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Clinical opinion

Cystoscopy with a 5-mm laparoscope and suction irrigator

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KEYWORDS:
Laparoscopy;
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Abstract. To investigate the hypothesis that cystoscopy using a 5-mm suction irrigator and video laparoscope is safe and useful during total laparoscopic hysterectomy (TLH), a retrospective analysis of patients undergoing total or radical laparoscopic hysterectomy over a 10-year period was conducted. Of 744 patients having simple or radical laparoscopic hysterectomy for either benign or malignant indications, 344 had cystoscopy using a 5-mm laparoscope after inflating the bladder with a 5-mm saline suction irrigator. Procedures in which cystoscopy was used took 13 minutes longer (mean: 141 vs 128, p = .0012) and patients lost 30 dL more blood (mean 145 vs 115, p = .0300), but patients did not have a longer hospital stay or more complications. Cystoscopy accurately confirmed cystotomy closure in 12 patients and identified 3 patients with ureteral injury; it did not identify 3 patients who developed a ureteral fistula 7 to 9 days after surgery. One complication was attributable to the cystoscopy. The data from this retrospective series suggest that cystoscopy during TLH is well-tolerated and can accurately reassure surgeons of immediate urologic tract integrity; but it is not useful to identify patients who may later fistulize.

Gynecologists addressing problems of the urologic tract, such as incontinence and prolapse, often perform cystoscopy. Additionally, cystoscopy is often indicated after gynecologic procedures, such as laparoscopic Burch colposuspension, transvaginal tension-free tape placement, uterosacral ligament plication, or extensive ureterolysis for tumor or endometriosis resection. Cystoscopy is also indicated whenever the gynecologist is concerned about urologic tract integrity, such as after a difficult hysterectomy due to scarring of the bladder to the uterus from prior cesarean section. Gynecologists may need to perform cystoscopy to assess the repair of a urologic injury, which occurs in 1% to 3% of patients who undergo gynecologic surgery.[1]

Intraoperative cystoscopy during laparoscopic hysterectomy has been encouraged to facilitate the diagnosis of suspected urologic injuries and to confirm adequacy of repair of any injuries identified.[2] Typically, the gynecologist must request that the operating room staff open a standard urologic cystoscopy set, prepare a 1- to 3-L bag of irrigation fluid, and obtain a light source. This equipment increases operating room costs and takes operating room staff time to procure; both of which may dissuade surgeons from performing cystoscopy.

If cystoscopy can be performed in a safe and cost-efficient fashion, more surgeons would be able to make the early diagnosis of urologic injury and perform the repair, thus preventing tragic fistula formation and potential reoperation. In this report, we describe the safety and effectiveness of an intraoperative cystoscopic technique using stan-

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Table 1 Demographic data

Patient demographics	No cytoscopy mean (SD) (n = 400)	Cystoscopy mean (SD) (n = 344)	(95% CI)	ANOVA p
Age (yrs)	48.9 (10.9)	51.5 (10.7)	(49.2–50.8)	.0012
Parity	1.1 (1.2)	1.5 (1.4)	(1.2–1.38)	<.0001
Body mass index	28.1 (7.1)	27.1 (6.4)	(27.2–27.9)	.663

dard laparoscopic instruments: a 5-mm suction irrigator and 5-mm video laparoscope.

Patients and methods

Of 744 total laparoscopic hysterectomies (TLHs) performed from September 1996 through July 2006, there were 344 cystoscopies performed to confirm urologic integrity. An obstetrics and gynecology resident, an attending obstetrician/gynecologist, or a general surgeon assisted all procedures. During simple TLH or radical laparoscopic hysterectomy, all surgery was performed entirely through the laparoscopic ports, including dissection of the cervix and closure of the vagina.[3] The simple and radical hysterectomy procedures are described elsewhere.[4] Cystoscopy was performed whenever the surgeon felt that the dissection was close to the ureter or the bladder or may have imposed on the integrity of these structures.

