Ectopic pregnancy (EP) is the implantation and development of a fertilized ovum in any other area outside of the uterine cavity. The incidence of EP ranges from 1/1000 to 1/150 pregnancies.\(^1\) EPs constitute 1-2% of all pregnancies and are among the most important morbidity and mortality reason in women of reproductive age.\(^2\) In recent years, EP can be diagnosed earlier by the use of transvaginal ultrasonography and the use of quantitative β-human chorionic gonadotropin (HCG) levels in routine in almost every clinic. This diagnosis leads to a decrease in the EP-related mortality rate. The diagnosis of patients without rupture allows them to benefit from medical or surgical treatment.\(^3\) Laparoscopic approaches are primarily preferred in the surgical treatment of EP in women who are hemodynamically stable.\(^4\) Laparoscopic treatment of EP has less intraoperative blood loss, less operational time, less analgesic necessity, less hospital stay, less recovery time, and economic cost advantages.\(^5\)

The purpose of this study was to examine the laparotomy and laparoscopic modalities in patients with EP who received surgical treatment in...
our clinic during the last six years and to assess the contributions of these two surgical treatments to the postoperative process.

**MATERIAL AND METHODS**

We examined retrospectively 471 patients who were diagnosed with EP between January 2012 and January 2018 in the Obstetrics and Gynecology Clinic, University of Health Sciences, Kanuni Sultan Suleyman Training and Research Hospital, Istanbul, Turkey. From the patients enrolled in the study, the data of only patients undergoing surgical treatment were analyzed. Of the 471 patients with EP, 202 (42%) underwent surgical treatment.

Surgical treatment was performed in patients who were hemodynamically unstable, had a ruptured EP during follow-up or on first admission after medical treatment, had any contraindication to methotrexate therapy, had concomitant intrauterine pregnancy, did not accept medical treatment, requested permanent contraception, and first received medical treatment but did not respond to medical treatment during follow-up. The patients who received surgery were separated into two groups: laparoscopic surgery and laparotomy. A comparison was made between these patients for age, gravidity, parity, mean β-HCG levels on admission, risk factors for EP, and clinical findings. All patients underwent a dilatation and curettage procedure. The EP diagnosis was verified with a pathological examination.

Statistical analyses were made by employing the Statistical Package for Social Sciences 20.0 (SPSS Inc.; Chicago, IL, USA). The Kolmogorov–Smirnov test was employed to investigate the data for normal distribution. In addition to descriptive statistical methods (mean, standard deviation) in the evaluation of normally distributed data, the independent sample t-test was used for binary comparisons. A p-value of <0.05 was considered statistically significant.

**RESULTS**

Of the 471 patients with EP, 202 (42%) underwent surgical treatment. Of these patients, 110 (54%) underwent laparotomy and 92 (46%) underwent laparoscopic surgery. The surgical data of the two groups are listed in Table 1.

The mean age of patients was 32±5.1 years in the laparotomy group and 33.1±4.9 years in the laparoscopy group. No statistically significant differences were observed between the two groups for age, gravidity, parity, mean β-HCG levels on admission, risk factors for EP, and clinical findings. All patients underwent a dilatation and curettage procedure. The EP diagnosis was verified with a pathological examination.

<table>
<thead>
<tr>
<th>Surgical technique</th>
<th>Laparoscopy (n:92) (%)</th>
<th>Laparotomy (n:110) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salpingostomy</td>
<td>10</td>
<td>10.8</td>
</tr>
<tr>
<td>Salpingectomy (including those ruptured during methotrexate therapy)</td>
<td>78</td>
<td>84.7</td>
</tr>
<tr>
<td>Over wedge resection</td>
<td>1</td>
<td>1.08</td>
</tr>
<tr>
<td>Cornual wedge resection</td>
<td>2</td>
<td>2.1</td>
</tr>
<tr>
<td>Milking</td>
<td>1</td>
<td>1.08</td>
</tr>
<tr>
<td>Scar resection</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

When the reasons for the initial admission in the two groups were examined, the most common complaint found in both groups was abdominal pain. When the risk factors for EP in the two groups were examined, the most common risk factor found in both groups was previous abdominal surgery. However, no significant differences were detected between the groups for complaints at ad-
mission and risk factors for an EP. Admission complaints and risk factors for an EP for both groups are listed in Table 3. When the localization of pregnancy materials in the two groups was examined, the most common localization site found in both groups was the fallopian tube. No differences at a statistical level were found between the groups for the localization site.

