

Original Investigation

Comparison of transumbilical and periumbilical median incisions in ovarian cancer surgery

Çeliksoy et al. Comparison of transumbilical and periumbilical incisions

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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 determine whether transumbilical or periumbilical midline incision conferred any advantage to the patient.

Material and Methods: This is a retrospective cohort study of patients who underwent ovarian cancer surgery with a midline incision, from the pubic tubercle to the xiphoid. All of the surgeries were performed by the same group of gynecological oncologists. Patients were classified into two groups according to the type of midline incision, transumbilical or periumbilical. The primary endpoint was the wound complication rate of the incisions.

Results: Transumbilical and periumbilical midline incisions were performed on 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: According to our findings, circumventing the umbilicus during laparotomy did not have any advantage. Future prospective randomized trials are warranted to confirm it.

Keywords: gynecologic oncology; incisional hernia; infection ; ovarian cancer

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Introduction

The most important goal while choosing the type of incision for surgery is to provide adequate exposure. Postoperative wound healing, pain, cosmetic concerns and complications such as hernia should also be considered. A properly placed incision of sufficient length is in harmony with minimal tissue trauma, complete haemostasis, proficient use of retractors, and efficient enlightenment [1]. Ovarian cancer surgery, whether primary or recurrent, is one of the most comprehensive operations due to its 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 ovarian cancer can metastasize [2]. The umbilicus is traditionally circumvented when conducting a midline laparotomy, although the reason for this is unclear. It is thought to raise the risk of wound infection and incisional hernia. To our knowledge, only one research on this subject has been published and, according to that report, the method of avoiding the umbilicus in midline laparotomy served no useful purpose. On the other side, circumventing the umbilicus was found difficult to perform a symmetrical curve around the umbilicus [3].

There is not enough evidence in the literature to say if the periumbilical midline incision is beneficial. This study was conducted to determine whether the use of the transumbilical incision differed from the periumbilical incision in terms of surgical site infection, incisional hernia incidence and cosmetic appearance.

Material and Methods

Trial design

Approval for the study was obtained from the Institutional Review Board. 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, transumbilical (TU) or periumbilical (PU) (**Figure 1**).

Figure 2 depicts the flow diagram and architecture of a retrospective cohort study.

Participants

Participants aged between 18 and 80 years were included. Patients who had a history of incisional or umbilical hernia before the 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.

Surgery technique

Preoperative mechanical bowel preparation was used in all patients. Antibiotic prophylaxis was given, and we used povidone-iodine for antiseptics of the skin. The same team of gynaecologic oncologic surgeons (our gyn-oncology team consisted of 8 surgeons, two surgeons performed each surgery : one was a senior/consultant and the other was a fellow) performed all of the operations through a midline laparotomy. 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 through the previous scar was followed. 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 by diathermy in cut mode. When extending superiorly, the ligamentum teres was encountered and taken between

clamps, divided, and ligated for exposure to the liver. Bleeding points were controlled by coagulation diathermy. For exploration, a Thompson retractor was used. After the operation of 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 14th and 21st postoperative day. Patients were followed up every 3 months according to our ovarian cancer follow-up protocol, and magnetic resonance imaging (MRI) / computed tomography (CT) scan was performed in the first year after the surgery.

Data collection

Demographic characteristics, serum albumin levels, the ASA (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, evisceration were noted. While grouping the operation type, primary surgery was considered whether neoadjuvant chemotherapy was administered or not. Those who received preoperative chemotherapy regardless of primary or recurrent surgery were considered 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 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 (Wound satisfaction score (WSS); higher scores represent higher satisfaction).

Primary endpoints

The primary objective was to compare the two type of incisions in terms of wound infection and incisional hernia. And the secondary endpoint was satisfaction of patients with their scars.

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) 21.0 version was used for all statistical analyses. Comparison of categorical variables were performed using exact Fisher's 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 ones were compared using the Mann-Whitney U test. P values < 0.05 were considered statistically significant. Data were expressed as mean \pm standard deviation (SD) or median and range for continuous variables and categorical values were expressed as absolute numbers and percentages.

Results

Patients characteristics

The medical records of 168 patients were analysed and forty six patients were eventually ruled out. Transumbilical and periumbilical midline incisions were performed on 54 and 68 patients, respectively (**Figure 2**). There were no statistically significant variations between the two groups in terms of patient characteristics and operative data, as seen in **Table 1 and Table 2**.

Over all, 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 difference in procedures and neoadjuvant treatments between both groups. Hyperthermic intraperitoneal

chemotherapy (HIPEC) was administered to a total of eight patients. All patients received chemotherapy (platinum based regimen) postoperatively, three refused to complete treatment and four interrupted for toxicity. A total of 36 patients had a history of midline incision, 27 of which were due to previous ovarian cancer surgery. More patients in group PU had a history of midline incision than in group TU (36.8% vs 20.4%), with a p value of 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) of all patients, with no statistically significant difference between the two types of incisions (33.3% vs 33.8%, $p= 0.99$).