The technique consisted of the gynecologic surgeon removing the urethral catheter after closure of the vaginal cuff, and before removal of the trocars, clearing all tissue and clot debris from the laparoscopic 5-mm suction irrigator (Stryker Endoscopy, San Jose, CA), and flushing the tubing until the saline irrigant fluid was clear. The irrigator was then inserted axially into the urethra to about 4 cm above the urethral meatus. The bladder was filled with saline solution under constant laparoscopic visual control or visually observing 200 dL of volume drain from the bag of irrigation fluid. The irrigator was removed, and the 5-mm video laparoscope (Stryker Endoscopy) was inserted carefully to view the bladder fundus. In standard fashion, the scope was pulled back until the urethrovesical junction was identified, then advanced minimally, looking posterolaterally to identify each of the ureteral ostia. When a strong jet was identified from each ureteral os, the remainder of the bladder epithelium was examined, and the scope was removed. A catheter was reinserted with lidocaine jelly, and the catheter balloon was inflated. Then the suction irrigator tube was inserted into the large distal end of the catheter tubing to gently suction the bladder until empty. If a thinning or an overt hole in the wall was observed, a suture repair was undertaken laparoscopically. If no ureteral jet was identified, then ureteral injury was suspected and laparoscopic investigation was undertaken, and repair or stenting was performed as needed.

Data analysis

With investigational review board approval yearly from Sequoia Hospital, Redwood City, CA, the office and hospital charts were reviewed. The data were analyzed with JMP statistical analysis software (SAS Institute, Cary, NC), using ANOVA for comparison of continuous data and χ^2 analyses including Fisher's exact test for nominal data. A value of $p < .05$ was considered significant.

Results

There were 744 patients who underwent simple or radical hysterectomy during the 10-year period for both benign and malignant indications. Of these patients, 344 had cystoscopy with a 5-mm laparoscope after inflating the bladder with the suction irrigator (Table 1). The mean age was greater in the cystoscopy group (51 vs 49, p = .0012), and mean parity was higher in the cystoscopy group (1.5 vs 1.1, p <.0001), but mean body mass index (BMI) was similar at 27.6 in both groups, with 13 women having a BMI between 40 and 60.

Patients having cystoscopy were more likely to have had adhesions from a prior cesarean section; to undergo a urologic procedure such as Burch colposuspension, ureterolysis, or repair of cystotomy; or to have had a malignant diagnosis and procedure such as node dissection or debulking (Table 2). The mean duration of cases in which cystoscopy was employed took 13 minutes longer (141 vs 128,

Table 2 Additional procedures performed

Additional procedures	No cystoscopy No. (%) (n = 400)	Cystoscopy No. (%) (n = 344)
Resection of endometriosis	25 (6)	29 (8)
Lysis of adhesions	22 (6)	28 (8)
Debulking of tumor	3 (1)	3 (1)
Uterosacral ligament plication	6 (2)	64 (19)
Burch colposuspension	4 (1)	29 (8)
Cystotomy repair	0 (0)	12 (3)
Ureterolysis	11 (3)	34 (10)
Not specified	225 (56)	148 (43)

Sometimes many procedures were performed on 1 patient.

Table 3 Surgicopathological data

Surgical data	No cystoscopy mean (SD) (n = 400)	Cystoscopy mean (SD) (n = 344)	(95% CI)	*ANOVA p
Duration of surgery (min.)	128.2 (52.4)	141.1 (56.7)	(130.1–137.9)	.0012
Estimated blood loss (dL)	115 (189)	145 (169)	(115.3–142.7)	.03
Transfusion (No. of units)	0.055 (0.3)	.047 (0.4)	(.025–.076)	.7458
Length of hospital stay (days)	1.5 (0.9)	1.3 (1.9)	(1.35–1.48)	.0628
Uterine weight (g)	221 (260)	258 (301)	(218–260)	.0907

p = .0012), and patients had a 30 dL higher mean estimated blood loss (145 vs 115, p = .0300), but the patients did not have a higher mean number of days in the hospital (1.3 vs 1.5 NS), or experience more complications (Table 3).

Patients having cystoscopy were not more likely to have sustained a complication or developed a urinary tract infection. There was 1 complication attributable to the cystoscopy: a 5-mm bladder perforation at the base of the bladder fundus was caused by insertion of the scope in the twelfth patient in the series. The defect was suture-repaired without sequelae.

