



**FIGURE.** The customary surgical approach for laparoscopic cystectomy to remove an endometrioma is mechanical stripping of the cyst wall. To achieve hemostasis after this process, bipolar desiccation, suturing, or a hemostatic agent can be employed. Data indicate that bipolar desiccation, when used, may significantly decrease the ovarian reserve.

ILLUSTRATION: KIMBERLY MARTENS FOR OBG MANAGEMENT



# MINIMALLY INVASIVE GYNECOLOGIC SURGERY

Recent data indicate that electing a topical hemostatic agent or suturing may better protect ovarian reserve than using bipolar electrosurgery during laparoscopic ovarian cystectomy to remove an endometrioma in reproductive-aged women. In addition, the time has come once and for all to forgo routine preoperative mechanical bowel preparation in minimally invasive gynecologic surgery.



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Rightly so, the topics of mechanical tissue extraction and hysterectomy approach have dominated the field of obstetrics and gynecology over the past 12 months and more. A profusion of literature has been published on these subjects. However, there are 2 important topics within the field of minimally invasive gynecologic surgery that deserve our attention as well, and I have chosen to focus on these for this Update.

First, laparoscopic treatment of ovarian endometriomas is one of the most commonly performed gynecologic procedures worldwide. Many women undergoing such surgery are of childbearing age and have the desire for future pregnancy. What are best practices for preserving ovarian function in

these women? Two studies recently published in the *Journal of Minimally Invasive Gynecology* addressed this question.

Second, until recently, the rate of bowel injury at laparoscopic gynecologic surgery has not been well established.<sup>1</sup> Moreover, mechanical bowel preparation is commonly employed in case intestinal injury does occur, despite the lack of evidence that outcomes of these possible injuries can be improved.<sup>2</sup> Understanding the rate of bowel injury can shed light on the overall value of the perceived benefits of bowel preparation. Therefore, I examine 2 recent systematic reviews that analyze the incidence of bowel injury and the value of bowel prep in gynecologic laparoscopic surgery.

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# Bipolar coagulation inferior to suturing or hemostatic sealant for preserving ovarian function

*Song T, Kim WY, Lee KW, Kim KH. Effect on ovarian reserve of hemostasis by bipolar coagulation versus suture during laparoendoscopic single-site cystectomy for ovarian endometriomas. J Minim Invasive Gynecol. 2015;22(3):415–420.*

*Ata B, Turkgeldi E, Seyhan A, Urman B. Effect of hemostatic method on ovarian reserve following laparoscopic endometrioma excision; comparison of suture, hemostatic sealant, and bipolar desiccation. A systematic review and meta-analysis. J Minim Invasive Gynecol. 2015;22(3):363–372.*

Data from 2 recent studies, a quasi-randomized trial by Song and colleagues and a systematic review and meta-analysis by Ata and colleagues emphasize that bipolar desiccation for hemostasis may not be best practice for protecting ovarian reserve during laparoscopic ovarian cystectomy for an endometrioma.

### AMH levels decline more significantly for women undergoing bipolar desiccation

Song and colleagues conducted a prospective quasi-randomized study of 125 women whose endometriomas were laparoscopically removed via a single-site approach and managed for hemostasis with either bipolar desiccation or suturing of the ovarian defect with a 2-0 barbed suture. All surgeries were conducted by a single surgeon.

At 3 months postsurgery, mean AMH levels had declined from baseline by 42.2% (interquartile range [IR], 16.5–53.0 ng/mL) in the desiccation group and by 24.6% (IR, 11.6–37.0 ng/mL) in the suture group ( $P = .001$ ). Multivariate analysis showed that the method used for hemostasis was the only determinant for reduced ovarian reserve.

In their systematic review and meta-analysis, Ata and colleagues included 10 studies—6 qualitative and 4 quantitative. All studies examined the rate of change of serum AMH levels 3 months after laparoscopic removal of an endometrioma.

In their qualitative analysis, 5 of the 6 studies reported a significantly greater decrease in ovarian reserve after bipolar desiccation (varying from 13% to 44%) or a strong trend in the same direction. In the sixth study, the desiccation group had a lower decline in absolute

The customary surgical approach for laparoscopic cystectomy is by mechanical stripping of the cyst wall (FIGURE, page 42) and the use of bipolar desiccation for hemostasis. Stripping inevitably leads to removal of healthy ovarian cortex,<sup>3</sup> especially in inexperienced hands,<sup>4</sup> and ovarian follicles inevitably are destroyed during electrosurgical desiccation. When compared with the use of suturing or a hemostatic agent to control bleeding in the ovarian defect, the use of bipolar electrosurgery may harm more of the ovarian cortex, resulting in a comparatively diminished follicular cohort.

