Original Research Article

Evaluation of Two Techniques for Transverse Exposure in Obese Patients Undergoing Cesarean Section: A Comparative Study

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ABSTRACT

Introduction One of the greatest challenges of the 21st century is the high prevalence of obesity in different age groups. Statistics have shown that pregnant women with body mass index greater than 40 kg/m^2 are more likely to have Cesarean section (C-section). The secondary outcomes of the new method and the routine method (using leukoplast tape) were compared by surveying the surgery team on their satisfaction with each tool for surgical site exposure in women undergoing C-section compared to leukoplast tape. **Materials and Methods:** This study was conducted on 130 obese patients undergoing C-section at the Kamali Hospital in Alborz Province (Iran) during 2016. Trained operating room personnel completed two checklists designed for assessing satisfaction. Other variables were assessed via personal observation and surveying the surgical team. Time elapsed until fetal expulsion and from fetal expulsion to wound closure, and the total duration of the surgery were accurately calculated and recorded in the intervention and control groups**. Results:** The mean number of regular and long gauzes used in the intervention group (15.98±3.5 and 3.65±1) was significantly lower than that of the control group (19.8±5.1 and 4.32±1.1). Time elapsed from fetal expulsion to wound closure was significantly shorter in the intervention group compared to the control group (P<0.001). **Conclusions:** Given the increased prevalence of obesity in pregnant women undergoing elective C-section and the positive outcomes of this new method, it is recommended to use the method for these surgical procedures.

KEYWORDS: Cesarean section, obese patients, leukoplast tape

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INTRODUCTION

One of the greatest challenges of the 21st century is the high prevalence of obesity in different age groups [1]. Unfortunately, pregnant women make up a significant proportion of the obese population. Statistics have shown that pregnant women with body mass index (BMI) greater than 40 kg/m^2 are more likely to have a cesarean section (C-section). In addition, they are at higher risk of developing life threatening postoperative Complications. Anesthesiologists and surgeons are facing more challenges when performing anesthesia and C-section in obese women compared to those with a normal BMI [2], because health and safety of two humans are at stake. Performing intubation and maintaining adequate ventilation during surgery in obese women are among the major challenges for anesthesiologists. Bleeding control and access to internal organs during C-section are more challenging in mothers with a high BMI. Considering the larger volume of bleeding and the extended duration of surgery in obese patients, bleeding control and ensuring safe surgical techniques are crucial and must be handled with caution [3, 4]. Large hanging abdominal panniculus is a main cause of prolonged surgery and heavy bleeding in obese patients. This complicates access to the surgical site and the subcutaneous tissues, surgical exposure of the uterus, making uterine incision and fetal expulsion. Moreover, large venous vessels increase the risk of subcutaneous bleeding and formation of hematoma [5]. Therefore, surgeons should have access to appropriate facilities and equipment before making any

type of surgical incision in these patients [6]. Most surgeons prefer the transverse incision for obese patients due to less postoperative pain, lack of negative impact on the respiratory system, invisibility of the incision on the abdomen and the avoidance of abdominal hernia [7]. Surgeons should choose and use the most suitable surgical incision method based on the patients' conditions [8]. Selection of the ideal surgical incision method is more vital in obese patients due to higher risk of postoperative complications [6, 9]. Previous studies have shown that adjusted Joel-Cohen incision is often preferred since it reduces the duration of surgery, time until fetal expulsion and postoperative pain [10]. An increased rate of maternal obesity increases the risk of uterine rupture and fetal damage during C-section [11]. A clearer view of the surgical site can provide rapid access to the uterus and safer fetal expulsion. In one retrospective study, Shayna et al. found that the time from surgical incision to fetal expulsion is significantly different between obese and non-obese women. They also reported that newborns from obese mothers have lower Apgar scores compared to those from non-obese mothers [12]. Currently, Leukoplast tape is used with the help of an extra scrub technician for lifting the abdominal tissue for accessing intra-abdominal organs and making surgical incisions. However, these methods have some disadvantages. Several exclusive tools and accessories have been designed by individuals and companies for a better access to intra-abdominal organs, ensuring proper surgical exposure, shortening the duration of operation and maintaining the safety of obese patients during surgery [13-17].

A simple tool has been designed consisting of a suction interface and two towel clamps. This tool was used for transverse incisions in a large population of obese women undergoing C-section (rather than only one case). We aimed to evaluate C-section outcomes including duration of surgery and number of sponges used during the procedure to measure the amount of bleeding during surgery. The results were compared with C-section outcomes in another group of obese women undergoing this surgery using the leukoplast tape. Finally, we examined the secondary outcomes of C-section using this tool by surveying the surgery team on their satisfaction with the tool compared to leukoplast tape for surgical site exposure in women undergoing C-section.

