Comparing Ovarian Reserve after Laparoscopic Excision of Endometriotic cysts and hemostasis achieved either by Bipolar Coagulation or Suturing: A Randomized Clinical Trial

By: Dr. Safoura Rouholamin
Introduction

- Endometriosis as an enigmatic disease is most commonly found on the ovaries and presents with pelvic pain and infertility.
- Laparoscopic stripping has been introduced as the method of choice for cystectomy of endometrioma.

Decreased ovarian reserve which is due to surgical removal of a part of the healthy ovarian tissue together with the endometrioma wall is considered as a major concern after surgery leading to the risk of premature ovarian failure.

• True planning in cystectomy and selection of an appropriate method for hemostasis have been shown to limit the damage to the ovary.
• It means the identification of normal ovarian tissue from pseudocapsule of endometrioma with use of sharp dissection without trimming or removal of ovarian edge.

Hemostatic procedure after stripping of endometrioma is either laparoscopic bipolar electrocoagulation or suturing techniques. Bipolar electrocoagulation is a traditional and simple method to control bleeding of ovarian wound ground that does not require special surgical skills.
After improvements in laparoscopic techniques and devices, suturing of ovarian tissue has also been proposed for hemostasis that requires high surgical skills.

Indeed heating during the application of electrosurgical coagulation damages ovarian stroma and vascularization that leads to damage the surrounding healthy ovarian tissue.
There are many tests to measure ovarian reserve, among which Antimullerian hormone (AMH) is accepted as the most reliable marker due to conditions of being independent of menstrual cycle and unaffected by hormone use.

we designed this study to compare ovarian reserve between laparoscopic suturing and bipolar coagulation techniques in women with unilateral endometrioma.

We evaluated ovarian reserve using AMH and *follicle stimulating hormone* (FSH) levels before and after cystectomy of ovarian endometrioma.
Materials and Methods

- inclusion criteria:
  - age 18-42 year
  - regular menses
  - unilateral ovarian cyst, clinical and ultrasonographic finding as endometriotic cysts
  - complaining of pelvic pain, infertility and suspected ovarian mass.
Exclusion criteria:
- prior ovarian surgery
- known endocrine disease
- history of oral contraceptive pill use or intake of other hormonal agent for the past 3 cycle
- suspected ovarian malignancy required performing adnexectomy.
• Checked of AMH and FSH levels were performed at the third day of the menstrual cycle before the operation and rechecked at 3 months after surgery.

• One hundred nine patients were randomly assigned into two following groups: bipolar coagulation (n=57) and suturing (n=52), using a computer-designed randomization method
Surgical procedure

- After establishment of pneumoperitoneum with the Veress needle (Ethicon Endo-surgery Inc., USA) through a vertical 10-mm subumbilical incision, a 10-mm laparoscope was introduced.
- Then, two to three additional 5-mm trocars were placed for operative instruments.
- Intra-abdominal $\text{CO}_2$ pressure was set to 13-15mmHg.
- Ovarian cystectomy was begun with adhesiolysis.
- If the cyst was opened and spillage occurred, peritoneal irrigation was performed, the plane of cleavage between the cyst wall and ovarian tissue was identified and cystectomy was done with traction and counter-traction techniques using two grasping forceps.
- Then ovary was mobilized and the cortex was grasped with two or three atraumatic forceps and incised using scissors.
Surgical procedure

- In bipolar coagulation group, after stripping the ovarian cyst wall, bipolar coagulation technique was used to control significant bleeding (40W current; Richard Wolf, Germany).
- If oozing from ovarian hilus needed extensive use of bipolar in order to care ovarian reserve, the ovary was sutured and the case was exclude from study.
Surgical procedure

- In laparoscopic suturing group, no bipolar coagulation was performed during or after stripping the ovarian cyst wall.
- The sutures were performed with intracorporeal knots using 2-0 polyglicanic absorbable sutures (Vicryl; Ethicon Inc., New Jersey, USA).
- Suture is performed using needle holders for the closure of ovarian parenchyma and controlling bleeding.
- Bleeding from ovarian hilus was only resolved by suturing.
- The running suture starting from central area, around the ovarian hilus to peripheral tissue, was performed with intraovarian knots to re-approximate the edges in order to achieve satisfying hemostasis.
- Knots were not detectable on the ovarian surface for prevention of adhesion.
Results

