

Comparative Analysis of Laparoscopy Versus Laparotomy Approaches in Treating Ectopic Pregnancy

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Abstract: *Objective:* To compare and analyze the effects of laparotomy (AS) and laparoscopic surgery (LS) on ectopic pregnancy (EP). *Methods:* The surgical trial initiated case extraction in January 2017 and concluded in May 2023. The subjects comprised 30 cases of EP, categorized into two groups of 15 cases each based on the selected surgical method during treatment for subsequent analysis and comparison. EP patients in Group A chose AS surgical treatment, while those in Group B opted for LS surgical treatment. The perioperative parameters, complication ratio, survival status score (SF-36), and postoperative curative effect values were compared between the two groups of EP patients. *Results:* Throughout the perioperative period, various parameters such as blood loss level, operation time, abdominal pain relief time, ambulation time, catheterization time, exhaust time, and hospitalization time were recorded and compared between the two groups of EP patients. Complication ratios were documented and compared in EP patients from both groups post-operation. The test results indicated a lower value for complications in Group B ($P < 0.05$). SF-36 scores of EP patients in both groups were assessed and compared post-operation, with the test result indicating a higher value for Group B ($P < 0.05$). The postoperative curative effects of EP patients in both groups were evaluated and compared, revealing overall similarity between the two groups ($P > 0.05$). *Conclusions:* The curative effects of AS and LS surgery in EP are similar, but LS surgery demonstrates better prevention and control of complications, reduced bleeding and trauma, and faster postoperative body recovery. Consequently, the prognosis and survival status are superior in LS surgery, providing valuable reference points.

Keywords: Ectopic pregnancy; Laparotomy; Laparoscopic surgery; Efficacy; Complications

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1. Introduction

In the field of gynecology, ectopic pregnancy (EP) is a common occurrence, also referred to as ectopic gestation. This condition arises from developmental defects or abnormalities in fertilized eggs due to various factors such as abnormal endocrine status, the application of reproductive assistance technology, issues with fallopian tubes, and contraceptive failure. It involves the implantation of the fertilized egg outside the uterine cavity, such as in the ovary, fallopian tube, or abdominal cavity^[1,2].

EP patients experience different symptoms based on the sizes of gestational sacs or the implantation sites of fertilized eggs, leading to variations in their clinical presentation. Common manifestations include vaginal bleeding, abdominal pain, and missed periods. In severe cases, increased bleeding may lead to symptoms such as shock, fainting, anal bulge, and intense abdominal pain ^[3,4].

Conservative conventional therapy is often ineffective in treating EP patients. Therefore, surgical intervention is crucial to prevent the rupture of the gestational sac and avoid serious consequences such as death and hemorrhage ^[5]. In the past, laparotomy surgery (AS) was commonly employed, preserving reproductive function but associated with significant trauma, numerous complications, and slow recovery, making it suboptimal overall ^[6].

In recent years, laparoscopic surgery (LS), developed under the concept of minimally invasive procedures, has gained widespread use. LS demonstrates advantages such as a lower incidence of AS defects and improved overall therapeutic effects ^[7]. Thus, this article explores the impact of EP on AS and LS treatments, shedding light on the comparative effectiveness of the two approaches.

2. Materials and Methods

2.1. General information

The surgical trial initiated case extraction in January 2017 and concluded in May 2023. The study included 30 cases of EP, selected based on the following criteria: (1) aged 21–40 years old; (2) gestational week below 8 weeks; (3) all diagnosed with EP and having tubal pregnancy; (4) all experiencing menopause, abdominal pain, and vaginal bleeding with complete information; and (5) voluntary operation. Exclusion criteria comprised: (1) contraindication to surgery; (2) fallopian tube rupture due to EP; (3) history of pelvic surgery; (4) previous medical history of EP; and (5) non-tubal EP. All patients have given consent to participate in this study. Information on the 30 cases of EP revealed an average number of pregnancies of 2.05 ± 0.47 times, an average menopause duration of 44.31 ± 6.11 days, and an average age of 28.51 ± 3.11 years. Patients were divided into 15 cases per group according to different surgical methods selected during treatment for subsequent analysis and comparison. The results of the two groups' test information were all $P > 0.05$. Ethics approval was obtained for this study.

