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Original Article

# Effect on Ovarian Reserve of Hemostasis by Bipolar Coagulation Versus Suture During Laparoendoscopic Single-Site Cystectomy for Ovarian Endometriomas

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**ABSTRACT** **Study Objective:** To compare the postoperative decrease in ovarian reserve between hemostasis by bipolar coagulation and suture during laparoendoscopic single-site cystectomy (LESS-C) for ovarian endometriomas.
**Design:** Prospective comparative study (Canadian Task Force Classification II-1).
**Setting:** University hospital.
**Patients:** One hundred twenty-five patients with ovarian endometriomas.
**Interventions:** Patients with endometrioma were managed by hemostasis with either bipolar coagulation (n = 62) or suturing (n = 63) during LESS-C. We evaluated the impact of surgery on ovarian reserve using serum anti-Müllerian hormone (AMH) levels, which were measured before surgery and 3 months after surgery in all patients.
**Measurement and Main Results:** Baseline characteristics such as age, bilaterality of endometriomas, and preoperative AMH levels were similar between the 2 study groups. There were also no differences between the 2 groups in surgical outcomes, such as operative time, operative blood loss, or operative complications. In both study groups, postoperative AMH levels were lower than preoperative AMH levels ($p < .001$). The decline rate of AMH levels was significantly greater in the bipolar coagulation group than in the suture group (42.2% [interquartile range, 16.5%–53.0%] and 24.6% [interquartile range, 11.6%–37.0%], respectively, $p = .001$).
**Conclusion:** Hemostasis by bipolar coagulation after stripping of the endometrioma during LESS-C reduces ovarian reserve more than suturing does, as determined by serial AMH levels. Therefore, suturing may be a better hemostatic choice after stripping ovarian endometriomas. Journal of Minimally Invasive Gynecology (2015) 22, 415–420 © 2015 AAGL. All rights reserved.

*Keywords:* AMH; Bipolar coagulation; Ovarian cystectomy; Ovarian reserve; Suture



Laparoscopic cystectomy is a well-established method of management for ovarian endometriomas [1–6]. The surgical procedure is usually performed by stripping the endometriotic cyst wall, followed by bleeding control of the ovarian wound ground using bipolar coagulation or suturing. However, the ovarian hemostasis achieved by these 2 methods could result in damage to the ovarian reserve [7–11]. Bipolar coagulation can result in thermal destruction of the surrounding healthy ovarian follicle, whereas a hemostatic suture may result in mechanical damage to normal ovarian tissue and an increase in intra-ovarian pressure in ischemic regions.

Studies that have compared hemostasis by bipolar coagulation versus suturing during laparoscopic ovarian

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cystectomy have not shown consistent effects on ovarian reserve [1,7,12]. Furthermore, no study that has compared these 2 hemostatic methods has been performed in the setting of laparoendoscopic single-site ovarian cystectomy (LESS-C). Because of the increasing patient demand for LESS-C, it is important to determine which hemostatic methods better preserve postoperative ovarian reserve. Therefore, we compared the effects of bipolar coagulation versus suturing on ovarian reserve in patients who underwent LESS-C for ovarian endometriomas.

## Materials and Methods

This was a prospective nonrandomized study of 125 patients who underwent LESS-C for endometriomas between October 2011 and May 2014 at the CHA Gangnam Medical Center, Seoul, Republic of Korea. The 62 patients who underwent LESS-C with hemostasis by bipolar coagulation were compared with 63 patients who underwent LESS-C with hemostasis by suturing to control bleeding from the ovarian wound ground. Group allocation was carried out according to an odd or even procedure, with the first patient being allocated to the suture group, the second to the bipolar coagulation group, and so on. Patients between 18 and 39 years of age, with a maximum diameter of the endometriotic cyst between 3 and 12 cm, regular menstrual bleeding (defined as cycle length between 21 and 45 days), and appropriate medical status for laparoscopic surgery (American Society of Anesthesiologists Physical Status classification 1 or 2) were included in this study. Patients with any suspicious findings of malignant gynecologic disease, postmenopausal status, pregnancy, lactation, any other endocrine disease (such as uncontrolled thyroid dysfunction, hyperprolactinemia, or Cushing syndrome), or use of hormonal treatments in the 3 months before surgery were excluded. After obtaining institutional review board approval for this study, all patients gave written consent for their data to be collected prospectively.

