

A novel technique for laparoscopic removal of the fallopian tube after ectopic pregnancy via transabdominal or transumbilical port using homemade bag: A randomized trial

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Background: The purpose of this study was to evaluate the feasibility and surgical outcome of a novel technique for laparoscopic removal of the fallopian tube using a homemade retrieval bag through a 10-mm transumbilical or 5-mm transabdominal port. **Materials and Methods:** A total of 40 women with ruptured ectopic tubal pregnancy were randomized into a 10-mm transumbilical group ($n = 20$) or a 5-mm transabdominal group ($n = 20$) according to the port used for specimen removal. Fallopian tube removal was performed using a new method based on the use of a homemade surgical glove as a retrieval bag. **Results:** There were no differences in the demographic characteristics between the two groups. The specimen retrieval time was significantly shorter in the transumbilical group than in the transabdominal group. Post-operative pain scores, assessed using a visual analog scale, were similar between the groups. No cases of rupture of the homemade retrieval bag were observed. **Conclusion:** The laparoscopic removal of the fallopian tube through the 10-mm umbilical port using a homemade retrieval bag is associated with shorter operative time than retrieval through a 5-mm abdominal port. The present results showed the feasibility and safety of our homemade retrieval bag and novel technique.

Key words: Ectopic pregnancy, homemade retrieval bag, laparoscopy, specimen removal, transumbilical

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INTRODUCTION

Ectopic pregnancy is a common and life-threatening condition that accounts for approximately 2% of all pregnancies, with the great majority occurring in the fallopian tubes.^[1,2] Close observation, medical management and surgery are the treatment options for this condition.^[3,4] Surgical treatment consist of salpingostomy or salpingectomy, which should be performed laparoscopically.^[2,3] In laparoscopic surgery, which has several well-known advantages over open surgery, surgeons have attempted to reduce the number and size of ports to obtain better cosmetic results and improve patient satisfaction.^[5] However, this poses a challenge with respect to specimen retrieval, which is still a major problem associated with laparoscopic procedures.^[6-8]

Furthermore, the high cost of commercial specimen retrieval bags limits their use in the operating room, especially in our country. Therefore, we designed a simple specimen retrieval bag and a novel retrieval technique and determined their feasibility and safety in the present study.

The aim of this study was to evaluate specimen retrieval time, post-operative pain, specimen integrity, length of hospital stay, intraoperative and post-operative complications and cosmetic and overall surgical satisfaction associated with laparoscopic removal of the fallopian tube through either a 10-mm transabdominal or a 5-mm transabdominal port using a homemade retrieval bag and a novel technique.

MATERIALS AND METHODS

The study was conducted as a prospective, randomized trial after approval was given by the University Ethics Committee. Between January 2012 and September 2012, 70 women were hospitalized with a diagnosis of ectopic pregnancy at Department of Obstetrics and Gynecology, Ege University School of Medicine, Izmir, Turkey. Of the patients, 16 were managed medically and 54 were managed surgically. Among the surgically managed cases, 10, 4 and 40 women underwent salpingostomy, milking and salpingectomy, respectively. All 40 patients who underwent salpingectomy because of ruptured ectopic pregnancy participated in this study. Patients

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were informed by the researchers and informed consent was obtained from the patients. Women who entered the study were randomized into 2 groups according to the laparoscopic procedure for specimen extraction, which was performed through either a transumbilical 10-mm port ($n = 20$) or a transabdominal 5-mm port ($n = 20$). Randomization was performed according to a computer-generated list. Patients and care nurses were blinded with respect to the assignment of a specimen extraction technique. The characteristics of the patients, including age, body mass index (BMI) and obstetric history, were recorded at admission. After the operation, patients recorded the severity of incisional pain on a visual analog scale (VAS) with 0 indicating no pain and 10 indicating unbearable pain on the post-operative day (POD) 0 and POD 1. The surgical technique, tubal size, specimen extraction time and the length of hospital stay were also recorded. Tubal size was determined intraoperatively by measuring the widest part of the fallopian tube.

