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ORIGINAL ARTICLE

Evaluation of the optimal laparoscopic method for benign ovarian mass extraction: a transumbilical route using a bag made from a surgical glove versus a lateral transabdominal route employing a standard endobag

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ABSTRACT

We compared two transumbilical (TU) routes of surgical specimen retrieval in women with ovarian masses treated via laparoscopy: a bag made from a surgical glove and lateral transabdominal (LTA) retrieval employing a standard endobag. A total of 109 women undergoing laparoscopic surgery to treat benign adnexal masses were retrospectively evaluated between 2014 and 2017. In total, 57 masses were removed via the TU route and 52 via the LTA route. We recorded the ovarian mass size; additional postoperative analgesic drug requirements. Postoperative incisional pain scores were assessed using a 10–cm visual analogue scale (VAS), time to discharge and procedure type. The mean VAS scores at 1 h (5.0 ± 1.7 vs. 6.3 ± 1.3; $p < .001$); 12 h (0.7 ± 0.8 vs. 1.2 ± 1.1; $p = .004$); and 24 h (0.1 ± 0.3 vs. 0.7 ± 0.6; $p < .001$) were lower in the TU-removal group. Furthermore, additional postoperative analgesic drug requirements were significantly higher in the LTA-removal group (10 (19.2%) vs. 3 (5.3%); $p = .03$). During laparoscopic surgery, removal of an ovarian mass via an umbilical port (compared to a lateral port) causes less postoperative pain and does not increase the risk of wound complications such as infection or hernia.

KEYWORDS

Ovarian mass; laparoscopy; specimen retrieval

IMPACT STATEMENT

- **What is already known on this subject?** Laparoscopy has been used for the last 30 years. Constant improvement in the technique and equipment has allowed extensive, laparoscopic pelvic and abdominal surgery affording better outcomes than open surgery, an improved recovery, less pain, and fewer postoperative complications. However, mass removal remains a concern. Most laparoscopic specimens are larger than the initial trocar incision. Minimally invasive, adnexal mass surgery usually requires a trocar at least 10 mm wide to remove the mass. Alternatively, adnexal mass extraction from the abdominal cavity can proceed via a suprapubic, umbilical, or vaginal route.
- **What do the results of this study add?** During laparoscopic surgery, ovarian mass removal through an umbilical port using an endobag made from a surgical glove is useful due to the method requiring little funds, is easy to do, and results in a lower amount of postoperative pain than a removal via a lateral port using a standard endobag.
- **What are the implications of these findings for clinical practice and/or further research?** A transumbilical route using a bag made from a surgical glove is easy, economical, and causes less postoperative pain to the patient than removal via a lateral port employing a standard endobag.

Introduction

Adnexal masses are common clinical issues faced by gynaecologists. Benign adnexal masses cause 7% of all inpatient admissions among women aged 15–54 years; more than 50% require surgery (Walsh et al. 2017). Laparoscopy has been used for the last 30 years. Constant improvement in the technique and equipment has allowed extensive, laparoscopic pelvic and abdominal surgery affording better outcomes than open surgery, improved recovery, less pain, and fewer postoperative complications (Kilpiö et al. 2017; Moulton et al. 2017). However, mass removal remains a concern; most laparoscopic specimens are larger than the initial trocar incision (Ghezzi et al. 2012). Minimally invasive, adnexal mass surgery usually requires a trocar at least 10 mm wide to remove the mass. Alternatively, adnexal mass extraction from the abdominal cavity can proceed via a suprapubic, umbilical, or vaginal route. It has been suggested that a 10 mm fascial incision needs to be sutured to avoid formation of a hernia (Wang et al. 2014; Kilpiö et al. 2017).

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Here, we compared mass removal via the transumbilical (TU) route (using a hand-made endobag) and the lateral transabdominal (LTA) route (employing a standard endobag).

