

## Original Article

# The Use of Barbed Suture for Bladder and Bowel Repair

Dina Chamsy, MD\*, Cara King, DO, and Ted Lee, MD

From the Division of Minimally Invasive Gynecologic Surgery, Department of Obstetrics, Gynecology and Reproductive Sciences, University of Pittsburgh Medical Center, Pittsburgh, PA (all authors).

**ABSTRACT** **Study Objective:** To describe the laparoscopic repair of bladder and bowel injuries using barbed suture and review postoperative outcomes.

**Design:** Retrospective medical chart review (Canadian Task Force classification II-3).

**Setting:** Large academic medical institution.

**Patients:** Thirty-three women who underwent laparoscopic repair of the bladder and/or bowel wall using barbed suture between January 2009 and July 2013.

**Intervention:** Not applicable.

**Measurement and Main Results:** The patients underwent a total of 9 cystotomies (27.3%), 7 enterotomies (21.2%), 4 bladder seromuscular injuries (12.1%), 12 bowel seromuscular injuries (36.4%), and 1 bladder and bowel seromuscular injury (3.0%). Of the 33 injuries, 17 (51.5%) were intentional in the setting of bladder or bowel endometriosis nodule excision, whereas the other 16 (48.5%) were accidental and occurred at the time of lysis of adhesions. Thirteen of 14 bladder injuries (92.9%) were at the dome, and 1 injury (7.1%) was at the trigone. Fifteen of 20 bowel injuries (75%) were rectal, 3 (15%) were on the colon, and 2 (10%) were on the small intestine. Cystotomies ranged in length from 1 to 5 cm, and enterotomies ranged from 1.5 to 6 cm. All bladder and bowel seromuscular injuries were repaired using a single layer of barbed suture. Twelve full-thickness bladder or bowel wall defects (75%) were repaired using 2 layers of barbed suture, and 4 defects (25%) were repaired using a layer of barbed suture and a layer of a running or interrupted smooth delayed absorbable suture. Duration of follow-up ranged from 1 month to 15 months. There were no major complications. Only 1 patient who had undergone a large enterotomy repair developed constipation secondary to a mild rectal stricture diagnosed 3 months postoperatively. Symptoms of constipation since resolved spontaneously in that patient.

**Conclusion:** Barbed suture provides adequate tension-free bladder and bowel repair. No major complications have been encountered; therefore, the use of barbed suture for the repair of bladder or bowel defects seems feasible and safe. Journal of Minimally Invasive Gynecology (2015) 22, 648–652 © 2015 AAGL. All rights reserved.

**Keywords:** Barbed suture; Cystotomy repair; Enterotomy repair; Laparoscopy

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The introduction of knotless barbed suture into the surgical market decreased the challenges of laparoscopic suturing

Ted Lee serves as a consultant for Ethicon. Cara King and Dina Chamsy report no conflicts of interest.

This study was presented as an oral abstract at the American Association of Gynecologic Laparoscopists 43rd Global Congress, November 16–21, 2014 Vancouver, Canada.

Corresponding author: Dina Chamsy, MD, Magee-Womens Hospital of UPMC, 300 Halket St, Pittsburgh, PA 15213.

E-mail: [dinachamsy@hotmail.com](mailto:dinachamsy@hotmail.com)

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and intracorporeal knot tying. Although initially approved by the Food and Drug Administration (FDA) for soft tissue approximation, it is now being extensively used and marketed for a variety of laparoscopic surgeries, including urologic and gastrointestinal procedures [1,2]. The first published report on the use of barbed suture in gynecologic surgery was by Greenberg and Einarsson in 2008 [3]. Since then, barbed suture has gained popularity in the field of minimally invasive gynecologic surgery and is now commonly used to close the vaginal cuff in total laparoscopic hysterectomy and to reapproximate the myometrium after laparoscopic myomectomy. Barbed suture also

is being increasingly used to close the peritoneum following mesh placement in sacrocolpopexy procedures.

Gynecologists do not commonly encounter cystotomies or enterotomies in their practice, and thus opinions on the use of barbed suture to repair bladder and bowel injuries are conflicting owing to anecdotal descriptions and lack of solid data.