2.2. Methods

EP patients in Group A underwent AS surgical treatment. The specific operation involved placing the patient in a supine position, administering general anesthesia, making an approximately 5 cm incision in the lower abdomen (horizontal or vertical), absorbing accumulated blood in the abdominal cavity, exploring internal conditions, clamping the affected side's fallopian tube, resecting the tube, and suturing the bleeding wound with absorbable stitches. The abdominal cavity was closed layer by layer post-operation.

EP patients in Group B opted for LS surgical treatment. The specific operation involved placing the patient in a bladder lithotomy position, administering general anesthesia, making a horizontal incision about 10 mm below the umbilical cord, injecting carbon dioxide (CO₂) gas, maintaining a pressure of about 10–15 mmHg, inserting a laparoscope, exploring the uterus and abdominal cavity, establishing two auxiliary operation holes (each about 5 mm in length), resecting the affected side's fallopian tube, flushing the pelvic cavity with sodium chloride solution, checking for bleeding and residual pregnancy tissue, releasing CO₂ gas, and closing the abdominal cavity.

2.3. Evaluation items

The comparative test items for the two groups of EP patients included:

- (1) Perioperative items: Recorded parameters included blood loss level, operation time, abdominal pain relief time, bed activity time, catheterization time, exhaust time, and hospitalization time.
- (2) Complication ratio: Recorded types encompassed symptoms of pelvic adhesions, intestinal adhesions, menopause, infection, etc.
- (3) Quality of life score: SF-36 was utilized for assessment, covering material conditions, physical conditions, social conditions, and psychological conditions, with scores set at 100 points per item [8]. High scores indicated better conditions.
- (4) Postoperative curative effect value: Evaluation was primarily based on changes in symptoms, B-ultrasound results, human chorionic gonadotropin β subunit (β -HCG) level, etc. Marked effectiveness was judged if abdominal pain and vaginal bleeding were eliminated, no pelvic cavity mass was detected by B-ultrasound, and β -HCG levels were below 1,000 IU/L. Effectiveness was determined if the block reduction rate was 60% or more, and the β -HCG reduction rate was 50% or more. Ineffective outcomes were judged if the criteria for markedly effective or effective results were not met, or if symptoms worsened [9]. The effective rate and markedly effective rate were included in the overall level of curative effect.

2.4. Statistical analysis

SPSS 22.0 was used for statistical analysis. Counting data such as complication ratio and postoperative curative effect value were tested using χ^2 and expressed as [n (%)]. Measurement data such as perioperative items and SF-36 score were tested using the t -test and expressed as mean \pm standard deviation (SD). After testing and comparison, $P < 0.05$ was considered statistically significant.

3. Result

3.1. Perioperative items

Table 1 shows that during the perioperative period, various parameters such as blood loss level, operation time, abdominal pain relief time, ambulation time, catheterization time, exhaust time, and hospitalization time had a significantly lower value in Group B as compared to Group A ($P < 0.05$).

Table 1. Comparison of perioperative items (mean \pm SD)

Group	Bleeding volume (mL)	Surgery (min)	Eliminate abdominal pain (h)	Getting out of bed (h)	Catheterization (h)	Exhaust (h)	Hospitalized (d)
Group A ($n = 15$)	94.15 \pm 25.23	80.52 \pm 13.51	57.52 \pm 11.61	13.34 \pm 2.42	13.22 \pm 3.67	32.25 \pm 7.11	8.25 \pm 4.27
Group B ($n = 15$)	56.11 \pm 15.32	64.52 \pm 10.44	39.44 \pm 9.26	8.21 \pm 2.33	6.21 \pm 3.41	20.22 \pm 6.55	4.41 \pm 4.22
t value	37.524	16.014	18.547	5.125	7.154	12.054	4.248
P value	0.000	0.000	0.000	0.002	0.000	0.000	0.011

3.2. Complication ratio

Postoperatively, the complication ratios of EP patients in the two groups were recorded and compared. Group B exhibited only one case of pelvic adhesion symptoms, resulting in a total ratio of 6.67%. In contrast, Group A had two cases of pelvic adhesion symptoms, one case each of intestinal adhesion symptoms, menopause, and infection symptoms, resulting in a total proportion of 33.33%. The test results indicated that the EP in Group B had a lower value ($\chi^2 = 22.314$, $P = 0.000$).