Materials and methods

A total of 109 women undergoing laparoscopic surgery at three centres to remove benign adnexal masses were retrospectively evaluated between January 2014 and September 2017. Masses were removed via the TU route in 57 women and via the LTA route in 52. All of the operations were performed by senior consultants experienced in terms of both TU and LTA retrieval, with the aid of trainees and nurses. All of the patients underwent an ultrasound investigation prior to surgery to evaluate mass morphology and size. Patients with suspected malignancies, deep infiltrating endometriosis, indications for concomitant hysterectomy, and a possible requirement for myomectomy were excluded. We recorded the body mass index (BMI); parity; ovarian mass size; perioperative and postoperative complications; requirements for additional postoperative analgesic drugs; postoperative incisional pain scores assessed using a 10 cm visual analogue scale (VAS) at 1, 3, 12, and 24 h after surgery; estimated blood loss (mL); time to discharge; and the procedure type. A postoperative fever was defined as a body temperature over 37 °C twice over a 15-min interval, and a temperature of 38 °C in the first 24 h after surgery.

The patients were admitted one day before surgery. Antibiotic prophylaxis (Cefazolin, 500 mg) was given intravenously 15–30 min before skin incision, and antithrombotic prophylaxis (when required) featured low-molecular-weight heparin given subcutaneously 12 h before surgery and for 15 days after surgery. The umbilicus was cleaned using a cotton swab before skin disinfection, and the bladder was drained via Foley catheterisation. Each laparoscopic procedure was performed under general endotracheal anaesthesia with patients in the lithotomy position. A uterine manipulator was inserted if necessary to afford exposure of the pelvic organs. Our postoperative care protocol featured the administration of the prokinetic agent metoclopramide (as an antiemetic), if required, and prophylaxis for stress-induced gastritis in the form of histamine H2 blockers for 48 h after surgery. All of the patients received steady oral Paracetamol for 48 h after operation, after removal of the epidural catheter. Additional nonsteroidal analgesia was provided when required, and its use was carefully documented. Antiemetic agents were prescribed for nausea, if required. No opioid antagonists were used postoperatively.

A pneumoperitoneum was created using a Veress needle. A 1.2 cm vertical incision was created at the level of the umbilicus, and a 10–12 mm trocar was inserted through the umbilicus (optic port) followed by a 10 mm 0° operative laparoscope. Three additional 5 mm trocars were inserted under direct vision at the level of the lower abdominal quadrants (lateral to the rectus muscles), and another in the suprapubic area via a midline, vertical skin incision. The patients were then placed in the Trendelenberg position. The adnexal mass was identified and dissected in a step-by-step manner until it was totally free. If intraoperative rupture occurred, we carefully suctioned out all cyst fluid. In the LTA group, the left lower trocar was upsized from 5 to 10 mm, and an endobag with a 40 cm-long thread was rolled, grasped with grasping forceps, and introduced with the free end of the thread held outside the abdomen. The thread was pulled to close the endobag, and the trocar cannula withdrawn. The endobag (with the contained specimen) was then removed through the LTA. For the TU group, we created a surgical glove bag during the operation as follows: a sterile, surgical latex glove (size 8.5) was doubly tied at the level of the wrist, the fingers were removed, and a 75 cm purse-string suture was created (using a symmetrical knot) to form a bag (Figure 1). It takes an average of 10 min to make the glove bag. The glove was lubricated with normal saline to remove the talcum powder and then introduced through the 10 mm umbilical port (the optic port). The finger of the glove was cut because it is easy to inside the 10 mm throcar and also easy to move the grove like this. Rupture of the homemade retrieval bag did not occur in our study. The specimen was placed inside the glove under direct visualisation. The tail of the suture was fastened outside the abdominal cavity to close the orifice of the bag. Withdrawal of the suture pulled the bag beneath the wound. The specimen-containing bag was then pulled out of the umbilical wound, together with the trocar, after deflation of the pneumoperitoneum. Once the orifice of the bag emerged from the wound, the mass was aspirated or fragmented to facilitate specimen retrieval.