Secondary outcome

Sixty-six patients had died of cancer by the time the study was scheduled. According to the findings of a survey administered to surviving patients, there was no disparity in wound satisfaction scores between both groups (5 vs 5, $p=0.15$).

Discussion

The origin of circumventing the umbilicus during a midline abdominal incision is unclear. There is a belief that transumbilical incisions have the potential to increase the rate of surgical site infection, since the umbilical dimple causes moisture to collect and stay stagnant, allowing bacteria to colonize [4]. In our study, the transumbilical midline incision was found to be safe. To date, only one research focusing on laparotomy and comparing circumumbilical and transumbilical incisions has been performed, which was published in 1987. In that prospective randomized study, 109 patients from the general surgery department were enrolled and were randomly allocated to the transumbilical abdominal incision group or the circumumbilical abdominal incision group. Wound infections occurred in 9 of 58 (15.5%) patients who had transumbilical incisions and 8 of 51 (15.7%) patients who had circumumbilical incisions. As a result, it was discovered that avoiding the umbilicus in the incision had no impact on the risk of infection [3]. Later, as laparoscopy became more common, studies on transumbilical and periumbilical 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 see whether the initial umbilical trocar was better through a transumbilical or periumbilical (infra or supraumbilical) incision. There were no major differences in the rates of complications like 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 group TU vs 18.5% (10/54) in group PU. We did not find any significant difference, either.

Hamzaoglu et al. identified the umbilical flora and microorganisms that caused trocar site infection. Prior to the laparoscopic surgery, they took swabs from the umbilical dimple before and after antiseptics 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 antiseptics, bacteria isolated before and after antiseptics did not cause wound infection. They discovered that povidone-iodine is an effective antiseptic and that pathogens acquired in hospitals cause trocar site infection rather than the umbilical flora [6].

Incisional hernia of the umbilicus is also a cause for concern. In the aforementioned study, comparing transumbilical and circumumbilical abdominal incisions, Paes et al. observed surviving patients for at least one year, and three of the 109 patients had incisional hernias with no difference between the two groups [3]. In our 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 we also did not notice any difference in hernia rates. The transit pass through the umbilicus was supposed to shorten the incision. The length of incisions of surviving patients were measured, we did not find any statistically significant difference.

In our research, no surgeon had any difficulty accessing the abdomen through a transumbilical incision, as previously reported by Paes et al [3]. Since it was a cancer surgery, the operation times were long (mean time 4 hours) in our study, which did not make the speed of the transumbilical 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. discovered that the wounds healed without the need for skin sutures at the base of the umbilicus [3].

Vertical midline incision per se was associated with poor cosmetic results [8]. The satisfaction with the appearance of the wound was rated similar by both groups of our 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.

There were strengths and weaknesses of our study. Our research had the advantage of filling a gap in the literature regarding the effects of a transumbilical midline incision and this trial could lead to a shift in practice. Major limitation of our study was its retrospective design. Due to the complexity of our patients' conditions, there might be bias in the assessment of outcomes, and it may be more appropriate to evaluate the outcomes of transumbilical incision in less complex surgeries.

Conclusion

To summarize, our research and the previous historical study both found that passing through the umbilicus had no negative consequences. Furthermore, studies based on laparoscopy revealed that the umbilical incision was a relatively risk-free procedure. Avoiding the umbilicus during laparotomy provided no benefit. Passing through the umbilicus is safe and feasible method. It may be simpler and faster to perform a transumbilical abdominal incision. To clarify and change the current strategy, randomized prospective trials are required.

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Table 1. Characteristics of patients			
	Transumbilical (n=54)	Periumbilical (n=68)	p
Age,y	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 (%)			0.13
Premenopausal	24 (44,4)	20 (29,4)	
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

Table 1. Operative data of patients			
	Transumbilical (n=54)	Periumbilical (n=68)	p
Type of operation, n(%)			0.13
Primary	46 (85.2)	49 (72.1)	
Recurrence	8 (14.8)	19 (27.9)	
HIPEC, n(%)	2 (3.7)	6 (8.8)	0.30
Duration of surgery, min	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 (WSS)	5 (1-7) n= 27	5 (3-10) n= 29	0.15

