Comparison of transumbilical and periumbilical median incisions in ovarian cancer surgery

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Abstract

Objective: The umbilicus is traditionally circumvented while performing a vertical midline abdominal incision. There is a gap in knowledge pertaining to avoiding the umbilicus. Our aim was to investigate whether a transumbilical (TU) or periumbilical (PU) midline incision conferred any advantage to the patient.

Material and Methods: This was a retrospective cohort study of patients undergoing ovarian cancer surgery with a midline incision, from the pubic tubercle to the xiphoid. All surgery was performed by the same team of gyneacological oncologists. Patients were classified into two groups according to the midline incision used, TU or PU. The primary endpoint was the incision wound complication rate.

Results: TU and PU midline incisions were performed in 54 and 68 patients, respectively. There were no differences between the two groups in terms of patient characteristics and operative details. The two groups had comparable rates of complications, including wound infection (7.4% vs. 10.3%, p=0.75), deep surgical site infection (11.1% vs. 4.4%, p=0.18), evisceration (3.7% vs. 4.4%, p=0.99) and incisional hernia (33.3% vs. 33.8%, p=0.99).

Conclusion: Our findings suggest that circumventing the umbilicus during laparotomy did not have any advantage. Future prospective randomized trials are warranted to validate this finding. (J Turk Ger Gynecol Assoc 2023; 24: 271-6)

Keywords: Gynecologic oncology, incisional hernia, infection, ovarian cancer

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Introduction

The most important consideration when choosing the type of incision for surgery is to provide adequate exposure. Postoperative wound healing, pain, cosmetic concerns and complications, such as hernia risk, should also be considered. A properly placed incision of sufficient length will facilitate minimal tissue trauma, complete haemostasis, proficient use of retractors, and efficient visualization (1). Ovarian cancer surgery, whether primary or recurrent, is one of the most comprehensive operations due to the tumor spread pattern. It requires a wide incision for exploration, staging and debulking of both upper and lower abdomen implants. The vertical midline incision provides access to the abdominal viscera, liver, spleen, inferior vena cava, aorta, kidneys, pelvic organs and related lymphatics that may be sites of ovarian cancer metastasis (2).

The umbilicus is traditionally circumvented when conducting a midline laparotomy, although the reason for this is unclear, possibly to reduce the risk of wound infection and incisional hernia. To the best of our knowledge, only one study on this subject has been published and, according to this report, the method of avoiding the umbilicus in midline laparotomy served no useful purpose (3). However, it was reported that when circumventing the umbilicus it was difficult to perform a symmetrical curve around the umbilicus.

Thus, there is insufficient published evidence to understand if the periumbilical (PU) midline incision is beneficial or not. The present study was conducted to determine whether outcomes after the use of the transumbilical (TU) incision differed from

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the PU incision, in terms of surgical site infection, incidence of incisional hernia and cosmetic appearance.

Material and Methods

Trial design

Approval for the study was obtained from the İstanbul University, İstanbul Faculty of Medicine Clinical Research Ethics Committee (approval number: 08, date: 02.04.2021). Between January 2016 and December 2019, patients who underwent a laparotomy for ovarian cancer surgery with a vertical midline incision, from the pubic tubercle to the xiphoid, were reviewed retrospectively. Patients who met the criteria were classified into two groups according to the type of midline incision, TU or PU (Figure 1). Figure 2 depicts the flow diagram and architecture of the retrospective cohort study.

Participants

Participants aged between 18 and 80 years were included. Patients who had a prior history of incisional or umbilical hernia before the index surgery and patients who were lost during the follow-up within 12 months of the operation, were not included. Patients who had a relaparotomy due to complications, such as anastomotic leak and whose fascia was not closed, were also excluded.