The specimen retrieval time was calculated from the time of bag opening to complete removal. The surgical time was the time from skin incision to closure. The TU and LTA fasciae were closed under direct visual control using 0-Vicryl sutures and a traditional needle holder. The fasciae of the 5 mm incisions were not closed. All of the skin incisions were closed with absorbable 4-0 Vicryl (POLYSORB 1). The port sites did not receive preoperative or postoperative local anaesthesia. To prevent postoperative nausea and vomiting, all patients were given Dexamethasone (5 mg) at the start of anaesthesia and Ondansetron (4 mg) with Droperidol (0.1 mg/10 kg) at the end of surgery. Each patient also received Fentanyl (1 mg/kg) and Ketoprofen (100 mg) at the end of surgery (for pain control). Postoperative fluid (125 mL/h intravenously) was given for the first 24 h, postoperatively. The patients were allowed clear fluids as desired in the immediate postoperative period. Metoclopramide (20 mg) and gastric protective agents were given to reduce postoperative nausea and pain. Each patient was asked by the care nurse to record the severity of incisional pain on a VAS (0, no pain; 10, unbearable pain) at 1, 3, 12, and 24 h after surgery.

The categorical factors are summarised using frequencies and percentages. All of the values are expressed as the means ± standard deviations (with 95% confidence intervals), unless stated otherwise. Continuous variables were compared using Student's *t*-test and the Mann–Whitney *U*-test. The categorical data was compared with the aid of the χ^2 test. Logistic regression analysis was used to define the predictive factors. The results are presented as the odds ratios (OR) and 95% confidence intervals (CIs). All of the statistical analyses were performed using MedCalc Software (Version 14.0 for

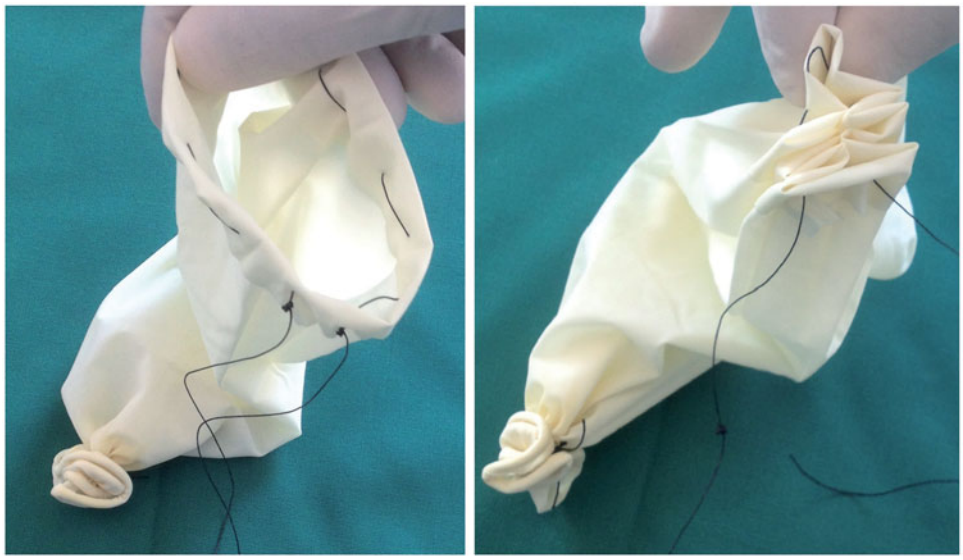

Figure 1. Surgical glove bag.

Table 1. The demographic data and clinical characteristics of the patients.

	TU ($n=57$)	LTA ($n=52$)	p
Age (years), mean ± SD	43.7 ± 12.0	40.1 ± 9.4	.088
BMI (kg/cm^2), mean ± SD	31.1 ± 4.2	30.0 ± 4.7	.229
Parity, mean ± SD	1.3 ± 0.7	1.2 ± 0.9	.666
Mass size (cm), mean ± SD	9.1 ± 2.3	8.2 ± 2.5	.347
Estimated blood loss (mL), mean ± SD	10.5 ± 4.7	9.7 ± 4.5	.421
Operation time (min), mean ± SD	76.2 ± 14.7	71.3 ± 18.0	.088
Specimen retrieval time (min), mean ± SD	9.2 ± 2.2	8.5 ± 2.8	.124
Previous abdominal surgery, *n* (%)	10 (17.5)	13 (25.0)	.341
Postmenopausal status, *n* (%)	12 (21.1)	9 (17.3)	.620
Surgery, *n* (%)			.380
Unilateral salpingo-ooferectomy	15 (26.3)	10 (19.2)	
Cystectomy	42 (73.7)	42 (80.8)	
Postoperative fever, *n* (%)	1 (1.8)	2 (3.8)	.505
Additional analgesic requirement, *n* (%)	3 (5.3)	10 (19.2)	.025
Cost			
Sterile surgical gloves			
Average number/surgery	1		
Price/unit ($)	0.43		
Endobag			
Average number/surgery		1	
Price/unit ($)		14.4	

TU: transumbilical; LTA: lateral transabdominal; SD: standard deviation; BMI: body mass index.