Possible deleterious effects on the ovarian reserve can be determined with a blood test to measure anti-Müllerian hormone (AMH) levels postoperatively. Produced by the granulosa cells of the ovary, this hormone directly reflects the remaining ovarian egg supply. Lower levels of AMH have been shown to significantly decrease the success rate of in vitro fertilization (IVF), especially in women older than age 35.<sup>5</sup> Moreover, AMH levels in the late reproductive years can be used as a predictive marker of menopause, with lower levels predicting significantly earlier onset.<sup>6</sup>



**In 2 systematic reviews, bipolar coagulation resulted in a significantly greater decline in ovarian reserve than alternative methods for attaining hemostasis**

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AMH level than in the other 5 studies. The authors note that this 2.7% decline was much lower than the values reported for the bipolar desiccation group of any other study. (Those declines ranged between 19% and 58%.)

Although not significant, in all 3 of the included randomized controlled trials (RCTs), the desiccation groups had a greater loss in AMH level than the hemostatic sealant groups, and in 2 of these RCTs, bipolar desiccation groups had a greater loss than the suturing groups.

Among the 213 study participants in the 3 RCTs and the prospective cohort study included in the quantitative meta-analysis, alternative methods to bipolar desiccation were associated with a 6.95% lower decrease

### WHAT THIS EVIDENCE MEANS FOR PRACTICE

Compared with the use of bipolar electrosurgery to attain hemostasis, the use of a topical biosurgical agent or suturing could be significantly better for protection of the ovarian follicles during laparoscopic ovarian cystectomy for endometrioma. These alternative methods especially could benefit those women desiring future pregnancy who are demonstrated preoperatively to have a low ovarian reserve. As needed, electrosurgery should be sparingly employed for ovarian hemostasis.

in AMH-level decline (95% confidence interval [CI], -13.0% to -0.9%;  $P = .02$ ).

## Large study identifies incidence of bowel injury during gynecologic laparoscopy

Llarena NC, Shah AB, Milad MP. Bowel injury in gynecologic laparoscopy: a systematic review. *Am J Obstet Gynecol.* 2015;125(6):1407-1417.

In no aspect of laparoscopic surgery are preventive strategies more cautiously employed than during peritoneal access. Regardless of the applied technique, there is an irreducible risk of injury to the underlying viscera by either adhesions between the underlying bowel and abdominal wall or during the course of pilot error. Moreover, in the best of hands, bowel injury can occur whenever normal anatomic relationships need to be restored using intra-abdominal adhesiolysis. Given the ubiquity, these risks are never out of the surgeon's mind. Gynecologists are obliged to discuss these risks during the informed consent process.

Until recently, the rate of bowel injury has not been well established. Llarena and colleagues recently have conducted the largest systematic review of the medical literature to

date for incidence, presentation, mortality, cause, and location of bowel injury associated with laparoscopic surgery while not necessarily distinguishing for the type of bowel injury. Sixty retrospective and 27 prospective studies met inclusion criteria.

### The risk of bowel injury overall and defined

Among 474,063 laparoscopic surgeries conducted between 1972 and 2014, 604 bowel injuries were found, for an incidence of 1 in 769, or 0.13% (95% CI, 0.12%-0.14%).

The rate of bowel injury varied by procedure, year, study type, and definition of bowel injury. The incidence of injury according to:

- definition, was 1 in 416 (0.24%) for studies that clearly included serosal injuries and enterotomies versus 1 in 833 (0.12%) for studies not clearly defining the type of bowel injury (relative risk [RR], 0.47; 95% CI, 0.38-0.59;  $P < .001$ )

### FAST TRACK

Investigators found the incidence of bowel injury to be 0.13% among more than 450,000 surgeries

- study type, was 1 in 666 (0.15%) for prospective studies versus 1 in 909 (0.11%) for retrospective studies (RR, 0.78; 95% CI, 0.63–0.96;  $P = .02$ )
- procedure, was 1 in 3,333 (0.03%; 95% CI, 0.01%–0.03%) for sterilization and 1 in 256 (0.39%; 95% CI, 0.35%–0.45%) for hysterectomy
- year, for laparoscopic hysterectomy only, was 1 in 222 (0.45%) before the year 2000 and 1 in 294 (0.34%) after 2000 (RR, 0.75; 95% CI, 0.57–0.98;  $P = .03$ ).