Surgical technique

Preoperative mechanical bowel preparation was used in all patients. Antibiotic prophylaxis was given, and povidone-iodine was used for antisepsis of the skin. The same team of gynaecologic oncologic surgeons performed all of the operations through a midline laparotomy. The team consisted of eight surgeons in total. Each surgery was performed by a senior consultant and a fellow, drawn from this pool of surgical staff. Laparotomy was performed with a scalpel for skin incision through the middle of the umbilicus (group TU) or from the left side of the umbilicus (group PU), extending from the pubic tubercle to the xiphoid; followed by diathermy in cut mode for the subcutaneous tissue. For patients who previously had surgery at the planned incision site, the incision was made through the previous scar. A limited amount of fascia was opened by a scalpel. The preperitoneal fat was bluntly dissected from the peritoneum by sweeping the index finger. Once it was marked, the peritoneum was raised with forceps and opened longitudinally with scissors. After the peritoneal cavity had been entered, the fascial incision was completed

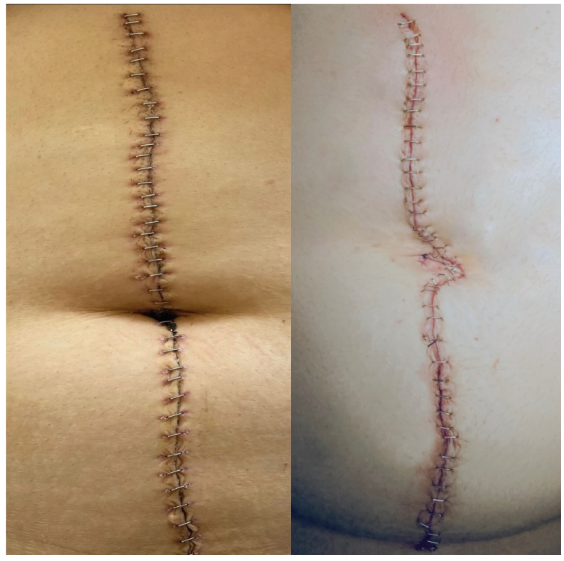

Figure 1. Transumbilical and periumbilical midline incisions

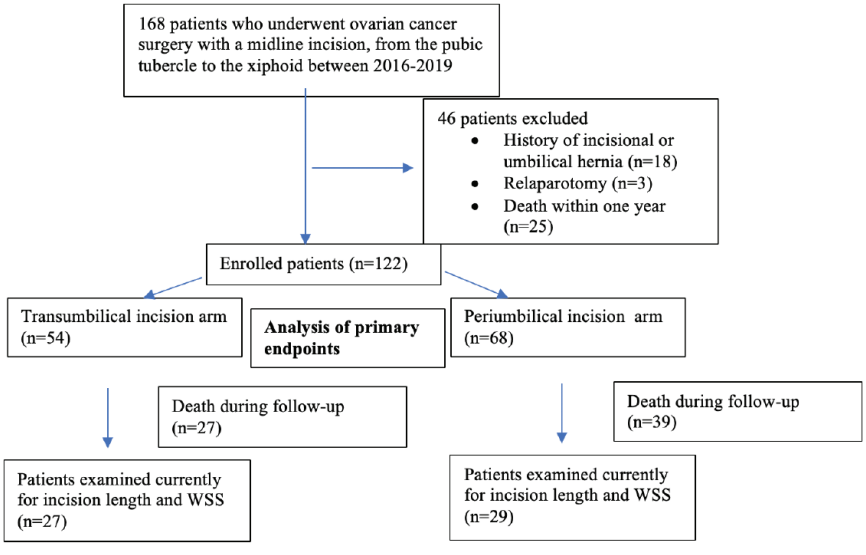

Figure 2. Flow diagram
WSS: Wound satisfaction score

by diathermy in cut mode. When extending superiorly, the ligamentum teres was encountered and taken between clamps, divided, and ligated to expose the liver. Bleeding points were controlled by coagulation diathermy. For exploration, a Thompson retractor was used. After the operation for ovarian cancer, whether primary or recurrent, we used a continuous-suture technique for closing the fascia in one layer with slowly absorbable monofilament suture, polydioxanone (PDS) no 1. Subcutaneous tissue was closed with absorbable multifilament polyglactin no. 2-0 and skin was closed with metal staples. A drain was put in a Douglas pouch. Subcutaneous drains were not used.