Table 2. VAS scores.

	TU	LTA	p
VAS,[a] 1 h	5 (4.6–5.3)	6 (5.9–6.7)	<.001
VAS,[a] 3 h	4 (3.2–4.4)	4 (3.8–4.9)	.162
VAS,[a] 12 h	0 (0.4–0.9)	1 (0.9–1.5)	.004
VAS,[a] 24 h	0 (0.1–0.3)	1 (0.5–0.9)	<.001

[a]Median (95% confidence interval).
TU: transumbilical; LTA: lateral transabdominal; SD: standard deviation; VAS: visual analogue scale.

Windows, Mariakerke, Belgium). A p value of $< .05$ was considered to indicate statistical significance. *Post hoc* power analysis was calculated using the website 'clincalc.com'.

Results

The demographic data and clinical characteristics of the patients are shown in Table 1. Age, BMI, parity, ovarian mass size, menopausal status, specimen removal time, operation time, and procedure type did not differ between the groups. The mean blood loss was 10.5 ± 4.7 mL in the TU group and 9.7 ± 4.5 mL in the LTA group ($p=.421$). Ten patients (17.5%) in the TU group and 13 (25.0%) in the LTA group had previous histories of abdominal surgery ($p=.341$). The numbers of patients undergoing unilateral salpingo-oophorectomy in the TU and LTA groups were 15 (26.3%) and 10 (19.2%), respectively, and the numbers of cystectomy patients were 42 (73.7%) and 42 (80.8%), respectively ($p=.380$). The numbers of patients exhibiting high fevers in the first 24 h after surgery were one (1.8%) in the TU group and two (3.8) in the LTA group ($p=.505$).

The mean VAS scores at 1 h (5.0 ± 1.7 vs. 6.3 ± 1.3; $p<.001$), 12 h (0.7 ± 0.8 vs. 1.2 ± 1.1; $p=.004$), and 24 h (0.1 ± 0.3 vs. 0.7 ± 0.6; $p<.001$) were lower in the TU than in the LTA-removal group (Table 2). According to *post hoc* power analysis, the power of this study was 99.5% (α: 0.05) for VAS 1 h, and 99.9% for VAS 24 h. Furthermore, the need for additional postoperative analgesics was significantly greater in the LTA-removal group (10 (19.2%) vs. 3 (5.3%); $p=.025$). We encountered no major complications. According to Kolmogorov-Smirnov and Shapiro-Wilk, VAS1-3-12-24 values were not normally distributed data. The median VAS values for the TU and LTA groups were 5 and 6 for 1 h (4 and 4 for 3 h; 0 and 1 for 12 and 24 h).

Regression analysis was performed in Table 3 to define the risk factors for high VAS (≥6 for 1 h) score. The median value of VAS score at the first hour was 6 and the high VAS values be accepted as 6 and up. TU route for specimen retrieval independently protected against the high VAS score.

Discussion

We used an LTA route (with a standard endobag) and a TU route (using a hand-made surgical glove-derived bag) to extract ovarian masses during laparoscopy; we sought to reduce postoperative pain. Our hypothesis was that the TU

Table 3. Univariate and multivariate analyses of the risk factors for high VAS (≥6 for 1 h) score.