MATERIALS AND METHODS

The present clinical trial was conducted on 130 obese patients undergoing C-section at Kamali Hospital in Alborz Province, Iran. The study included pregnant women with BMI > 29 in the 12^{th} week of pregnancy undergoing C-section for the first or second time. Exclusion criteria included cardiopulmonary disease, history of hemorrhagic disease, and intraoperative complications such as hemorrhage and severe muscle adhesions, which prolong the surgery. Written consent was obtained from all subjects. Using purposive sampling, the subjects were randomly divided into a control or sham control group (leukoplast tape) and an experimental (towel clamp and suction tube). Trained operating room personnel working outside the Kamali Hospital completed the two checklists designed to assess satisfaction and other study variables by personal observation and surveying the surgery team. Validity of the instrument was confirmed by specialists using the content validity method. Simultaneous testing was used to assess the reliability. Sample size was calculated as 63 per group according to the equation below, with 5% error and statistical power of 80%. However, it was ultimately raised to 65.

$$n = \frac{(2s_2^2)(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2}{(\bar{x}_1 - \bar{x}_2)^2}$$

In the intervention group, inexpensive and accessible equipment such as suction tube and towel clamps were used to lift the abdominal tissue (Figure1) to achieve a better view of the surgical site, while wide leukoplast tape and an extra scrub technician were required to pull the abdominal skin toward the chest in the control group (Figure 2).

Figure 1. The intervention group (Kamali Hospital)

Figure 2. The control group (Kamali Hospital)

In the intervention group, surgical exposure was made using a simple tool consisting of a suction catheter and two towel clamps to take the pressure off the chest by pulling back the skin upwards while pushing the abdominal muscles to the sides. After abdominal skin preparation, a drape was drawn on the patient's abdominal skin and a layer of the drape was used for covering the patient to create minimum irritation. A towel clamp was then used to lift the skin and a suction tube passing through the towel clamps' handle was used to lift the abdominal tissue and muscles toward the anesthesia drape (i.e. the patient's head). The two ends of the suction tube were connected by clips to the two separate bars of the anesthesia screen (which separates the anesthesia care provider from the surgeon). The hanging abdominal panniculus was taken away from the surgeon's and the surgery team's access. Time until fetal expulsion, time from fetal expulsion to wound closure and total duration of the surgery were accurately calculated and recorded for both groups. Once the surgery was over, the towel clamp position was checked for injuries. Then, the surgeons were asked about their satisfaction with the method used in comparison with the conventional leukoplast tape. After asking for permission, an expert took images from the patients' post-exposure conditions from different angles (front and lateral) using a digital camera (Canon) in both groups. The data obtained were analyzed in SPSS (version 16) using Chi-square test and t-test.

RESULTS

The two groups were similar in terms of demographic and clinical variables (Table 1).

Group	Age	Height	Weight (the 12th week)	BMI (12th week)	Current Weight	Current BMI	Abdominal Circumference
Control	29.98±5.9	162.15±5.8	89.52±9.1	33.93±3	106.41±12.67	40.30	155.41±5.4
Intervention	31.28±6.07	161.09±6.5	86.75±10.6	33.27±3.49	104.25±12	39.25	154.6±6.7
P-Value	0. 134	0. 334	0. 114	0.253	0. 156	0. 128	0. 121

Table 1 Comparison of demographic and clinical data between the two groups (Mean ± SD)

Overall, 86.2% of the women in the control group and 83.1% of those in the intervention group underwent elective C-section, and the rest were admitted to the operating room as emergency cases. The mean number of regular and long gauzes used in the intervention group was significantly lower than that of the control group. The mean duration of surgery in the control group (47.86±7.9 min) and intervention group (56.21±9.4 min) was significantly different (P=0.000). The mean duration from the beginning of anesthesia until surgical incision (P=0.004) and fetal expulsion until wound closure (P=0.000) was significantly different between the two groups. However, the mean time elapsed from surgical incision to fetal exposure had no significant difference (P=0.146) (Table 2).