No complications related to the surgical intervention were observed in any of the patients. However, 9 (8.1%) patients who underwent laparotomy had surgical wound infection between 6th and 10th postoperative days. Of the patients, three were treated with outpatient antibiotic therapy and six were treated with inpatient antibiotic therapy. All patients were successfully treated. The risk of surgical wound infection was higher at a statistical level in the laparotomy group than in the laparoscopy group. In the laparoscopy group, there were no complications including surgical wound infection.

In the laparotomy group, 19 (17.2%) symptomatic patients with Hb level ≤10 g/dL required erythrocyte suspension transfusion; 8 (9%) patients in the laparoscopy group required erythrocyte suspension transfusion. No differences at a significant level were observed between the groups in terms of blood transfusion and intraoperative blood loss.

The localization of EP, surgical indications, blood transfusion, and postoperative complications in the two groups are shown in Table 4.
DISCUSSION

Both laparoscopy and laparotomy are used in the surgical treatment of EP. Laparoscopic surgery is the primary modality in EP treatment in women who are hemodynamically stable. Laparoscopic surgery has advantages such as less blood loss, shorter surgery time, less postoperative pain, and shorter hospital stay. Consistent with the literature, our study found that the length of hospital stay after the operation was shorter at a significant level in the laparoscopy group than in the laparotomy group (p=0.012). However, our study found that surgery time was significantly longer in the laparoscopy group than in the laparotomy group (p=0.032).

It is important to decide whether laparoscopy or laparotomy is performed in hemodynamically unstable or ruptured EPs. There are publications in the literature claiming that laparoscopy is possible in women who have a ruptured EP and who are hemodynamically unstable. In our study, 36 (39.1%) patients who had a ruptured EP at first admission and 4 (4.3%) patients who had a ruptured EP during follow-up after methotrexate treatment underwent laparoscopic surgery.

While it is accepted that laparoscopic surgery is contraindicated in some cases like interstitial/cornual pregnancy, obesity, and serious adhesions, most of these absolute contraindications are now invalid with the improvement of surgical skills and instruments in recent years. In our study, three (3.2%) patients with a cornual EP underwent laparoscopic surgery and did not have any complications.

While the pneumoperitoneum established in laparoscopic surgery leads to positive intra-abdominal pressure, which reduces venous return and cardiac output, the Trendelenburg position during surgery can increase cardiac output and can provide bleeding control partially because of compression of blood vessels by an established pneumoperitoneum. In our study, 110 (54%) patients underwent laparotomy while 92 (46%) patients underwent laparoscopic surgery. In the laparoscopy group, there were no complications in patients with a ruptured EP.

Soriano et al. compared the efficacy and postoperative complications of laparoscopic surgery in 178 patients with an EP, who were hemodynamically stable or unstable. Only three patients were converted to laparotomy because of hemodynamic instability. No significant differences were detected in postoperative complications between the two groups. In our study, no patient in the laparoscopy group was converted to laparotomy.

Yao et al. compared laparoscopy and laparotomy in the surgical treatment of EP and concluded that both treatments had similar efficacy.
Studies have shown that laparoscopic surgery provides advantages such as short hospitalization, rapid recovery, and low cost over laparotomy. In our study, the hospital stay was found to be shorter in accordance with that in the literature.

CONCLUSION

When surgical treatment is decided in patients with EP, laparoscopic surgery can be preferred more because it leads to less contamination, reduces hospital stay, and has a cost advantage over laparotomy. However, treatment methods can vary according to the facilities of clinics, availability of surgical instruments, and experience of physicians.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Pınar Yalçın Bahat, Gökçe Turan, Berna Aslan Çetin, Ibrahim Polat; Design: Pınar Yalçın Bahat, Gökçe Turan, Berna Aslan Çetin; Control/Supervision: Gökçe Turan, Berna Aslan Çetin; Data Collection and/or Processing: Pınar Yalçın Bahat, Gökçe Turan; Berna Aslan Çetin; Analysis and/or Interpretation: Berna Aslan Çetin; Literature Review: Gökçe Turan; Writing the Article: Pınar Yalçın Bahat, Gökçe Turan; Critical Review: Berna Aslan Çetin; References and Fundings: Pınar Yalçın Bahat, Gökçe Turan, Berna Aslan Çetin; Materials: Pınar Yalçın Bahat, Gökçe Turan, Berna Aslan Çetin, Ibrahim Polat.

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