Operative technique

Patients were placed in the lithotomy position. The operation was performed under endotracheal general anesthesia. The abdominal skin and umbilicus were cleaned with 10% povidone-iodine solution. The Rubin cannula was used for manipulating the uterus. Pneumoperitonization was achieved using a veress needle inserted through the umbilicus and a 10-mm trocar was inserted at the same location for the optic system. Under direct visualization, 2 5-mm ancillary trocars were inserted into the left and right lower abdominal quadrants lateral to the inferior epigastric arteries. First, the ectopic mass was localized by pelvic and upper abdominal visualization after evacuation of the hemoperitoneum caused by the rupture of the ectopic pregnancy. Second, a salpingectomy was performed using bipolar forceps and scissors and the tube was placed in a homemade retrieval bag. A surgical glove (size 6.5) was

tied with a 2-0 Vicryl (Polysorb®) thread at the level of intersection of the fingers and body. Then the fingers were cut and removed and the residual part of the glove was used as a retrieval bag [Figure 1]. Before the retrieval bag was blindly introduced into the abdominal cavity through the umbilical port, we lubricated the sterile surgical glove with normal saline to remove the talcum powder. The laparoscope was then re-introduced through the umbilical port. Once in the peritoneal cavity, the bag was opened and the specimen was placed inside the bag under direct vision. The lips of the retrieval bag with the specimen inside were grasped with the laparoscopic instrument handled through the right lower abdominal quadrant. The retrieval bag was then pulled out through the right lower abdominal 5-mm trocar in the transabdominal group. In the transumbilical group, the retrieval bag was pushed into the 10-mm umbilical port from the inside of the abdomen under direct visualization through the same port. By manipulating the laparoscopic instrument from the right lower abdominal quadrant, the retrieval bag was pushed into the 10-mm port and the optic system and the umbilical trocar were removed until the tip of the laparoscopic instrument was observed from the skin [Figure 2]. If the specimen was too large to pass through the lower abdominal incision or the umbilical incision, the mouth of the retrieval bag was pulled out manually by the surgeon and the specimen was pulled out using Kocher clamps. During this procedure, an ancillary trocar served as the gas delivery port for insufflation. The specimen retrieval time was calculated as the time from the opening of the retrieval bag to the completion of bag removal. All skin incisions were closed with absorbable 2-0 Vicryl (Polysorb®). The specimen was evaluated after the operation to determine whether it was intact. Pre-operative or post-operative local anesthetic infiltration of the port sites was not performed. Post-operative pain was managed with 1 g of intravenous paracetamol every 8 h to a maximum of 3 doses (the first

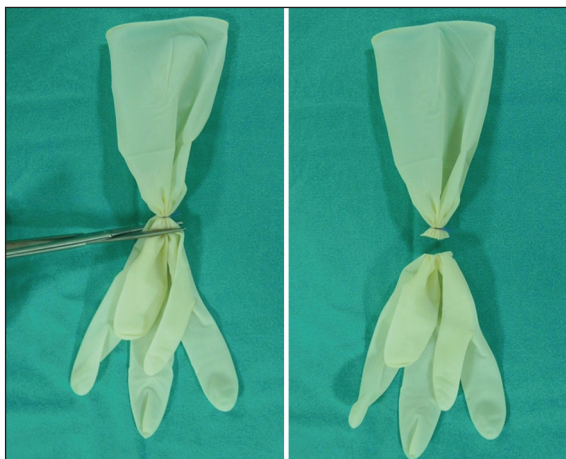


Figure 1: Homemade retrieval bag. The fingers of a sterile surgical glove were removed, and the end of the glove was tied using 2-0 vicryl thread

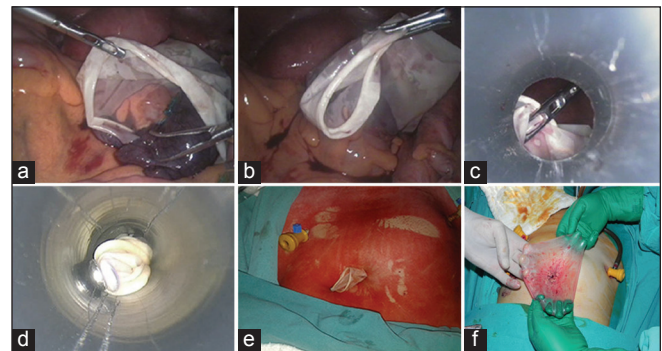


Figure 2: Specimen removal through a 10-mm umbilical port. (a) The homemade bag was opened with an atraumatic grasper, and the surgical specimen was inserted. (b) The lips of the retrieval bag with the specimen inside were grasped. (c-e) By manipulating the laparoscopic instrument from the right lower abdominal quadrant, the retrieval bag was pushed into the 10-mm port, and the optic system and trocar were removed until the tip of the laparoscopic instrument was observed from the skin. (f) The mouth of the bag was pulled out by the surgeon

dose was administered 15 min before skin closure). Rescue analgesia (1 g paracetamol) was administered on patient request. The timing of analgesic requirement and the total amount of medication administered were recorded. Patients were scheduled for a follow-up appointment 3 months after the operation, at which time they were interviewed to identify any complication that may have occurred after discharge and were asked to rate their overall satisfaction with the surgical procedure and cosmetic appearance on separate questionnaires.^[9]