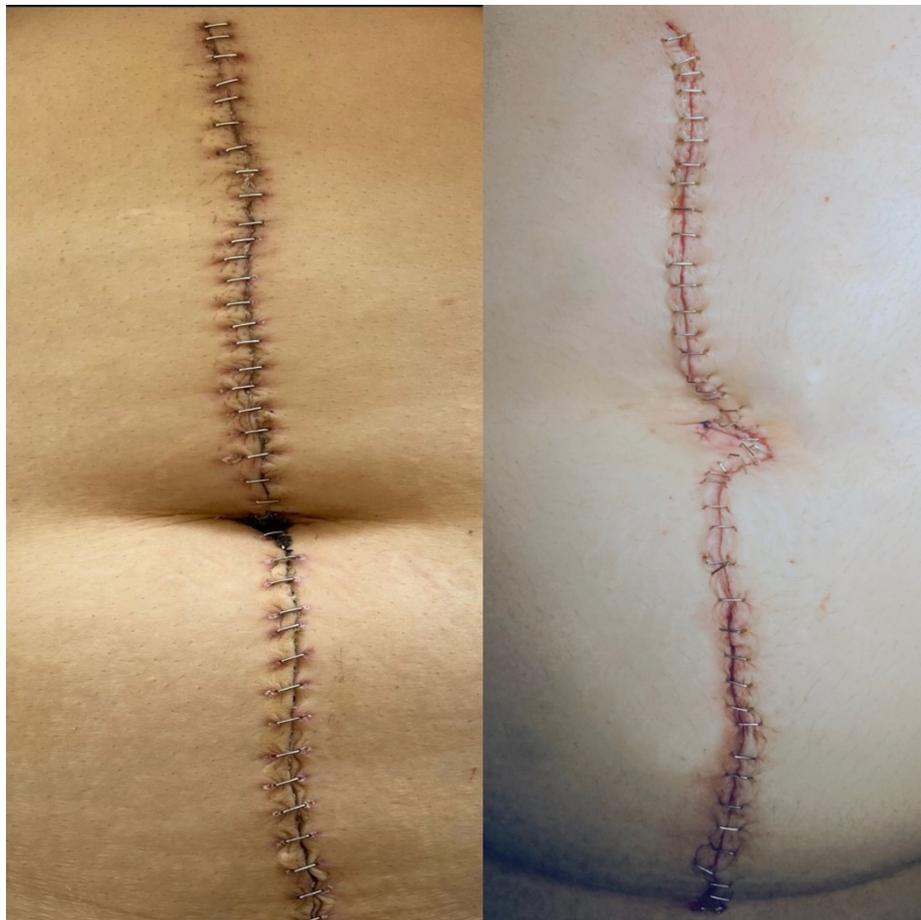


Figure 1. Transumbilical and periumbilical midline incisions

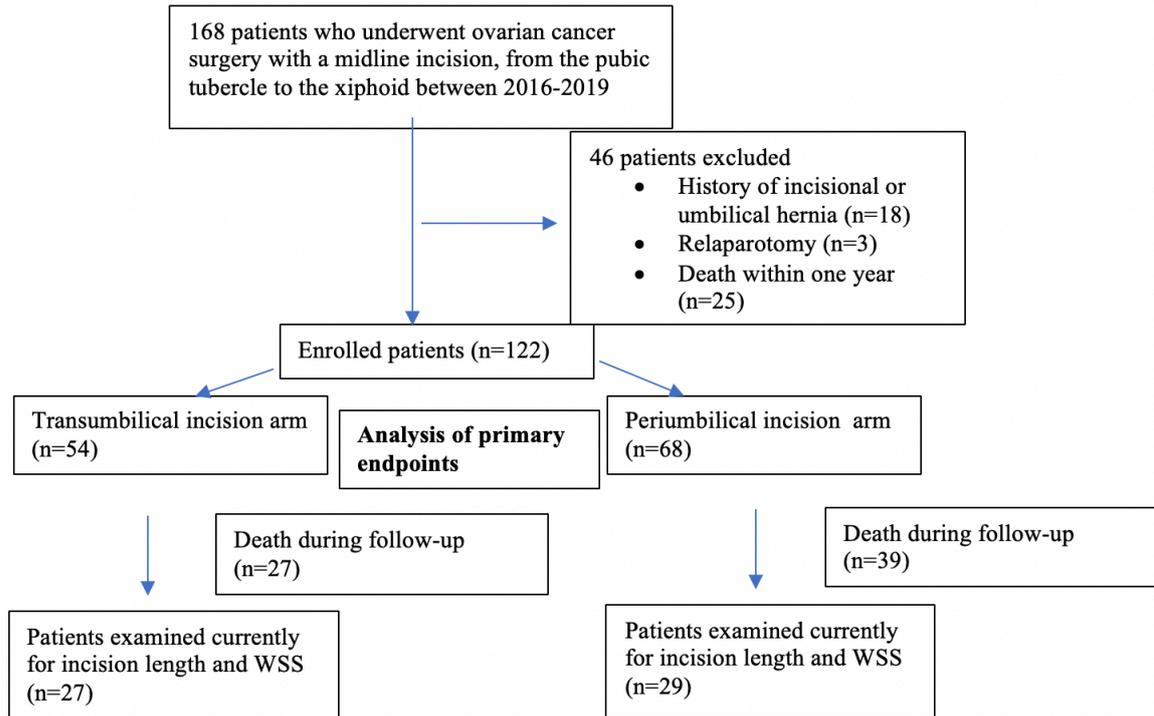


Figure 2. Flow diagram