Table 2 C-section outcomes in the two study groups

Group	Time(anesthesia-surgical incision)	Time(surgical incision-fetal expulsion)	Time(fetal expulsion - wound closure)	Surgery duration	Gauzes (No)	Long gauzes (No)	Birth Weight (Kg)
Control	10.42 ± 4.0 min	8.95 ± 4.5 min	36.11 ± 8.2 min	56.21±9.4 min	19.8 ± 5.1	4.32 ± 1.1	3.36 ± 0.44
Intervention	8.25 ± 4.35 min	7.82 ± 4.5 min	31.5 ± 5.2 min	47.86±7.9 min	15.98 ± 3.5	3.65 ± 1	3.36 ± 0.40
P-Value	0.004	0.146	<0.001	<0.001	<0.001	0.001	0.995

Approximately 89% of the personnel found towel clamps and suction tubes an effective method for surgical exposure, while others suggested that the presence of an extra scrub technician was helpful. According to 83% of the surgical team members, a major problem with the leukoplast tape is that the surgical tape usually separates after the secondary prep. Other members of the surgical team mentioned problems such as contamination of the surgical site, difficulty cutting the tape and lacking skilled personnel to attach the tape to the patient's abdomen.

DISCUSSION

The results of this study showed that the new method used for surgical exposure in obese patients could reduce the duration of surgery as well as the amount of bleeding. Surgeons and operating room technicians were also satisfied with the new method. Approximately four less regular gauzes and one less long gauze were used in the intervention group compared to the control group. The amount of blood absorbed by this number of gauzes is approximately 100 ml, which is clinically valuable. This finding is consistent with the results obtained by

Susan et al., who used an innovative method to improve surgical exposure, bleeding control and ligature in surgical dissection [16]. More than 89% of the operating room personnel and the surgery team members found this simple tool effective, which is consistent with the results of Shobery et al. [13]. No study was found in the literature that has used the exact method we have used in this study. In a case report, the hanging abdominal panniculus of an obese patient was pushed away during C-section using a simple tool consisting of a Doyen retractor, a hook, two slings and two rods to hook the retractors and slings [17]. The mentioned method may increase the risk of serious skin injuries, while our method minimizes the risk of skin injuries, since the edge and serrates of the sterile towel clamps are fixed to the patient's surgical drape along with the skin underneath. Given the importance of retracting the hanging abdominal panniculus in abdominal surgeries, Clinical Innovation Co. has introduced a product called the Traxi panniculus retractor, which is a sticky latex-free sheet. According to the comments of surgery teams, the product has been satisfactory in most obese patients because the sheet helps retract the hanging panniculus from the incision site. Surgeons believed that the product resolves the issue of lifting the mother's abdomen, ultimately increasing the possibility of providing a better and safer patient care to the mother and baby [15]. The tool we have used in the present study might cause minor non-persistent skin damage compared to the Traxi retractor, but it can improve the patient's respiratory status because the abdominal panniculus is refracted from the incision site, and takes a heavy pressure off the diaphragm. In the case of Traxi adhesive sheets, the hanging abdominal panniculus is retracted from the incision site and pushed toward the diaphragm, which can cause pressure on respiratory muscles and lead to hypoventilation. Graf et al. performed panniculectomy on a 75-year-old man with BMI of 50 using an innovative technique called the Rultract Skyhook Surgical Retractor System. The system consisted of several hanging slings and hooks and a retractor attached to the edge of the bed. The sharp hooks pierced the abdominal panniculus, grasped the heavy hanging layers like a clamp, and pulled them up through the retractors attached to the sides of the bed, acting like a crane. The advantages proposed for this system are consistent with the results obtained in the present study [14]. In both methods, parts of the skin texture are removed with the sharp hooks piercing them, but the patient develops no complications. However, the use of this aggressive tool is not appropriate for non-obese patients since it may cause serious persistent skin and tissue damage. The innovative method proposed in our study can take the pressure off the diaphragm and improve patient's ventilation by lifting and retracting the abdominal panniculus. In addition, it reduces bleeding and the duration of surgery and improves surgeons' satisfaction. Therefore, it is recommended to conduct a prospective study to evaluate the changes in respiratory parameters (PaO_2/FIO_2 ratio and pulmonary function test) when using these two methods. Given the availability of advanced techniques for calculating the amount of blood loss through different software programs that can scan regular and long gauzes impregnated with blood, it is recommended to re-evaluate the variable using methods that are more accurate or by measuring hemoglobin and hematocrit changes before and after the surgery. It is also suggested to use this simple tool in abdominoplasty and compare its advantages with the routine methods used for this type of surgery.

CONCLUSIONS

According to the surgeons, the method introduced in our study is satisfactory since it reduces bleeding, requires less number of gauzes, and causes less skin damage. Given the increased prevalence of obesity in pregnant women undergoing elective C-section and the positive outcomes and benefits of this method, the proposed method is highly recommended for such procedures.

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