection that were treated with flavoxate in 1

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Patient data

Pt. — Age — Gravidity/ No. (yrs) Parity	Surgical History	Current Operation	Intentional Cystotomy	Size of Defect (cm.)	Complications
1 — 34 — 1/0	Multiple myomectomies	Salpingectomy for ectopic pregnancy, injury at 10 mm. trocar site	No	1	None
2 — 48 — 7/2	Appendectomy, cesarean section ×2	Laparoscopic assisted vaginal hysterectomy and bilat. salpingo-oophorectomy	No	1	None
3 — 54 — 3/3	Tubal ligation, tuboplasty	Total laparoscopic hysterectomy and bilat. salpingo-oophorectomy	No	2	Ureteral fistula
4 — 54 — 2/2	None	Laparoscopic assisted vaginal hysterectomy and bilat. salpingo-oophorectomy, bladder neck suspension	No	2	Incisional erythema
5 — 42 — 0/0	Total abdominal hysterectomy, bilat. salpingo-oophorectomy	Treatment of ovarian remnant	No	2	None
6 — 38 — 3/0	Laparotomy for tubal reanastomosis, laparoscopic treatment of ectopic pregnancy ×3	Multiple myomectomies, colpotomy	No	0.5	None
7 — 45 — 2/1	None	Partial cystectomy for endometriosis, laparoscopic assisted vaginal hysterectomy and lt. salpingo-oophorectomy	Yes	2	None
8A — 45 — 2/2	Total abdominal hysterectomy and bilat. salpingo-oophorectomy	Treatment of ovarian remnant	Yes	4	Vesicovaginal fistula
8B		Treatment of vesicovaginal fistula	Yes	2	Mild urinary incontinence
9 — 61 — 3/3	Total abdominal hysterectomy	Bilat. salpingo-oophorectomy for residual ovaries embedded in bladder	Yes	2	Bladder spasms
10 — 48 — 2/2	Total abdominal hysterectomy and bilat. salpingo-oophorectomy, cesarean section ×2	Treatment of vesicovaginal fistula	Yes	2	None
11 — 39 — 1/0	Myomectomy, treatment of endometriosis	Partial cystectomy for endometriosis, laparoscopic assisted vaginal hysterectomy and bilat. salpingo-oophorectomy	Yes	2	None
12 — 27 — 0/0	Laparotomy for endometriosis	Full thickness partial cystectomy and bowel resection for endometriosis, total laparoscopic hysterectomy and bilat. salpingo-oophorectomy	Yes	1.5	None
13 — 28 — 5/2	Laparotomy for lt. salpingo-oophorectomy, 4 laparoscopies	Full thickness partial cystectomy for endometriosis, presacral neurectomy	Yes	4	None
14 — 28 — 0/0	Laparotomy	Full thickness partial cystectomy for endometriosis	Yes	3	None
15 — 36 — 1/1	Laparoscopy	Segmental bladder resection for endometriosis, total laparoscopic hysterectomy and bilat. salpingo-oophorectomy	Yes	3	None
16 — 39 — 0/0	Laparotomy for endometrioma	Full thickness partial cystectomy and bowel resection for endometriosis	Yes	2	None
17 — 38 — 1/0	None	Full thickness partial cystectomy and bowel resection for endometriosis	Yes	1.5	None
18 — 43 — 0/0	Laparoscopy and laparotomy for endometriosis	Full thickness partial cystectomy for endometriosis, total laparoscopic hysterectomy and bilat. salpingo-oophorectomy	Yes	3	None
19 — 31 — 0/0	None	Partial cystectomy for endometriosis	Yes	3	None

Followup was obtained by chart review or contacting the referring physician. After followup of 6 to 48 months, all women were well with no complications.

DISCUSSION

Bladder injury is not common during laparoscopic surgery. The bladder may be perforated incidentally when inserting the trocars, or during blunt or sharp dissection. Injury is more likely if the bladder is not completely empty, or in patients with adhesions and endometriosis surrounding the bladder. The laparoscopic approach is also gaining a significant role in treatment of conditions requiring intentional partial resection of the vesical wall, including endometriosis deeply infiltrating the bladder,[2–5] ovarian remnants completely adherent to the surface of the bladder and repair of a vesicovaginal fistula.[8] To our knowledge we report the first series of bladder injuries repaired laparoscopically.

Our results show that laparoscopic repair with a 1-layer suturing technique can be successful for treatment of cystotomies. It is important that the bladder is mobile, all necrotic tissue is removed and there is sufficient tissue for repair without tension. The only instruments needed are 2 atraumatic grasping forceps, a laparoscopic needle holder and scissors. Sutures should include all layers of the bladder, and the surgeon should be familiar with intracorporeal or extracorporeal knot tying techniques. One must confirm that the ureteral orifices are not injured. No postoperative peritoneal drainage is required. A cystogram should be performed to ascertain that the bladder has healed well before the Foley catheter is removed.

Only anecdotal cases supporting the laparoscopic closure of bladder defects have been reported to date,[2–7] 2 of which suggested closure of the cystotomy in 2 layers.[6,7] In a more recent study a laparoscopic staple was used to transect and secure the ureter along with a cuff of bladder.[9] Although stapling devices may be easier to use and less time-consuming, they are more expensive and have a greater potential for lithogenesis. Our experience shows that watertight closure and good healing are possible with 1-layer suturing. The only failure in our series was due to a vesicovaginal fistula following 1-layer laparoscopic cystotomy repair. This complication was repaired successfully during a second laparoscopic procedure, again with 1-layer suturing techniques.