### How were injuries caused, found, and managed?

Thirty studies described the laparoscopic instrument used during 366 reported bowel injuries. The majority of injuries (55%) occurred during initial peritoneal access, with the Veress needle or trocar causing the damage. This was followed by electrosurgery (29%), dissection (11%), and forceps or scissors (4.1%).

According to 40 studies describing 307 injuries, bowel injuries most often were managed by converting to laparotomy (80%); only 8% of injuries were managed with laparoscopy and 2% expectantly.

Surgery to repair the bowel injury was delayed in 154 (41%) of 375 cases. The median time to injury discovery was 3 days (range, 1–13 days).

In only 19 cases were the presenting signs and symptoms of bowel injury recorded. Those reported from most to least often were: peritonitis, abdominal pain, fever, abdominal distention, leukocytosis, leukopenia, and septic shock.

### WHAT THIS EVIDENCE MEANS FOR PRACTICE

In this review of 474,063 laparoscopic procedures, bowel injury occurred in 1 in 769, or 0.13% of procedures. Bowel injury is more apt to occur during more complicated laparoscopic procedures (compared with laparoscopic sterilization procedures, the risk during hysterectomy was greater than 10-fold).

Most of the injuries were managed by laparotomy surgery despite the potential to repair bowel injury by laparoscopy. Validating that peritoneal access is a high risk part of laparoscopic surgery, the majority of the injuries occurred during insufflation with a Veress needle or during abdominal access by trocar insertion. Nearly one-third of the injuries were from the use of electrosurgery, which are typically associated with a delay in presentation.

In this study, 41% of the injuries were unrecognized at the time of surgery. All 5 of the reported deaths were associated with a delay in diagnosis, with an overall mortality rate of 1 of 125, or 0.8%. Since all of these deaths were associated with a delay in diagnosis, the rate of mortality in unrecognized bowel injury was 5 of 154, or 3.2%. Among women who experienced delayed diagnosis, only 19 of 154 experienced signs or symptoms diagnostic for an underlying bowel injury, particularly when the small bowel was injured.

### Mortality

Mortality as an outcome was only reported in 29 of the total 90 studies; therefore, mortality may be underreported. Overall, however, death occurred in 1 (0.8%) of 125 bowel injuries.

The overall mortality rate from bowel injury—calculated from the only 42 studies that explicitly mentioned mortality as an outcome—was 1 in 125, or 0.8% (95% CI, 0.36%–1.9%). All 5 reported deaths occurred as a result of delayed recognition of bowel injury, which made the mortality rate for unrecognized bowel injury 1 in 31, or 3.2% (95% CI, 1%–7%). No deaths occurred when the bowel injury was noted intraoperatively.



**All deaths related to bowel injury were a result of delayed diagnosis**

## Can mechanical bowel prep positively affect outcomes in gynecologic laparoscopy, or should it be discarded?

Arnold A, Aitchison LP, Abbott J. Preoperative mechanical bowel preparation for abdominal, laparoscopic,

and vaginal surgery: a systematic review. *J Minim Invasive Gynecol.* 2015;22(5):737–752.

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**P**opularized for more than 4 decades, the practice of presurgical bowel preparation is predicated on the notion that the presence of less, versus more, feces can minimize bacterial count and thereby reduce peritoneal contamination. Logically then, surgical site infections (SSIs) should be reduced with bowel preparation. Moreover, the surgical view and bowel handling during laparoscopic surgery should be improved, with surgical times consequently reduced.

Surgeons must weigh the putative benefits of mechanical bowel preparation against the unpleasant experience it causes for patients, as well as the risks of dehydration or electrolyte disturbance it may cause. To this day, a considerable percentage of gynecologists and colorectal surgeons routinely prep the bowel after weighing all of these factors, despite the paucity of evidence for the practice's efficacy to reduce SSI and improve surgical outcomes.<sup>7</sup>

The results of this recent systematic review critically question the usefulness of preoperative bowel preparation for abdominal, laparoscopic, and vaginal surgery.

