



Comparison between Pfannenstiel Incision and higher transverse Cohen incision, during elective Cesarean section, a randomized controlled trial among morbidly obese parturients

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Submitted: 04 January 2023; Accepted: 11 February 2023; Published: 13 March 2023

ABSTRACT

Objectives: The purpose of this investigation was to compare between Pfannenstiel incision and a higher transverse incision used to perform cesarean section (CS) in obese patients with BMI 35 kg/m² or more, regarding the maternal morbidity including wound infection, dehiscence, seroma formation, and the need for further management.

Material and methods: In this study 100 obese women with BMI of 35kg/m² or more, pregnant in their third trimester, attending for elective cesarean delivery. Fifty of them underwent CS through a Pfannenstiel incision, and the other 50 patients underwent delivery via a higher transverse suprapannicular incision 3 centimeters below the level of the anterior superior iliac spines. If a pannus is present, it should be kept in its natural position (not retracted) to provide room for the incision.

Results: In our investigation, we found a significant reduction in the mean incision to fetal delivery time, hemoglobin drop, pain score, and the rate of wound complications 1 week postoperative, but the APGAR score at 5 minutes was reduced in the suprapannicular group. However, regarding the total operative time, surgical complications, need for neonatal intensive care unit, intraoperative complications, need for opioid analgesia and wound complications 6 weeks postoperatively there was no statistically significant difference.

Conclusion: In obese parturients, the standard Pfannenstiel incision is linked to a higher frequency of wound problems; higher transverse skin incisions may lower the risk of wound complications in this group.

Keywords: *Obesity-cesarean delivery-wound infection-suprapannicular incision-Pfannenstiel incision*

INTRODUCTION

Obesity with pregnancy has maternal, fetal and neonatal risks including increased risk of miscarriage, congenital abnormalities, gestational diabetes, gestational hypertension, preeclampsia, stillbirth, shoulder dystocia,

operative vaginal delivery, postpartum hemorrhage, postpartum depression, cesarean section, maternal mortality, and wound complications, also obese postpartum women are more likely to get venous thromboembolism and have trouble nursing. (1)

The risk of cesarean birth increases linearly with the mother's body mass index, making obesity an independent risk factor for cesarean delivery. Women who are severely obese and have BMIs over 35 are at a much higher risk. (2)

Women who are obese as mothers are more likely to have post-Cesarean wound problems. Wound infection, seroma, hematoma, and dehiscence are all complications. In obese parturients, the total wound complication rate for cesarean sections varies from 5.9 to 30%. (3)

Each five-unit increase in body mass index has been proven to double the risk of wound infection in obese females. (4) Previous studies found that women with a BMI above 50 had a roughly four-fold higher chance of developing wound complications. (5)

Obese poses greater risks of fascial dehiscence, seromas, hematomas, wound infections include cellulitis and abscess, endometritis, and deep vein thrombosis, all of which have an adverse effect on postoperative results. Notably, the patients at increased risk of surgical complications are the very patients with an increased need for cesarean sections. (5)

A survey of 247 members of the American College of Obstetricians and Gynecologists, conducted in 2016, 84% of obstetricians preferred using a Pfannenstiel skin incision for non-emergent cesarean deliveries of morbidly obese women, with 67% opting to tape the panniculus to retract it cephalad and 16% choosing a vertical incision. (6)

PATIENTS AND METHODS

This is a pilot RCT. 160 patients scheduled to undergo elective cesarean section at Kasr Al Ainy University Hospital, who met the inclusion criteria, were enrolled in this pilot study. The study was conducted over the course of 18 months, from May 2019 to November 2020. 56 patients had a Pfannenstiel incision placed below the pannus (should a pannus exist), and 55 patients had a Cohen incision placed above the pannus (should a pannus exist).

Objectives

Primary outcome: Comparing composite maternal morbidity in the first six weeks, wound complications as cellulitis, wound abscess, wound separation or dehiscence, hematoma, seroma development, endometritis, and postpartum hemorrhage in people with BMI equal to or greater than 35 kg/m² as regards the type of abdominal incision whether Pfannenstiel incision or the higher transverse Cohen's incision.

Secondary outcomes: To compare Pfannenstiel cesarean incision to higher transverse skin incisions in terms of: Maternal composite morbidity according to pannus stage, estimated blood loss as shown by a drop in hemoglobin, the incidence of low transverse uterine incisions (hysterotomy) compared to all other types of uterine incisions, the duration of the operation time from the time of skin incision to the time of delivery of the newborn, the duration of the entire operation (from the time of skin incision to the completion of closure of the skin incision), pain score and the use of pain medications utilized in the first 48 hours post procedure.

Inclusion criteria

Pregnant women in the third trimester coming for elective cesarean section, BMI \geq 35 kg/m² at the time of delivery were considered eligible for the study. Signed written informed consent.

Exclusion criteria

Unwilling to participate or unable to provide consent, Evidence of infection (i.e. cellulitis) precluding placement of the incision at one of the randomly allocated sites, prior midline abdominal incision(s) or obstetric factors that prevent randomization as placenta previa, placenta accrete, fetal distress. Any associated comorbidities that might affect the wound healing (uncontrolled diabetes mellitus, severe anemia (Hb <8 gm. /dl)).