Until the patients were discharged, all wounds were examined daily. Patients were asked to use an abdominal corset for six weeks postoperatively. The metal staples were removed between the fourteenth and twenty-first postoperative days. Patients were followed up every three months according to our ovarian cancer follow-up protocol, and magnetic resonance imaging (MRI) and/or computed tomography (CT) scan was performed in the first year after the surgery.

Data collection

Demographic characteristics, serum albumin levels, the American Society of Anesthesiology score of patients, type of surgery, intraoperative details, the duration of hospital stay and early (within 30 days) postoperative complications, including infection or evisceration were noted. While grouping the operation type, primary surgery was considered together with whether neoadjuvant chemotherapy was administered or not. Those who received preoperative chemotherapy, regardless of primary or recurrent surgery, were considered to have had neoadjuvant chemotherapy. A wound infection was described as pus discharge. The presence of wound dehiscence without evisceration was also considered a sign of wound infection. During the 12-month follow-up, the presence of incisional hernia was evaluated. If a fascial defect (along the incision) was detected by imaging (CT or MRI) in the first year, it was noted as an incisional hernia.

Patients still alive were called for examination and informed consent was obtained. Incision length was measured and they were asked to score the appearance of the scar on a scale from 1 to 10 using a wound satisfaction score [(WSS); higher scores represent greater satisfaction].

Primary endpoints

The primary objective was to compare the two types of incisions in terms of wound infection and incisional hernia. The secondary endpoint was patient satisfaction regarding their scars.

Statistical analysis

The SPSS, version 21.0 was used for all statistical analyses (IBM Inc., Armonk, NY, USA). Data are expressed as mean ± standard deviation or median and range for continuous variables, as appropriate, and categorical values are expressed as absolute numbers and percentages. Comparison of categorical variables was performed using Fisher's exact test and Yates continuity correction. Comparison of continuous variables first required the evaluation of data normality. Normally distributed data was compared using an Independent-samples t-test while abnormally distributed data was compared using the Mann-Whitney U test. A $p<0.05$ was considered statistically significant.

Results

Patients' characteristics

The medical records of 168 patients were analysed and 46 patients were eventually excluded, leaving a study cohort of 122 patients. TU and PU midline incisions were performed on 54 (44.3%) and 68 (55.7%) patients, respectively (Figure 2). There were no significant differences between the two groups in terms of patient characteristics and operative data, as shown in Table 1, 2.

Overall, 4% (5/122) of the patients had chronic pulmonary disease, 26% (32/122) had hypertension and 12% (15/122) had diabetes mellitus. There were no significant differences in procedures and neoadjuvant treatments between the two groups. Hyperthermic intraperitoneal chemotherapy was administered to a total of eight patients. All patients received chemotherapy (platinum-based regimen) postoperatively, three refused to complete treatment and four interrupted because of toxicity. A total of 36 (29.5%) patients had a history of midline incision, 27 of which were due to previous ovarian cancer surgery. More patients in the PU group had a history of midline incision than in the TU group (36.8% vs. 20.4%) but this did not reach significance ($p=0.08$).

Primary outcome

The two groups had comparable rates of early wound complications, including wound infection (7.4% vs. 10.3%, $p=0.75$), deep surgical site infection (11.1% vs. 4.4%, $p=0.18$) and evisceration (3.7% vs. 4.4%, $p=0.99$). Incisional hernia occurred in 33.6% (41/122) with no significant difference between the two groups (33.3% vs. 33.8%, $p=0.99$).

Secondary outcome

Sixty-six patients had died of cancer by the time the study was scheduled. The surviving patients (45.9%) reported no disparity in WSS between the two groups (5 vs. 5, $p=0.15$).