	Univariate			Multivariate		
	OR	95% CI	*p*	OR	95% CI	*p*
Age (≥50 years)	0.5	0.2–1.2	.148	0.6	0.1–2.5	.580
BMI (≥30 kg/cm^2)	1.4	0.6–3.2	.359	2.1	0.8–5.6	.112
Multiparity	0.9	0.4–2.1	.917	0.9	0.3–2.3	.930
Large mass (≥10 cm)	1.0	0.4–2.3	.889	1.2	0.4–3.0	.696
Long retrieval time (≥10 m)	1.7	0.7–4.0	.173	1.5	0.5–4.2	.387
Previous abdominal surgery	1.0	0.4–2.7	.892	0.8	0.2–2.5	.742
Postmenopausal status	0.6	0.2–1.8	.452	0.9	0.2–4.1	.938
Surgery (cystectomy)	0.5	0.2–1.3	.180	0.6	0.2–1.9	.445
Mass removal route (LTA)	5.1	2.1–11.9	<.001	5.6	2.2–14.0	<.001

BMI: body mass index; TU: transumbilical.

approach would reduce pain and the need for additional analgesics. We could not use a standard endobag by TU route because in these condition 5 mm scope should be used, however, we have not used 5 mm scope for laparoscopy.

Removal of an adnexal mass requires consideration of bodily habitus, any planned concomitant procedures, the sizes and locations of the laparoscopic ports, the characteristics of the adnexal mass, and any underlying malignancy. Simple cysts (e.g. benign serous cystadenomas), especially when large, are often easily drained, excised, and then removed. However, when handling multiloculated cysts, solid masses, or masses of unknown malignancy status, it is important to remove the masses intact. Ideally, tissue extirpation should be performed via 5 mm-diameter ports. However, in our country, 5 mm-diameter endobags are not available—we must use 10 mm-diameter bags. Enlarging a port from 5 to 10 mm in diameter, particularly a lateral port, increases the risks of postoperative hernia and pain.

Laparoscopic surgery to remove adnexal masses is now a routine gynaecological procedure. Compared to a laparotomy, such surgery is associated with less intraoperative blood loss, fewer postoperative complications, shorter hospitalisation, and earlier recovery (Chou et al. 2010). However, specimen removal remains a concern. The postoperative day 0 VAS score was lower in the TU group than in the LTA group, as were the number of patients with VAS scores > 5, with statistical significance (Chou et al. 2010). However, the day 1 VAS score was similar in the two groups (Chou et al. 2010). In contrast, Kilpiö et al. (2017) found that the VAS scores were the same in the two groups. TU and transvaginal (TV) colpotomic removal of adnexal masses has also been compared. Use of the TV route was associated with less pain than the TU route (Ghezzi et al. 2012). In the TU group, the proportions of women who reported that the periumbilical region was the most painful region at 1, 3, and 24 h postoperatively were 31.2, 31.2, and 12.5%, respectively (Ghezzi et al. 2012); the figures for the colpotomy group were 5.7, 2.8, and 5.7% (Ghezzi et al. 2012). The TV approach is not popular because of potential complications arising if the peritoneal cavity is entered via the posterior vaginal fornix, and the lack of evidence of less morbidity than that associated with the traditional procedure. An ideal specimen extraction method must not compromise patient safety intraoperatively or postoperatively, it must not be too time-consuming, it should be easy to perform, and it should maintain the advantages of a minimally invasive approach.

In our study, the VAS scores were lower in the TU than the LTA group at 1, 12, and 24 h, postoperatively. Consistent with this, the need for additional painkillers (analgesics) was less in the TU group, with statistical significance. Very few relevant studies have appeared. Nevertheless, it seems more appropriate to remove adnexal masses via TU incisions, reducing pain, avoiding vessel injury, and allowing faster healing.

The limitations of our study include the retrospective nature of the work, the absence of certain data, and the small group size. Retrospective cohort studies are subject to selection and recall bias and may feature unknown confounding variables, which may negatively affect the accuracy of the results. Despite these limitations, the fact that the demographic characteristics of the two groups were similar, the availability of good follow-up data, and the performance of all surgeries by the same surgical teams enhance the validity of our results and mitigate possible weaknesses.

In conclusion, during laparoscopic surgery, ovarian mass removal through an umbilical port using an endobag made from a surgical glove is useful. The method is easy, economical, and causes less postoperative pain than removal via a lateral port employing a standard endobag.

Disclosure statement

No potential conflict of interest was reported by the authors.

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