The majority of studies evaluating the efficacy and safety of barbed suture for bladder and bowel repair have been conducted in animals. In an *in vitro* randomized controlled study, Gozen et al [4] demonstrated that running barbed suture for pig bladder closure is faster and more effective than traditional monofilament suture. Demyttenaere et al [5] demonstrated that 3-0 unidirectional barbed suture compared with 3-0 Maxon offers comparable, yet faster closure of pig bowel. Omotosho et al [6] also concluded that barbed suture compares favorably with monofilament suture for gastrotomy and enterotomy closure in dogs. Research conducted on human tissue is scarce. Nemecek et al [7] conducted a study on 20 human cadavers and showed that unidirectional barbed suture has a higher bursting pressure than monofilament suture in small intestinal anastomoses. Another study by Tyner et al [8] compared the use of barbed suture and traditional monofilament suture in the laparoscopic suturing of gastrojejunostomy and jejunojejunostomy in 84 obese patients undergoing gastric bypass surgery. Both groups had similar complication rates at 30 days. Although most of these studies had outcomes favoring the use of barbed suture, the results cannot be generalized, because many of these studies were conducted on animals and had small numbers of subjects.

As stated by Greenberg [9] in his review on the use of barbed suture in *Obstetrics and Gynecology* in 2010, “the choice and use of suture in obstetrics and gynecology is based more on anecdote and experience than data.” Owing to the paucity of solid data supporting the use of barbed suture in bladder and bowel repair, many surgeons still comply with the traditional use of interrupted or running smooth sutures. Because our practice at Magee-Womens Hospital is a referral center for the management of advanced endometriosis, we perform a large number of advanced bladder and bowel endometriosis excisional procedures by conventional laparoscopy, and thus are well experienced with primary bladder and bowel repair. We began using unidirectional barbed suture in bladder and bowel repairs in 2009 based on the limited yet favorable data available on the use of barbed suture for bladder and bowel repair. The objective of this retrospective chart review is to describe cases of both intentional and accidental bladder or bowel injuries that were repaired laparoscopically with barbed suture, and to evaluate postoperative outcomes.

## Materials and Methods

Approval from the University of Pittsburgh’s Institutional Review Board was obtained to search the electronic medical

records and identify patients who had undergone laparoscopic bladder or bowel repair by a single surgeon (T.L.) between January 2009 and July 2013. Current Procedural Terminology codes for “cystotomy repair,” “suturing of small bowel lacerations,” and “suturing of large bowel laceration” and International Classification of Diseases, Ninth Revision codes for “endometriosis of unspecified site,” “intestinal endometriosis,” and “accidental puncture of laceration” were used, and a total of 202 charts were reviewed. Inclusion criteria included cystotomy repair, enterotomy repair, and oversewing of bladder or bowel seromuscular injuries using at least 1 layer of delayed absorbable barbed suture. We excluded all cases where smooth monofilament suture was exclusively used to perform the repair. Thirty-three patients met these criteria and were included in the study.

A retrospective review of medical records was then conducted to abstract information about these 33 patients. We collected demographic data including age, race, body mass index (BMI), parity, and past surgical history. We also gathered information regarding the patients’ presenting symptoms, primary surgery performed, details regarding the bladder or bowel injury including its cause, location, size, instrument used at the time the injury occurred, type of injury (mechanical vs thermal) and description of the repair including number of layers, sutures used, axis of repair, and placement of corner suspension sutures. Postoperative course was also recorded, including complications and the duration of follow-up.

Results are given using descriptive statistics using Stata data analysis and statistical software (StataCorp, College Station, TX). Continuous data are given as mean, standard deviation (SD), and 95% confidence interval when normally distributed and as median and interquartile range (IQR) when not normally distributed. Categorical data are given as frequency and percentage.

## Results

Thirty-three patients were found to have undergone bladder and/or bowel repair using barbed suture by a single surgeon at our institution between January 2009 and July 2013. Mean patient age was 40.6 (10.6) years, and mean BMI was 26.8 (5.8). Twenty-nine patients (87.9%) were white, and 4 patients (12.1%) were African American. Thirteen (39.4%) were nulliparous, and 20 (60.6%) were multiparous. Three patients (9.1%) had not undergone previous surgery, 10 (30.3%) had undergone a previous laparoscopic procedure, 11 (33.3%) had undergone a previous laparotomy, and 9 (27.3%) had undergone previous laparoscopic and open procedures. Twenty-nine patients (87.9%) presented with pelvic pain, 11 (33.3%) had abnormal uterine bleeding, and 4 (12.1%) had pelvic organ prolapse (Table 1).

The primary surgical procedures were 12 total laparoscopic hysterectomies (36.5%), 13 laparoscopic excisions of endometriosis (39.4%), 3 salpingoophorectomies

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