Table 1. Characteristics of patients

	Transumbilical, (n=54)	Periumbilical, (n=68)	p
Age, years	51.7±13.9	54.2±11.2	0.29
Parity	2 (0-12)	2 (0-10)	0.58
BMI, kg/m^2	28.6±6.0	26.9±5.7	0.30
Smoking, n (%)	8 (14.8)	5 (7.4)	0.30
Neoadjuvant chemotherapy, n (%)	13 (24.1)	16 (23.5)	0.99
Menopause status, n (%)			
Premenopausal	24 (44.4)	20 (29.4)	0.13
Postmenopausal	30 (55.6)	48 (70.6)	
Preoperative serum albumin level, mg/dL	3.68±0.79	3.90±0.52	0.92
ASA score (3-4), n (%)	10 (18.5)	14 (20.6)	0.96
Diabetes mellitus, n (%)	4 (7.4)	11 (16.2)	0.17
Hypertension, n (%)	16 (29.6)	16 (23.5)	0.58
Ascites, n (%)	50 (92.6)	67 (98.5)	0.17
History of midline incision, n (%)	11 (20.4)	25 (36.8)	0.08
BMI: Body mass index, ASA: American Society of Anesthesiologists			

Table 2. Operative data of patients

	Transumbilical, (n=54)	Periumbilical, (n=68)	p
Type of operation, n (%)			
Primary	46 (85.2)	49 (72.1)	0.13
Recurrence	8 (14.8)	19 (27.9)	
HIPEC, n (%)	2 (3.7)	6 (8.8)	0.30
Duration of surgery, minutes	240 (30-720)	233 (60-600)	0.48
Bowel resection, n (%)	18 (33.3)	18 (26.5)	0.53
Stoma, n (%)	11 (20.4)	11 (16.2)	0.72
Hospitalization period, day	8 (2-26)	6 (2-21)	0.71
Wound infection, n (%)	4 (7.4)	7 (10.3)	0.75
Surgical site infection (except the wound), n (%)	6 (11.1)	3 (4.4)	0.18
Evisceration, n (%)	2 (3.7)	3 (4.4)	0.99
Incisional hernia, n (%)	18 (33.3)	23 (33.8)	0.99
Incision length, cm	30 (23-33), (n=27)	30.5 (24-35), (n=29)	0.16
Wound satisfaction score	5 (1-7), (n=27)	5 (3-10), (n=29)	0.15
HIPEC: Hyperthermic intraperitoneal chemotherapy			

Discussion

The origin of the widely-held notion that circumventing the umbilicus is beneficial during a midline abdominal incision is unclear. There is a belief that TU incisions have the potential to increase the rate of surgical site infection, since the umbilical dimple causes moisture to collect and stagnate, allowing bacteria to colonize (4). In the present study, the TU midline incision was found to be as safe as the PU incision. To date, only one study focusing on laparotomy and comparing circumbilical and TU incisions has been performed (3). In that prospective randomized study, 109 patients from the general surgery department were enrolled and were randomly allocated to the TU abdominal incision group or the circumumbilical abdominal incision group. Wound infections occurred in 9 of 58 (15.5%) patients who had TU incisions and 8 of 51 (15.7%) patients who had circumumbilical incisions. These authors reported that avoiding the umbilicus during the incision had no impact on the risk of infection. Later, as laparoscopy became more common, studies on TU and PU incisions for laparoscopic access were conducted. The initial peritoneal access is a crucial aspect of laparoscopic surgery. Five randomized controlled trials, involving 783 patients, were examined in a meta-analysis to investigate whether the initial umbilical trocar was better

through a TU or PU (infra or supraumbilical) incision. There were no major differences in the rates of complications, including surgical site infection or umbilical hernia, between both groups (5). In our series, the overall surgical site infection rate, including deep and superficial infections, was 14.7% (10/68) in the TU group vs. 18.5% (10/54) in the PU group PU which was not significantly different.

Hamzaoglu et al. (6) identified the umbilical flora and microorganisms that caused trocar site infection. Prior to laparoscopic surgery, these authors took swabs from the umbilical dimple before and after antisepsis of the skin with povidone-iodine, and from the infection site if infection was present. Povidone-iodine was found to be effective in removing microorganisms from the umbilical dimple in 89 of 100 patients. Despite being isolated after antisepsis, bacteria isolated before and after antisepsis did not cause wound infection. They concluded that povidone-iodine is an effective antiseptic and that pathogens acquired in hospitals cause trocar site infection, rather than the umbilical flora.

