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Cystosufflation to Prevent Bladder Injury

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ABSTRACT **Study Objective:** This brief report will share information about the use and safety of inflating the bladder with carbon dioxide to delineate the margins during laparoscopic dissections near the bladder in patients who have scarring, adhesions, or challenging anatomy.

Design: A retrospective chart review of patients undergoing total or radical laparoscopic hysterectomy, or support procedures from September 5, 1996, through October 30, 2008, was conducted. Canadian Task Force level III.

Setting: Community hospital.

Patients: Of 1004 patients having simple or radical laparoscopic hysterectomy or laparoscopic support procedures, cystosufflation was used in 173 patients. Indications included finding of adhesions from earlier cesarean section or massive myomas obscuring bladder margins, or planned anterior colpopexy or vaginal sacrocolpopexy.

Interventions: Cystosufflation uniformly entailed the following: clamping of the bladder catheter with a Kelly clamp; connection of the laparoscopic carbon-dioxide insufflation tubing to the catheter; then under direct laparoscopic observation, release of the Kelly clamp with immediate bladder inflation revealing the cystic margins.

Measurements and Main Results: Cystosufflation safely facilitated the dissection of the bladder off the anterior cervix and vagina, or off the anterior abdominal wall. Distention of the bladder elevated and rounded up the bladder margins so that the muscularis could be clearly identified, preventing bladder injury in all patients. No urologic complications occurred in these cases.

Conclusion: These retrospective data suggest that cystosufflation is well tolerated by patients and can reliably prevent cystotomy. Journal of Minimally Invasive Gynecology (2008) ■, ■–■ © 2008 AAGL. All rights reserved.

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Bladder injury was reported to occur during antiincontinence procedures [1] and hysterectomy [2], especially when myomas were present or after cesarean section was performed.

If bladder margins obscured by scarring, adhesions, or myomas could be intraoperatively safely identified, then the risk of unintended cystotomy could be markedly reduced. During hysterectomy performed for women with earlier cesarean section, it was noted that despite the scarring from the bladder peritoneum to the anterior uterus, the bladder muscularis margins could be inflated, elevated, and rounded up by minimal inflation with carbon dioxide, instilled under direct observation with the laparoscope. The muscularis could then be dissected away from the uterus or the peritoneal investment so that the bladder flap could be developed without injuring the muscularis. This article shares the specifics of the technique so that others may use it to avoid bladder injury.

Patients and Methods

Of 1004 cases of total and radical laparoscopic hysterectomies and support procedures performed during a 10-year period, cystosufflation was used in 173 women who had undergone earlier cesarean section, had large fundal or cervical myomas, were having an anterior colpopexy, or were undergoing vaginal sacrocolpopexy. In all cases, the Foley catheter was placed per urethra by the surgeon after prepping and draping were completed by the staff, so as to have access to the catheter on the sterile field should it be needed. After difficulty identifying bladder margins was confirmed, the gynecologic surgeon placed a Kelly clamp on the distal

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urethral catheter, and attached the carbon-dioxide insufflator to the clamped catheter. Because the insufflator constantly instills carbon dioxide at a specified rate (usually 3–40 L/min) up to a preset pressure (usually 10–12 mm Hg) while it is used during laparoscopic surgery, placing the clamp on the catheter before connecting the insufflation tube to the catheter prevents premature inflation of the bladder before it can be observed, and prevents excessive inflation. After the surgeon is refocused on observing the bladder through the laparoscope, the clamp is briefly opened and promptly reclosed as the bladder is distended just enough to delineate the muscularis margins, about 200 mL (Fig. 1). If the clamp is left on the Foley, typically the bladder will slowly deflate over a few minutes, but it will deflate quickly and immediately once the clamp is removed, allowing reconnection of the catheter to the Foley bag. The insufflator can be replaced on the trocar, and intraperitoneal pressure resumes at the preset level. It should be noted that sometimes the bladder does not insufflate until the peritoneal pressure is lowered by brief opening of the trocars.

Results

No complications were attributed to this technique, and no cystotomy occurred during any bladder dissection when this technique was used.

Discussion

Laparoscopic injury to the urologic tract occurs in 1% to 3% of gynecologic surgery [2]. Laparoscopic repair of cystotomy [3] was described, thus making immediate diagnosis of urologic injury urgently useful, but prevention of bladder injury would be paramount to repair. Although it is recognized that insufflation of the bladder with carbon dioxide could also identify an occult cystotomy, cystosufflation was not used for this purpose in these cases. It was used early in the operation to prevent cystotomy.

Two incisions can cause scarring to the bladder after cesarean section: the peritoneal incision and the uterine incision. This scarring can be avoided during total laparoscopic hysterectomy by lateral dissection of the parametrial adventitia around the observed scar but adherence of the muscularis to the uterus can still result in injury. By minimally inflating the bladder, the muscular wall is rounded up and literally lifted away, providing a mild traction that both enhances identification of the muscularis margins and allows accurate sharp dissection of the muscularis margins, averting cystotomy.

Cystosufflation can be useful during radical hysterectomy, when the bladder pillars are dissected down to a level below the insertion of the ureters, rounding up the bladder margins and facilitating the dissection of the bladder off of the anterior vagina.