All procedures were performed by 1 surgeon (T. Song), who previously managed >200 LESS-C procedures. All patients underwent the same standard preparation before surgery, including the administration of prophylactic antibiotics 30 min before the procedure. The LESS-C technique used was previously described in detail [9]. In brief, after the introduction of general anesthesia, a single multichannel port was inserted through the umbilicus, and a laparoscope was introduced through 1 of the channels. Before initiating the stripping of the endometriotic cyst, the ovary was completely freed by obtuse and sharp dissection. After identifying a cleavage plane between the cyst wall and the ovarian cortex, the ovary was pulled slowly and gently in opposite directions with 2 atraumatic grasping forceps. Once the whole cystic wall was separated from the ovarian cortex, bipolar coagulation or ovarian suturing was applied for hemostasis. In the bipolar coagulation group, complete hemostasis was achieved with a 20- to 30-W current applied using bipolar forceps (Karl Storz, Tuttlingen, Germany) on sites of bleeding in the internal face of the ovary without coagulation of external surface. Bleeding sites were then re-examined by irrigation. In the suture group, hemostasis of the ovarian parenchyma was achieved using a 12-in, 2-0 unidirectional-barbed suture with a 26-mm half circle taper-point needle (V-Loc 90 Absorbable Wound Closure device; Covidien, Mansfield, Massachusetts). The first stitch was locked by a loop at 1 end of the ovarian wound, and then a continuous suture was passed through to the opposite end of the ovarian wound and cut without tying a knot. The ovary was sutured edge-to-edge. No chemical hemostats, except for bipolar coagulation or ovarian suture were allowed in either group. In the bipolar group, no bipolar coagulation was performed during or after stripping of the cysts. The ovarian cysts, which were placed into the specimen retrieval endopouch, were removed through the umbilical single-port. After bleeding was controlled, the single multichannel port was removed, the transumbilical fascia and subcutaneous tissue were approximated and closed layer by layer with 1-0 Vicryl (Ethicon, Somerville, New Jersey), and the skin was closed subcuticularly with 3-0 Vicryl.

The primary aim of this study was to compare the effects of 2 hemostatic techniques (bipolar coagulation vs suturing) on ovarian reserve in patients who underwent LESS-C for ovarian endometriomas. The ovarian reserve was assessed by measuring serum AMH levels, which were measured before surgery and 3 months after surgery in all patients. The rate of decline of serum AMH levels was defined as follows: rate of decline (%) = 100 × (preoperative AMH level – postoperative AMH level)/preoperative AMH level. The serum was separated from whole blood, transferred to polypropylene tubes, and stored at –70°C until the assay. Serum AMH concentrations were determined using a commercially available enzyme-linked immunosorbent assay kit (Beckman Coulter, Marseille, France). The detection limit of the assay was 0.14 ng/mL, and the intra- and inter-assay coefficients of variation for the AMH assay were >12.3% and >14.2%, respectively.

All statistical analyses were performed using SPSS 13.0 (SPSS Inc., Chicago, Illinois). Data are presented as means ± SD or medians (interquartile range [IQR]) for continuous variables, and frequencies (percentages) for categorical variables. Baseline parameters and study outcomes were compared between the 2 groups using the Student's *t*-test or the Mann-Whitney test for continuous variables, and the $\chi^2$ test or Fisher's exact test for categorical variables, as appropriate. The serum AMH levels before and after surgery were compared in the same group using the Wilcoxon signed-rank test. Multivariate analysis to determine independent parameters for postoperative ovarian reserve was performed using multiple linear regression. p Values <.05 were considered statistically significant.

## Results

Baseline characteristics including age, body mass index, parity, marital status, and abdominal surgical history were similar between the 2 study groups (Table 1). The diameter and location of ovarian cysts and the level of preoperative tumor markers (e.g., cancer antigen-125 and cancer antigen 19-9) also did not differ between the 2 groups.

The surgical outcomes of each group are shown in Table 2. The histologic type of ovarian cyst, ovarian surgery performed, operative time (defined as the time from skin incision to skin closure), operative blood loss (calculated as the difference between suction and irrigation), change in hemoglobin (defined as the difference between preoperative hemoglobin level and that at postoperative day 1), and length of hospital stay (defined as the time from the operation day to the day of discharge) were all similar between