Incisional hernia of the umbilicus is also a cause for concern. In the study of Paes et al. (3), comparing TU and circumumbilical abdominal incisions, surviving patients were followed for at least one year, and three of the 109 patients had incisional hernias with no difference between the two groups. In the present study, incisional hernia was encountered in 33.6% of all patients. Personal and technical risk factors for fascial disruption including age, ascites, major surgery, malignancy, type and length of incision (7), presumably contributing to the high incidence of hernia in our patients. These risk factors were all similar between both groups of patients and there was no difference in hernia rates between the PU and TU groups. The transit pass through the umbilicus was supposed to shorten the incision. The length of incisions of the surviving patients were measured, and again there was no difference between the groups.

In our series, no surgeon had any difficulty accessing the abdomen through a TU incision, as had been previously reported by Paes et al. (3). Since it was cancer surgery, the operation times were long (mean time 4 hours) in the present study, which did not make the rapidity of access achievable with the TU incision type very noticeable, but it may lead to faster access to the abdomen in emergency operations. Sutures were inserted and removed with difficulty inside the umbilicus, but Paes et al. (3) reported that the wounds healed without the need for skin sutures at the base of the umbilicus.

Vertical midline incision *per se* was associated with poor cosmetic results (8). The satisfaction with the appearance of the wound was rated to be similar by both groups of patients. No patient was asked whether the TU or PU incision was better, and the complaints were due to the length of the incision scar rather than the appearance of the umbilicus.

Study Limitations

There were strength and weaknesses of our study. Our research had the advantage of filling a gap in the literature regarding the effects of a TU midline incision and these results may lead to a change in practice. The major limitation of our study was its retrospective design. Due to the complexity of our patients' conditions, there might be a bias in the assessment of outcomes, and it may be more appropriate to evaluate the outcomes of TU incision in less complex surgery.

Conclusion

To summarize, both the present study and an earlier similar study found that passing through the umbilicus had no negative consequences. Furthermore, studies based on laparoscopy have shown that the umbilical incision was a relatively risk-free procedure. Avoiding the umbilicus during laparotomy provided no benefit. Passing through the umbilicus is a safe and feasible method. It may be simpler and faster to perform a TU abdominal incision. However, to validate these findings and provide evidence for a wider change in surgical practice, randomized prospective trials are required.

Ethics Committee Approval: *The study protocol was reviewed and approved by İstanbul University, İstanbul Faculty of Medicine Clinical Research Ethics Committee (approval number: 08, date: 02.04.2021).*

Informed Consent: *Patients still alive were called for examination and informed consent was obtained.*

Peer-review: *Externally peer-reviewed.*

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References

1. Meeks GR, Trenhaile TR. Management of abdominal incisions. J Pel Surg 2002; 6: 295.

2. Colombo N, Sessa C, du Bois A, Ledermann J, McCluggage WG, McNeish I, et al. ESMO-ESGO consensus conference recommendations on ovarian cancer: pathology and molecular biology, early and advanced stages, borderline tumours and recurrent disease†. Ann Oncol 2019; 30: 672-705.
3. Paes TR, Stoker DL, Ng T, Morecroft J. Circumumbilical versus transumbilical abdominal incision. Br J Surg 1987; 74: 822-4.
4. Voitk AJ, Tsao SG. The umbilicus in laparoscopic surgery. Surg Endosc 2001; 15: 878-81.
5. Shih SL, Chen BH, Tam KW. Transumbilical versus periumbilical incision for laparoscopic surgery: A meta-analysis. Am J Surg 2020; 220: 1592-8.
6. Hamzaoglu I, Baca B, Böler DE, Polat E, Ozer Y. Is umbilical flora responsible for wound infection after laparoscopic surgery? Surg Laparosc Endosc Percutan Tech 2004; 14: 263-7.
7. Guitarte C, Grant J, Zhao H, Wang S, Ferriss JS, Hernandez E. Incisional hernia formation and associated risk factors on a gynecologic oncology service: an exploratory analysis. Arch Gynecol Obstet 2016; 294: 805-11.
8. Yeung PP Jr, Bolden CR, Westreich D, Sobolewski C. Patient preferences of cosmesis for abdominal incisions in gynecologic surgery. J Minim Invasive Gynecol 2013; 20: 79-84.