Cystoscopy was used to confirm adequacy of cystotomy closure in 12 patients. All had adequate closure by cystoscopy evidencing no immediate leakage, but 2 patients later developed a breakdown at 9 and 15 days, respectively, and required laparotomy for bladder closure.

Cystoscopy was used to assess ureteral patency after ureterolyses, Burch colposuspensions, uterosacral ligament plications, and transvaginal tension-free tape procedures, accurately identifying 3 patients with ureteral injury, 2 of whom underwent successful immediate anastomosis with stenting, and 1 of whom required only stenting. All 3 healed without complication.

Cystoscopy was also used to assess ureteral patency after close dissections around the ureter in many patients, but this indication was not specifically recorded in the charts. Three patients who underwent cystoscopy with normal findings and bilateral, strong, and equal ureteral jets but later, developed ureteral fistula 7 to 9 days after the surgery.

Discussion

Laparoscopic injury to the urologic tract occurs in 1% to 3% of patients undergoing gynecologic surgery.[1] Laparoscopic repair of cystotomy,[5] vesicovaginal fistula,[6] and ureteral injury[7] have each been described, thus making immediate diagnosis of urologic injury more urgently useful. Ribiero et al[2] described the first extensive use of intraoperative cystoscopy to facilitate early diagnosis and immediate repair of urologic injuries.

Liberal use of cystoscopy was recommended during laparoscopic procedures when complications are a real concern;[8] but routine use of cystoscopy is not indicated, especially when urologic complications are rare.[9] These data and other reports confirm that occult injuries to the vascular supply of the ureter are not diagnosable by intraoperative cystoscopy, but may result in postoperative fistula development 7 to 14 days after normal cystoscopic findings.[10,11] When performing a combined hysterectomy with urologic repair or high-risk or complicated hysterectomy due to adhesions or prior cesarean section, cystoscopy has been shown to be useful.[12] However, surgeons can be dissuaded from performing intraoperative cystoscopy because of the time and expense incurred in obtaining the standard cystoscopy set, tubing, and irrigant fluid. If cystoscopy can be performed with more ease and less cost, it is possible that urologic injuries could be more often diagnosed and repaired laparoscopically.

Virtually every gynecologic laparoscopic procedure uses a suction irrigator, and most modern laparoscopy suites provide excellent 5-mm laparoscopes with optics superior to the older 10-mm units. Thus, there is no added cost and little increase in time for the surgeon to perform cystoscopy in a patient using the already employed irrigation fluid to distend the bladder, and the 5-mm scope to examine it, taking about 3 to 4 minutes.

While physicians may have concerns about using the same instrument in both the vaginal and abdominal fields, these data suggest that the patients did not have more complications. One precaution taken in all of these cases is the sterile preparation of the patients. The nursing staff is aware that the author does not change gloves or rescrub when handling tissue or moving instruments from the abdominal field to the vaginal field and back. The staff performs a rigorous scrub of the entire field, including the vulvar folds and the vaginal interior.

The potential benefits of immediate recognition and repair of urologic injury outweigh the small complication risk. The 1 complication directly attributed to the cystoscopic procedure was a perforation of the bladder wall due to operator error in manipulating the scope. In the absence of the smooth-tipped obturator provided for insertion of a standard cystoscope, surgeons must exercise caution in aiming the tip of the irrigator and scope along the axis of the urethra, and remain cognizant of the bladder anatomy. Although the data show that cystoscopy was associated with a mean of 30 dL greater blood loss and mean of 13 additional minutes, such blood loss and time

were not specifically due to the cystoscopy, but rather reflected the complexity of the procedures in which cystoscopy was needed, such as the higher likelihood of a malignant diagnosis, a history of adhesions or of cesarean section, or of urologic injury or repair. In no procedure was any portion of the blood loss attributed to the cystoscopy. In most cases, the inflation of the bladder with the suction irrigator and inspection of each ureteral os and the urothelium with the laparoscope *per urethram* took about 3 minutes.

Conclusions

Intraoperative cystoscopy with the laparoscopic instruments is both feasible and safe for patients. This series highlights the potential benefit of facilitating the early diagnosis of urologic injury, enabling early laparoscopic repair.

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