CONCLUSIONS

Our large series shows that bladder injury may be repaired successfully with laparoscopic 1-layer suturing techniques. However, it remains to be determined whether a multilayered suturing method would prevent complications, such as

fistula formation. The laparoscopic surgeon should be experienced before attempting such repairs.

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EDITORIAL: THE INCREASE IN MINIMALLY INVASIVE ENDOUROLOGY—A TRIBUTE TO EXCELLENCE AND A PLEA FOR THOUGHTFUL RESTRAINT

In this issue of the Journal 3 challenging articles deal with endourological (that is endoscopic and/or laparoscopic) treatment of nonmalignant urological entities that are classically treated by open surgery, that is complete ureteral obliteration, closure and/or partial resection of the bladder and ureterolysis. The unanimous conclusions are that endourological techniques are less morbid, equally effective and, therefore, more efficient than the traditional counterparts. Are these triumphant declarations applicable to daily practice?

During a 10-year period Conlin et al (page 1394) treated 10 patients with complete obliteration of the ureter of nonmalignant origin. Two patients were initially excluded from endourological therapy because of prohibitive technical factors (length of stricture in 1 and gross misalignment of the extremities in 1). All 8 patients treated endoscopically had successful recanalization (4 within the last 3 years), and 6 enjoy long-term success as defined by absence of symptoms, obstruction or a stent. One patient is content to have a stent and 1, with multiple previous operations and a poorly functioning kidney, underwent nephrectomy. Three factors are prerequisite to success: 1) expert preoperative evaluation to ensure adequate case selection, that is only short strictures with well aligned segments should be considered and longer, well aligned obliterations are acceptable if stent dependency is acceptable, although it should be noted that the failure rate for longer strictures is prohibitive at 73% (reference 20 in article); 2) careful perioperative exploration by transureteral retroperitoneoscopy (and endoluminal sonography when neighboring vessels are suspected) to determine the need for additional balloon dilation or incision, and 3) long-term postoperative evaluation. Although no long-term failures were observed in this highly select series, they have been reported under similar pathological and therapeutic conditions.[1] A review of the experience on the subject reveals that early attempts at reestablishing continuity were not successful (references 22 to 24 in article) but more recent reports of small select series attest to the reproducibility of this technique (references 25 to 27 in article). Technical advances, more experience and better selection have undoubtedly had a role.

Nezhat et al (page 1400) review their experience with 19 laparoscopic repairs of bladder wounds. In 6 cases bladder injury was unintentional and occurred during laparoscopic intervention. In 13 instances the bladder was entered deliberately to remove completely infiltrating endometriosis or ovarian remnants. The bladder was repaired by 1 layer of interrupted sutures using nothing other than simple intracorporeal and extracorporeal knot tying techniques. This method was preferred to staples, which have been used in urological operations, such as bladder cuff excision at completion of laparoscopic nephroureterectomy (reference 9 in article), since it is less expensive and less prone to stone formation. One patient had a vesicovaginal fistula, which was closed successfully at a later laparoscopic procedure. There is little doubt that this is a logical and cost-effective extension of laparoscopic surgery, which dedicated urologists should be able to adopt rapidly.

Elashry et al (page 1403) report the Washington University experience with laparoscopic ureterolysis in 6 patients with benign extrinsic obstruction compared to contemporary open surgery in 7. They obtained equally effective results (100% success with both approaches), with less morbidity from the laparoscopic procedure as noted by decreases in blood loss, postoperative pain medication, hospitalization time, convalescence and complication rate. Unfortunately, no mention is made of medical therapy with corticosteroids in primary retroperitoneal fibrosis, which might be included in the noninvasive armamentarium and regarded as a cost-effective alternative.

The 3 articles share 2 characteristics: 1) they are straightforward examples of pertinent scientific literature since they address 1 subject, present adequate data and followup, develop relevant arguments and reach a logical conclusion, and 2) they send a clear message that some strongholds of open surgery might be adequately and safely performed with endourological techniques, which are inherently less invasive, less morbid and, therefore, more efficient and cost-effective. Complete ureteral obliteration, bladder wounds or partial resections, and ureterolysis have been regarded, and are still considered, by many urologists as their exclusive domain. These articles may have convincingly shaken that quiet self-assurance. That one of these elitist articles has been produced in a fertile gynecological environment is an additional challenge.[2]

Are these conclusions readily acceptable and are these high success rates reproducible in daily practice? All authors have repeatedly stressed the prerequisite for adequate experience and facility with endourological techniques, which is evidently lacking for a casual operator who is limited in case load and selection expertise. It is of interest that significant proportions of the endoscopic cases were generated by the endourological procedures themselves, and that most, if not all, patients were referrals. I believe that this fact is a clear indication that concentration of experience should and will occur. Only highly trained and experienced endourologists will be able to maintain the high turnover of practice necessary to maintain such a perfect track record, which in turn will lead to a welcome, further decrease in indications for the exceptional interventions described by Conlin et al.

New procedures should be carefully assessed before they can be presented as a valid replacement to traditional surgery, which is precisely what these pioneering articles have done. However, widespread unselected application must proceed carefully lest the procedures fall into disrepute.

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