- For AMH level, the final model contained three of the eight predictors and was reached in seven steps.
- The strongest weight belongs to AMH level at baseline followed by treatment type and age.
- The results suggest that patients who underwent surgery with the suturing technique had higher AMH concentration as compared with patients in bipolar coagulation group ($\beta = 0.966$, 95%CI: 0.762-1.17; $p < 0.001$).
• age was negatively correlated with AMH level, so that with increasing one year of age, the average decrease in AMH concentration was -0.108 ($\beta = -0.108$, 95%CI: -0.04--0.002; p < 0.001).

• Treatment type was negatively correlated with FSH level, so that surgery with the suturing technique had lower FSH concentrations with higher ovarian reserve as compared with patients in bipolar coagulation group ($\beta = -1.33$, 95%CI:-2.42--0.24; p < 0.001).
<table>
<thead>
<tr>
<th></th>
<th>Bipolar coagulation group (n=47)</th>
<th>Suturing group (n=45)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>29.33±6.91</td>
<td>29.7±6.75</td>
<td>0.261</td>
</tr>
<tr>
<td>BMI</td>
<td>23.8±4.26</td>
<td>24.08±3.08</td>
<td>0.71</td>
</tr>
<tr>
<td>Parity</td>
<td>1.17±0.89</td>
<td>0.84±0.73</td>
<td>0.06</td>
</tr>
<tr>
<td>Pre hemoglobin</td>
<td>12.51±0.86</td>
<td>12.66±0.88</td>
<td>0.126</td>
</tr>
<tr>
<td>Chief complain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td>44(93.6)</td>
<td>31(68.9)</td>
<td>0.002</td>
</tr>
<tr>
<td>Infertility</td>
<td>3(6.4)</td>
<td>14(31.1)</td>
<td></td>
</tr>
<tr>
<td>Pre FSH</td>
<td>5.71±1.24</td>
<td>7.12±1.64</td>
<td>0.46</td>
</tr>
<tr>
<td>Pre AMH</td>
<td>4.41±1.65</td>
<td>3.1±2.21</td>
<td>0.384</td>
</tr>
<tr>
<td>Cyst diameter</td>
<td>9.72±1.76</td>
<td>8.75±2.07</td>
<td>0.01</td>
</tr>
<tr>
<td>Score</td>
<td>60.29±15.65</td>
<td>61.04±17.4</td>
<td>0.82</td>
</tr>
<tr>
<td>Time hemostasis</td>
<td>24.57±8.39</td>
<td>26.44±8.23</td>
<td>0.15</td>
</tr>
<tr>
<td>CA 125</td>
<td>72.38±84.81</td>
<td>53.24±43.04</td>
<td>0.18</td>
</tr>
<tr>
<td>Cul-de-sac</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No involvement</td>
<td>27(57.4)</td>
<td>26(57.8)</td>
<td>0.996</td>
</tr>
<tr>
<td>Partial involvement</td>
<td>15(31.9)</td>
<td>14(31.5)</td>
<td></td>
</tr>
<tr>
<td>Complete involvement</td>
<td>5(10.6)</td>
<td>5(10.9)</td>
<td></td>
</tr>
<tr>
<td>Ovarian involvement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superficial</td>
<td>1(2.1)</td>
<td>2(4.4)</td>
<td>0.421</td>
</tr>
<tr>
<td>Deep</td>
<td>46(97.9)</td>
<td>43(95.6)</td>
<td></td>
</tr>
</tbody>
</table>
Surgical outcome

<table>
<thead>
<tr>
<th>Bipolar coagulation group (n=47)</th>
<th>Suturing group (n=45)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Hb, mg/dL</td>
<td>1.05 ± 0.54</td>
<td>0.49</td>
</tr>
<tr>
<td>Change AMH, %</td>
<td>53.42 ± 15.28</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Note: Change AMH = (preoperative AMH level – postoperative AMH level)/preoperative AMH level.