Statistics

Data were analyzed using the statistical package for the social sciences 15.0 software package (SPSS Inc., Chicago, IL, United States). Proportions in the 2 groups were compared using the χ^2 test and odds ratio (OR) with 95% confidence interval (CI). The *t*-test and the Mann-Whitney U test were used to compare continuous variables sampled from a Gaussian or non-Gaussian distribution, respectively. Significance was set at $P < 0.05$.

RESULTS

The baseline characteristics of the patients are shown in Table 1. No significant differences in age, BMI, obstetric history, hospital stay and tubal size were detected between the two groups. The specimen retrieval time was significantly shorter in the transumbilical group than in the transabdominal group (43.5 ± 14.5 s vs. 69.4 ± 20.5 s, $P < 0.001$). The results of POD 0 VAS and POD 1 VAS were similar between the two groups [Table 2]. Rescue analgesia was required for four patients in the transumbilical group and three patients in the transabdominal group. No cases of intra-operative rupture of the homemade retrieval bag

during specimen extraction were observed. On the other hand, specimen evaluation after complete removal of the retrieval bag showed that intact tubes were detected in 3 cases in the transabdominal group and 18 cases in the transumbilical group ($P < 0.001$, OR: 51.0, CI 95%: 7.56-343.73). There were no surgical complications and all patients were discharged on POD 1. All patients were followed-up at our clinic 3 months after surgery and all recovered uneventfully without any complication such as post side herniation. Similar rating were obtained in the transumbilical group and the transabdominal group with regard to overall satisfaction with surgery (9.2 ± 0.6 vs. 9.5 ± 0.6 , respectively, $P = 0.69$) and cosmetic results (9.6 ± 0.5 vs. 9.8 ± 0.4 , respectively, $P = 0.74$).

DISCUSSION

Over the last 2 decades, laparoscopy has played a fundamental role in gynecological surgery. Although its initial use was restricted to diagnostic laparoscopy and laparoscopic sterilization, the laparoscopic technique is now recommended as surgical treatment for ectopic pregnancy and has been applied to most gynecological procedures.^[2,10] The laparoscopic approach has reduced mortality and yielded good cosmetic results, in addition to allowing patients to return to normal life in a short period of time.^[2] In gynecology and other surgical fields, efforts are ongoing to develop strategies to further reduce the size of the abdominal incision and the number of trocars. The proposed benefits of these changes include a decreased risk of wound infection, incisional hernias and post-operative pain, improved cosmetic appearance and greater patient satisfaction.^[5,11,12] However, the removal of the surgical specimen remains an important problem in laparoscopic resections, including salpingectomy, as specimens are generally larger than the port sites.^[13] Although the use of 5-mm trocars without enlarging for tissue removal is simple and cost-effective, the 5-mm ports are generally enlarged to 10-mm or more for specimen extraction.^[14] Laparoscopic salpingectomy is usually performed with at least 3 trocars and 1 of the lower lateral abdominal trocars is enlarged to 10-mm to facilitate the removal of tubes.^[2] This may lead to facial enlargement. Furthermore, extensive manipulation of the trocar port site during the passage of tissue can result in further stretching and tearing of the fascia.^[7,15] It has been established that the enlargement of lower abdominal incisions is associated with increased post-operative pain, an increased rate of complications such as hernia development and epigastric vessel injury and less pleasing cosmetic results.^[8,15-17] The fascial closure of enlarged lower abdominal trocar incisions has been recommended to prevent further hernia formation.^[7] However, incisional hernias at the site of 5-mm entries have only been anecdotally described in the