3.3. Quality of life

The SF-36 scores of Group B had higher values compared to Group A after the operation ($P < 0.05$).

Table 2. Comparison of quality of life (mean \pm SD, points)

Group	Material	Social	Physical	Psychological
Group A ($n = 15$)	62.41 \pm 2.15	64.25 \pm 3.32	64.12 \pm 2.33	62.15 \pm 2.33
Group B ($n = 15$)	79.25 \pm 3.44	80.22 \pm 3.41	78.45 \pm 2.11	79.14 \pm 2.11
<i>t</i> value	17.542	16.315	14.856	17.125
<i>P</i> value	0.000	0.000	0.000	0.000

3.4. Postoperative curative effect

EP patients in the two groups were evaluated and compared for the postoperative curative effect. In Group B, there were three effective cases and twelve markedly effective cases, resulting in an overall curative effect level of 100.00%. In Group A, there was one ineffective case, four effective cases, and ten markedly effective cases, resulting in an overall curative effect level of 93.33%. The test outcome indicated that the overall levels of the two groups were similar ($\chi^2 = 0.124$, $P = 0.568$).

4. Discussion

Clinically, the occurrence of EP is relatively frequent and common, with its etiology primarily involving three aspects: contraceptive failure, fallopian tube factors, and other contributing factors^[10]. In recent years, advancements in medical technology and an overall improvement in healthcare have led to a high detection rate of EP in its early clinical stages, with fallopian tube-related EP accounting for approximately 95% of cases^[11]. Conservative treatment is feasible for patients with small gestational age, no rupture of the gestational sac, and no peritoneal effusion. However, immediate surgery is required for patients with larger gestational age and associated symptoms, along with uterine effusion, to avoid serious consequences^[12].

Historically, when employing the AS operation to treat EP, the fallopian tube had to be fully exposed, resulting in a relatively large incision. The process involved separating muscle tissue, fascia tissue, and skin, leading to substantial bleeding and trauma, slow recovery, and the potential for various complications^[13]. In contrast, LS treatment for EP eliminates the need to open the abdominal cavity. It allows for the effective removal of the tissues, such as the pregnancy and gestational sac, with smaller trauma, reducing complications and minimizing postoperative scars, resulting in a reliable and ideal curative effect^[14].

During LS operations, a laparoscope and three small holes can be utilized, ensuring clear observation of the uterine cavity. This provides a good field of view for surgery, preventing residual pregnancy. In addition, LS allows for visual observation of fallopian tube blockages or adhesions, with the possibility of implementing recanalization treatment, meeting fertility needs, and ensuring a relatively higher pregnancy success rate post-surgery. Furthermore, LS reduces trauma, effectively removes blood clots, and eliminates lesions, resulting in a lower incidence of postoperative adhesions^[15].

This study recorded and compared various perioperative parameters, complication ratios, quality of life scores, and postoperative curative effects between the two groups. The finding indicated that Group B, undergoing LS surgery, exhibited lower values in complications, higher quality of life, and comparable overall postoperative curative effects. This emphasizes the pronounced outcomes and advantages of LS surgery for EP.

In conclusion, while the curative effects of AS and LS surgery in EP are similar, LS surgery demonstrates

superior prevention and control of complications, reduced bleeding and trauma, and faster postoperative body recovery. This leads to better prognoses and survival statuses, providing valuable reference points.

Disclosure statement

The author declares no conflict of interest.

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