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CLINICAL ARTICLE

A multicenter study comparing surgical outcomes and ultrasonographic evaluation of scarring after laparoscopic myomectomy with conventional versus barbed sutures

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ABSTRACT

Objective: To compare clinical outcomes after laparoscopic myomectomy using traditional interrupted sutures (TIS) versus continuous barbed suture (CBS) for treatment of symptomatic uterine myomas. *Methods:* In a multicenter retrospective study, data were obtained for women with uterine myomas who underwent laparoscopic myomectomy at three centers between January 1, 2009 and January 31, 2015. Suturing of the uterine wall had been performed initially using TIS; CBS were used from January 31, 2012. *Results:* Overall, laparoscopic myomectomy was performed using CBS for 360 women and using TIS for another 360. The mean operative time was 52 ± 19 min using CBS and 67 ± 21 min using TIS groups ($P = 0.001$). The mean blood loss was 135 ± 35 mL in the CBS group and 215 ± 55 mL in the TIS group ($P = 0.006$). The mean decrease in hemoglobin was 1.2 ± 0.2 g/L in the CBS group and 1.2 ± 0.2 g/L in the TIS group ($P = 0.072$). *Conclusion:* Laparoscopic myomectomy using CBS is a suitable alternative to TIS in the treatment of uterine myomas for women with up to three tumors.

1. Introduction

Laparoscopic myomectomy is generally considered to be a suitable alternative to standard laparotomic myomectomy. Indeed, when compared with laparotomic myomectomy, laparoscopic myomectomy has been shown to have similar long-term outcomes, shorter hospital stays, a quicker recovery, and better quality-of-life outcomes [1,2]. Moreover, laparoscopic myomectomy is less painful [3–5] and has decreased blood loss [2], reduced morbidity [4], fewer complications [5], better cosmetic results and patient compliance [1], and a lower adhesion rate [6].

However, laparoscopic myomectomy is considered to be a fairly difficult procedure [3,4]: major concerns include the surgeon's wall-reconstruction and suturing skills [7–9], reproductive outcomes [10–13], risk of recurrence [14–16], and costs, operative time, and risk of conversion to laparotomy [14–16]. The ability to perform a quick and safe laparoscopic suture is therefore essential [17–19].

A new kind of continuous barbed suture (CBS), the V-Loc (Covidien, Cornamaddy, Ireland), has been developed with unidirectional barbs that grasp the tissue at multiple points, thereby distributing the tension across the uterine wound. This suture eliminates the need to tie a knot. Angioli et al. have demonstrated reduced operating time and intraoperative blood loss with this CBS as compared with traditional interrupted sutures (TIS) [17]. However, there are no data on the uterine scarring process after V-Loc suturing in terms of the timing of myometrial remodeling, scar disappearance, and occurrence of complications such as hematomas.

The primary aim of the present study was to compare clinical outcomes in terms of the feasibility, safety, and efficacy of laparoscopic myomectomy using CBS versus TIS. A secondary aim was to compare the healing process 6 months after surgery.

2. Materials and methods

In a multicenter retrospective study, data were obtained for all women with uterine myomas who underwent laparoscopic myomectomy between January 1, 2009, and January 31, 2015, at the Department of Obstetrics and Gynecology of Perrino Hospital (Brindisi, Italy), the 2nd Department of Obstetrics and Gynecology of the University Medical School of Bari (Bari, Italy), or the Department of Obstetrics and Gynecology of the University Medical School of Padova (Padua, Italy). The study was approved by the institutional review board of University Medical

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School of Padova. All women provided informed consent for the surgical procedure after receiving thorough counseling about their therapeutic options. The women were informed that laparotomy would be undertaken if difficulties were encountered with the laparoscopic approach. Consent for inclusion in the present study was not necessary because of its retrospective nature.

The main indications for myomectomy were abnormal uterine bleeding, unexplained infertility, recurrent spontaneous abortion, and pain. At admission, all women underwent transvaginal ultrasonography performed by L.L. or S.L. to confirm eligibility for laparoscopy. Patients were suitable for laparoscopic myomectomy when they had myomas no larger than 9 cm and no more than three symptomatic subserous or intramural myomas. Patients were not suitable for this surgery if they had: more than three myomas or an individual myoma larger than 9 cm; a preoperative hemoglobin level of less than 85 g/L; documented cardiovascular disease (history of cardiac failure, myocardial infarction, or unstable angina); documented pulmonary obstructive disease (either poorly controlled or contraindicating prolonged Trendelenburg position); prior pelvic or abdominal radiation therapy; severe hip disease precluding use of the dorsolithotomy position; poor bone marrow, renal, or hepatic function; submucosal myomas; ovarian or uterine neoplastic lesions; obvious metastasis beyond the uterus; contraindication for general anesthesia; systemic infections; or an abnormal cervical smear. Pregnant patients were also ineligible for this surgery. Previous abdominal surgery was not considered a contraindication.

Within 7 days before surgery, all women were re-evaluated by transvaginal ultrasonography for a thorough mapping of myomas and to define the number, dimension, and location of new growths. All interventions were performed by one of four researchers (R.T., P.L., S.B., or E.C.) with the patient under general endotracheal anesthesia. A 10-mm trocar (Karl Storz, Tuttlingen, Germany) incorporating the 0-degree laparoscope (Karl Storz), which was connected to a monitor, was inserted through an umbilical incision. The abdominal cavity was accessed after a pneumoperitoneum was induced at the level of the umbilicus by Veress needle (Auto-Suture, Norwalk, CT, USA). A uterine manipulator was then inserted to mobilize the uterus.