Table 1: The characteristics of the patients

Characteristics	Transumbilical group (n=20)	Transabdominal group (n=20)	P value
Age, years	32.5±3.8	31.0±3.7	0.18
BMI, kg/m ²	24.3±3.4	24.0±3.6	0.75
Gravidity	2.2±2	2.0±1.5	0.98
Parity	1.0±1.6	0.6±0.7	0.46
Tubal size, cm	2.7±0.7	2.7±0.8	0.92

Data were expressed as mean±standard deviation (95% confidence intervals); BMI=Body mass index

Table 2: The operative outcomes

Variable	Transumbilical group (n=20)	Transabdominal group (n=20)	P value
Specimen retrieval time, s	43.5±14.5	69.4±20.5	<0.001
VAS 0	4.8±1.3	5.5±1.7	0.16
VAS 1	2.7±1.2	3.1±1.8	0.28

Data were expressed as mean±standard deviation (95% confidence intervals); VAS 0=Visual analogue scale on post-operative day 0; VAS 1=Visual analogue scale on post-operative day 1

literature and the closure of the fascia for 5-mm entries is not generally recommended.^[7] In the present study, we did not encounter with any complications such as incisional hernias or vascular injuries at port sides because the 5-mm lower abdominal incisions were not enlarged.

As the abdominal wall at the umbilicus is thin and scars can be concealed by the umbilicus, umbilical incision is an attractive way for specimen retrieval.^[13] The removal of benign adnexal masses via a 10-mm umbilical incision was shown to be associated with a shorter retrieval time and less post-operative pain than retrieval through a lateral abdominal 10-mm port.^[16] Ghezzi *et al.* reported that removal of adnexal masses through an umbilical incision has good cosmetic results.^[9] In the present study, we compared the 10-mm umbilical incision and 5-mm lateral abdominal incision and did not find a significant difference in post-operative pain scores, but the time required for removal of specimens was significantly shorter when using the umbilical route. Evaluation of cosmetic results and surgical satisfaction using a subjective questionnaire showed no significant differences in these items between the 2 groups. Since the abdominal wall at the umbilicus is thin, this allows the specimen in the bag can be visualized clearly and this helps to prevent iatrogenic rupture of the bag. On the other hand, the abdominal wall is thick at the lower abdominal port side and this may cause the retrieval bag to get stuck in the abdominal wall. However, in the present study, iatrogenic rupture of the retrieval bag did not occur in any of the patients, which could be attributed to the soft structure of the fallopian tube.

The use of many commercial and homemade specimen retrieval bags has been reported in the literature. Commercial bags are usually expensive while homemade bags are affordable. Several self-designed, homemade retrieval bags, including surgical gloves, condoms and reclosable zipper bags have been used, but they usually include a purse string closure mechanism around the opening of the bag.^[14,17-19] Surgical threads are used for the purse string mechanism and these threads are pulled from outside the abdominal cavity to close and to remove the bag. To avoid the risk of rupturing the homemade surgical glove specimen bag with the thread, we did not use a purse string mechanism. Instead, the lips of the retrieval bag were grasped with the laparoscopic instrument and pushed into the 10-mm umbilical port from the abdominal cavity under the direct visualization through the same 10-mm umbilical trocar. Rupture of the homemade retrieval bag did not occur in our study. The use of a 5-mm optical system may facilitate the insertion of the specimen bag in to a 10-mm umbilical trocar inside the abdominal cavity in our technique; however, this is not a realistic expectation in most operating rooms, in

which reaching the commercial specimen bag could be difficult. It has been argued that the talcum powder in surgical gloves could negatively affects the intestines and contact of surgical glove with the peritoneal fluid could cause it to collapse, making the collection of specimen difficult. To avoid contamination, surgical gloves were washed with saline to remove the talcum powder in our study. No intestinal complications were reported after the operations. Furthermore, our homemade specimen retrieval bag allows for the removal of specimens larger than the fallopian tube. However, additional investigations are required to determine the efficacy of our homemade retrieval bag and retrieval technique for the removal of larger and more rigid specimens than the fallopian tube.

The results of the present study suggest that fallopian tube removal through a 10-mm umbilical incision after ectopic pregnancy is a simple procedure with shorter operative time than removal through a transabdominal 5-mm incision. In addition, our homemade retrieval bag was shown to be a safe alternative to commercial specimen retrieval bags. Our homemade retrieval bag and retrieval technique should be considered for the laparoscopic removal of specimens, especially soft specimens, without enlarging the 5-mm incisions.

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