### Details of the analysis

The authors evaluated high-quality studies on mechanical bowel preparation to assess evidence for:

- surgeon outcomes, including the surgical field and bowel handling
- operative outcomes, including intraoperative complications and operative times
- patient outcomes, including postoperative complications, overall morbidity, and length of stay.

The authors identified RCTs and prospective or retrospective cohort studies in various surgical specialties comparing preoperative bowel preparation to no such prep. Forty-three studies met inclusion criteria: 38 compared prep to no prep, and 5 compared prep to a single rectal enema. Five high-grade studies in gynecology were included (n = 795), with 4 of them RCTs of gynecologic laparoscopy (n = 645).

### Operative field and duration

Of the studies comparing bowel prep with no prep, only the 5 gynecologic ones assessed operative field. Surgical view was perceived as improved in only 1 study. In another, surgeons only could guess allocation half the time.

Sixteen studies evaluated impact of mechanical bowel preparation on duration of surgery: 1 high-quality study found a significant reduction in OR time with bowel prep, and 1 moderate-quality study found longer operative time with bowel prep.

### Patient outcomes

Of all studies assessing patient outcomes, 3 high-quality studies of colorectal patients (n = 490) found increased complications from prep versus no prep, including anastomotic dehiscence ( $P = .05$ ), abdominal complications ( $P = .028$ ), and infectious complications ( $P = .05$ ).

Length of stay was assessed in 26 studies, with 4 reporting longer hospital stay with bowel prep and the remaining finding no difference between prep and no prep.

Across all specialties, only 2 studies reported improved outcomes with mechanical bowel preparation. One was a high-quality study reporting reduced 30-day morbidity ( $P = .018$ ) and infectious complication rates ( $P = .018$ ), and the other was a moderate-quality study that found reduced SSI ( $P = .0001$ ) and organ space infection ( $P = .024$ ) in patients undergoing bowel prep.

### Mechanical bowel preparation vs enema

Bowel prep was compared with a single rectal enema in 5 studies. In 2 of these, patient outcomes were worse with enema. One high-quality study of 294 patients reported increased intra-abdominal fecal soiling ( $P = .008$ ) in the enema group. (The surgeons believed that bowel preparation was more likely to be inadequate in this group, 25% compared with 6%,  $P < .05$ .) Whereas there was no statistical difference in the incidence



**Surgical field was not improved with bowel preparation in 4 of 5 studies**



### WHAT THIS EVIDENCE MEANS FOR PRACTICE

The theory behind mechanical bowel preparation is not supported by the evidence. Despite the fact that the bowel is not customarily entered, up to 50% of gynecologic surgeons employ bowel preparation, with the hope of improving visualization and decreasing risk of an anastomotic leak. The colorectal studies in this review demonstrate no evidence for decreased anastomotic leak or infectious complications. By extrapolation, there is no evidence that using preoperative bowel prep bestows any benefit if bowel injury occurs inadvertently and if resection or reanastomosis is then required.

Among the 7 studies examining bowel prep in laparoscopy (4 gynecology, 3 urology, and 1 colorectal), only data from 1 demonstrated an improved surgical field (and in this case only by 1 out of 10 on a Likert scale). The impact of mechanical bowel preparation on the visual field is the same for diagnostic or complex laparoscopic surgeries. One high-quality study with deep endometriosis resection demonstrated no change in the operative field as reflected by no practical differences in OR time or complications.

Preparing the bowel for surgery is an intrusive process that reduces patient satisfaction by inducing weakness, abdominal distention, nausea, vomiting, hunger, and thirst. Whereas this systematic analysis failed to confirm any benefit of the process, it provides evidence for the potential for harm. Mechanical bowel preparation should be discarded as a routine preoperative treatment for patients undergoing minimally invasive gynecologic surgery.

of anastomotic leak between these groups, there was higher reoperation rate in the enema-only group where leakage was diagnosed (6 [4.1%] vs 0, respectively;  $P = .013$ ).

### Bowel prep and preoperative and postoperative symptoms

Six high-quality studies reported on the impact of mechanical bowel preparation on

patient symptoms, such as nausea, weakness, abdominal distention, and satisfaction before and after surgery. In all but 1 study patients had significantly greater discomfort with bowel preparation. In 2 of the 6 studies, patients had more diarrhea ( $P = .0003$ ), a delay in the first bowel movement ( $P = .001$ ), and a slower return to normal diet ( $P = .004$ ). ❌

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