Results of multiple linear regression model for AMH

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized coefficient β</th>
<th>Unstandardized coefficient β</th>
<th>95% confidence interval for β</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment type</td>
<td>0.436</td>
<td>0.966</td>
<td>0.762 to 1.17</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Age</td>
<td>-0.108</td>
<td>-0.021</td>
<td>-0.04 to 0.002</td>
<td>P = 0.03</td>
</tr>
<tr>
<td>Pre AMH</td>
<td>0.783</td>
<td>0.491</td>
<td>0.428 to 0.554</td>
<td>p &lt; 0.001</td>
</tr>
</tbody>
</table>

Results of multiple linear regression model for FSH (significant variables)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized coefficient β</th>
<th>Unstandardized coefficient β</th>
<th>95% confidence interval for β</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment type</td>
<td>-1.33</td>
<td>-0.182</td>
<td>-2.42 to -0.24</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Pre FSH</td>
<td>0.848</td>
<td>0.703</td>
<td>0.668 to 1.02</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Age</td>
<td>-0.108</td>
<td>-0.021</td>
<td>-0.04 to 0.002</td>
<td>P = 0.03</td>
</tr>
<tr>
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<td>0.491</td>
<td>0.428 to 0.554</td>
<td>p &lt; 0.001</td>
</tr>
</tbody>
</table>
Assessed for eligibility (n=160)

Excluded (n= 25)
not meeting
inclusion criteria (bilateral)

Randomized (n=135)

Allocated to bipolar (n= 57)

6 patients required ovarian suture (n=51)

Lost to follow-up (n= 0)
3 patients conceived (n=47)

Analysed (n= 47)

Allocated to suturing (n=52)

4 patients required cutting (n=48)

Lost to follow-up (n=0)
3 patients conceived (n=45)

Analysed (n= 45)
Serum hormone concentrations between two groups before and after treatment

![Box plot showing AMH levels before and after treatment for different methods]
Serum hormone concentrations between two groups before and after treatment
Based on literatures, factors affecting ovarian reserve were cyst size, recurrences, bilateral case, techniques of surgery, skill of surgeon, and hemostasis method.


Possible mechanism is inadvertent removal of healthy ovarian tissue adjacent to the pseudocapsule of the cyst by electrosurgical coagulation, occurring during hemostasis.
• studies evaluating FSH levels and \textit{antral follicle count (AFC)} after laparoscopic excision, suggesting that suturing technique as a better choice after stripping ovarian endometrioma

other studies compared ovarian reserve between laparoscopic ovarian cystectomy and open laparotomy with hemostatic suturing and both indicated a significant decrease in ovarian reserve in bipolar group as compared to open suture group.


Ferrero et al. reported the same ovarian reserve in patients treated by bipolar coagulation and those treated by suturing after laparoscopic cystectomy of bilateral endometriomas.

They assessed ovarian reserve by serial AMH levels preoperatively and at 3, 6, and 12 months postoperatively and concluded that levels decreased and FSH levels increased regardless to the method used.

These different results may be due to different study population (patients with bilateral endometriomas) or study method (bipolar coagulation was applied when the cleavage plane of the cyst became difficult), but in our study bipolar coagulation was used after stripping the ovarian cyst wall.

In another study, 44 patients undergoing laparoscopic excision of a unilateral ovarian endometrioma were divided in two groups: bipolar electrocoagulation and intracorporeal suturing for obtain hemostasis. No significant differences in the serum levels of AMH and FSH were found at 3 months after surgery compared with preoperative levels. Their findings may be due to smaller sample size and use of diluted vasopressin in to the cyst wall which reduced both oozing and use of hemostatic methods.

We needed larger sample size, longer follow-up period of patients and designing a study with a control group in order to evaluate the long-term effect of endometrioma on ovarian reserve.

Our study has some advantages. It was a prospective randomized clinical trial, included only unilateral endometrioma, and reported no loss-to-follow-up.
Conclusion

- Our findings demonstrated that laparoscopic cystectomy for endometrioma reduced ovarian reserve, regardless of the ovarian hemostatic methods used.
- After laparoscopic stripping of endometrioma, intracorporeal suturing showed less damage on ovarian reserve as compared to bipolar electrocoagulation.
- Therefore, it is recommended that laparoscopic surgeons improve their skill of suturing technique, especially in young and infertile women, to prevent premature ovarian failure.