The patient was placed approximately in a 30-degree Trendelenburg position to facilitate intraperitoneal exposure by maintaining the small intestine in the mid and upper abdomen through both gravity and gentle instrumentation. Next, three suprapubic ancillary trocars (Karl Storz) were placed: one (5 mm) was inserted in the midline, 3 cm under the umbilicus; and one was inserted in each iliac fossa (5 mm on the left; 10 mm on the right), lateral to the inferior epigastric vessels. Before surgery began, all the pelvic structures were inspected and the abdomen was systematically explored in a clockwise manner via the laparoscope. The number, size, and location of myomas were then noted, and the course of the ureter was traced, especially in the case of broad ligament myomas.

For the myomectomy, the serosa overlying the myoma was first incised using a monopolar needle until the pseudocapsule of the myoma was reached. The cleavage plane was then identified, the myoma was fixed with a myoma drill (Karl Storz) for adequate traction (Fig. 1), and the fibroid was excised by introducing endoshears (Tyco US Surgical, Norwalk, CT, USA) and bipolar forceps (BiClamp, Erbe, Tübingen, Germany) between the uterine wall and the myoma for coagulating and cutting connective tissue bridges.

Suturing of the uterine wall was performed in one or two layers either by TIS with Polysorb 0 GS-21 (Polysorb, USSC, Norwalk, CT) using extracorporeal knots or by CBS with V-Loc. Suturing of the uterine wall had been performed initially using TIS; CBS were used from January 31, 2012, to the end of the study. The myomas were removed and extracted from the pelvic cavity using a single-patient-use electromechanical tissue morcellator (Rotocut, Karl Storz) through laparoscopic port sites of 15 mm placed in the left iliac fossa after the 5-mm trocar was extracted.

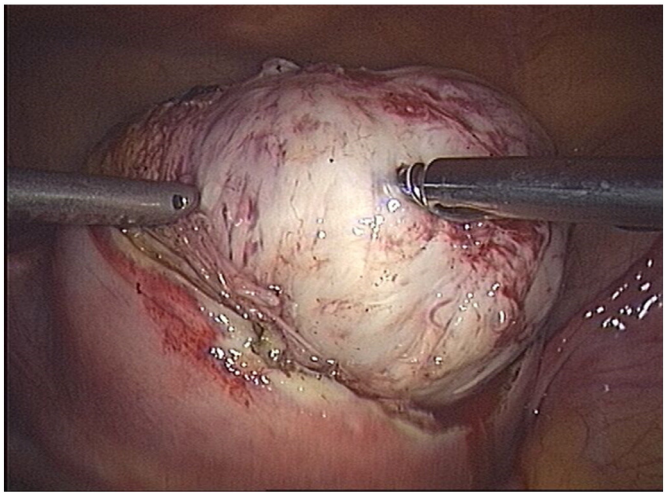

Fig. 1. After identification of the cleavage plane, the myoma was fixed with a myoma drill (right) for adequate traction.

During surgery, hemostasis was controlled laparoscopically. At the end of the surgical procedure, the abdomen was deflated and the trocars were removed. The 5- and 10-mm incisions were closed with mattress sutures of 2–0 Vicryl Rapide (Ethicon, Rome, Italy). The vaginal cavity was cleaned with povidone-iodine solution and a Foley catheter was inserted in the bladder.

Women with a uterus larger than what would be expected at 20 weeks of pregnancy and women with severe anemia were given gonadotropin-releasing hormone analogs before surgery. All patients received antibiotic prophylaxis (2 g cefoxitin intravenously) and perioperative low-molecular-weight enoxaparin (40 mg/24 h subcutaneously).

Information about age, height, weight, body mass index (BMI, calculated as weight in kilograms divided by the square of height in meters), operative time, estimated blood loss, perioperative blood transfusions, length of hospital stay, and intraoperative and postoperative complications was recorded for all patients. Blood loss was estimated by subtracting the volume of the irrigation fluid from the total amount of the fluid in the suction apparatus.

Transvaginal ultrasonography has been demonstrated to be a suitable method for evaluating the scar process and hematoma occurrence [20]. All patients underwent transvaginal ultrasonography by a physician on days 1, 60, and 90 after surgery to evaluate the number, size, and location of scars in the uterine area. The uterine scar diameter and healing pattern were determined by placing calipers around the outer edge of the echogenic, heterogeneous, and ill-defined areas [18]. For evaluation, each myometrial scar diameter was compared with the maximal myometrial diameter of the area previously occupied by the uterine fibroid before surgery [18]. For women with multiple myomas, each tumor was considered individually. A final transvaginal ultrasonography examination was performed at 6 months to evaluate disease recurrence.

The data were analyzed using SPSS 10.0.5 (SPSS Inc., Chicago, IL, USA). The χ^2, Fisher exact, Mann–Whitney, and Student t tests were used for statistical analysis. Variables with normal distribution were expressed as mean ± SD with 95% confidence interval (CI). Nonparametric variables were expressed as median (range). $P < 0.05$ was considered to be statistically significant.

3. Results

Between January 1, 2009, and January 31, 2012, 360 laparoscopic myomectomies were performed using TIS. A total of 360 laparoscopic myomectomies were then undertaken using CBS between February 1, 2012, and January 31, 2015. There were no cases of conversion to

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