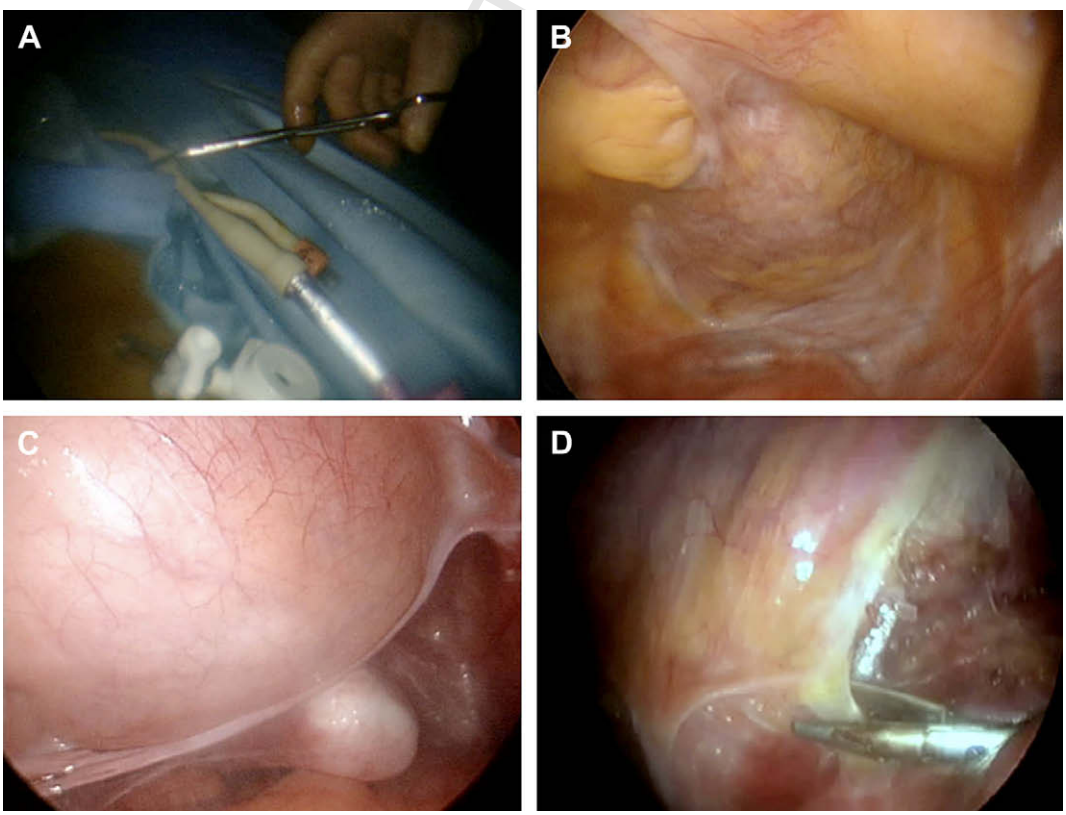

Fig. 1. Attachment of Kelly clamp to Foley catheter on sterile field (**A**). Laparoscopic observation as bladder is inflated, revealing upper margin for anterior colpopexy (**B**). Cystosufflation revealing vaginal apex with bladder elevated away, facilitating incision for removal of ovaries (**C**). Very close-up view of LigaSure incising bladder—flap peritoneum revealing underlying bladder muscularis in patient with earlier cesarean section and myomectomy with 1865-g uterus (**D**).

When patients have large anterior or isthmic myomas, the bladder anatomy can be very distorted. After myomectomy surgery, the uterus can be adherent to the anterior peritoneal wall, altering bladder location. In those cases, cystosufflation can help to retract the bladder muscularis away from the peritoneal incisions and adhesions so that the dissection can be done safely.

Similarly, during laparoscopic anterior vaginal colpopexy, the space of Retzius is approached by incising the peritoneum above the bladder margin, which can be difficult to identify at times. Visually identifying the precise bladder margin with minimal cystosufflation while incising the anterior peritoneal wall can prevent cystotomy at the dome.

Virtually every gynecologic laparoscopic procedure that involves dissection of the bladder from the anterior peritoneal wall of off the uterus and cervix or vagina carries risk of cystotomy. Although no added cost or significant time occurs for the surgeon to perform cystosufflation to distend the bladder, the savings from an averted cystotomy are immeasurable.

Use of saline was suggested, similar to a published report documenting use of the laparoscopic suction irrigator and 5-mm laparoscope for intraoperative cystoscopy at the end of a surgery [4]. However, use of carbon dioxide is quicker and easier. The 200 to 250 mL of carbon dioxide deflates immediately when the clamp is removed. After performing cystoscopy with a similar volume of saline irrigation, it is then necessary to suction the Foley catheter with the suction irrigator to deflate it, or wait for it to gradually occur over many minutes.

Three major concerns exist when considering this procedure. Accidental uncontrolled overinflation of the bladder is possible; however, we only opened the clamp to allow inflation under continuous direct laparoscopic visual monitoring, and overinflation did not occur in any case. In addition, the brief inflations with dry carbon dioxide have not caused postoperative bladder pain or bladder infections. No patients had a complication attributable to this procedure, and none had cystotomy.

Conclusions

This report highlights the potential benefit of intraoperative cystosufflation in preventing cystotomy during dissections around the bladder.

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