In this trial, only patients with BMI \geq 35kg/m², coming for elective cesarean section were enrolled.

All patients were subjected to: Informed written consent.

Full history and clinical examination including: Name, age, occupation and address, gravidity, parity and number of living, mode of prior deliveries, any medical disorder, prior surgical interventions, prior CS, and any associated complications (i.e. Wound infection), weight, height and BMI were calculated and presence of a pannus and its staging according to the staging system proposed by Igwe D et al. Grade 1: The pubic hairline is covered with panniculus, but not the full Mons pubis. Grade 2: The whole Mons pubis is covered with the panniculus. Grade 3: The panniculus covers the upper thigh. Grade 4: The panniculus reaches to mid-thigh. Grade 5: Panniculus reaches over the knee. (7).

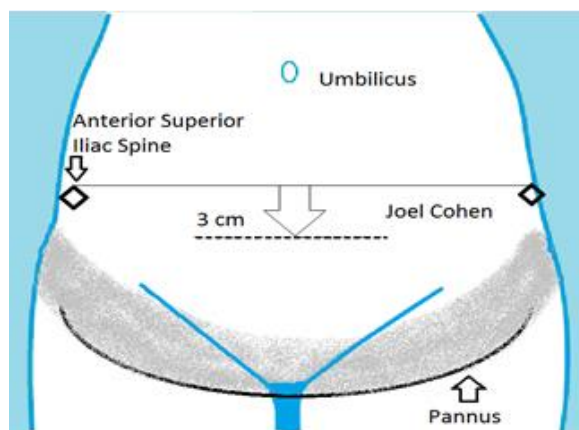
The patients were checked by anesthesia team prior to surgery.

The patients were randomized to the choice of incision using computerized randomization through the online service. (www.sealedenvelop.com).

The same obstetrician operated on all patients.

One group of patients was subjected to infrapannus Pfannenstiel incision, the other group was subjected to a supra pannus transverse skin incision (Cohen Incision).

At least 30 minutes before making the skin incision, all patients received prophylactic antibiotics in the form of intravenous 2 gms of third generation cephalosporin. Following the insertion of a Foley catheter and pretreatment of the vaginal area with a 10% povidone-iodine solution, the abdomen was cleaned with the same solution. The suprapannicular Cohen group underwent downward traction toward the patient's feet using two Allis clamps positioned on the panniculus' edge. The incision was made 3 cm below the line connecting the anterosuperior iliac crests, beneath the umbilicus, employing the same anatomic landmarks as a Cohen incision. The surgeon incised the subcutaneous fat in a plane perpendicular to the fascia while the assistant maintained caudal tension on the panniculus.



Cohen Incision

Three centimeters below the level of the anterior superior iliac spines, there is a straight transverse incision through the skin (higher than the Pfannenstiel incision). If a pannus is present, it should be kept in its natural position (not retracted) to provide room for the incision.

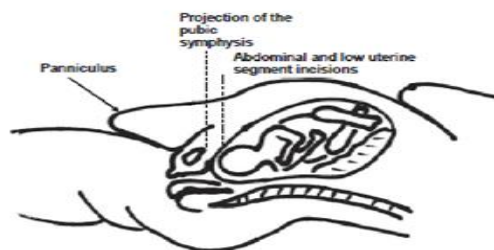
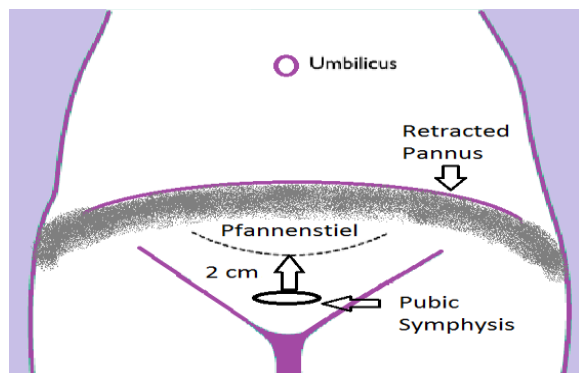


FIGURE 1: Cohen Incision

For the Pfannenstiel group the pannus should be pulled up to facilitate insertion of the Pfannenstiel incision, which is a curving incision

that is around 10-15 cm long and 2 cm above the pubic symphysis.



Pfannenstiel Incision

The length of this curving incision is between 10 and 15 cm, and it extends 2 cm above the pubic symphysis. To provide room for the Pfannenstiel incision, a pannus should be retracted if it is present (see figure).

FIGURE 2: Pfannenstiel Incision

The following data were collected during the CS Received prophylactic antibiotics preoperatively, panniculus staging, type of uterine incision performed, neonatal 5 minute APGAR score, neonatal weight, neonatal admission to intensive care unit(NICU), intraoperative complications, Operative times (incision to delivery of neonate, incision to closure of incision).

The uterine incision was closed in 2 layers, the rectus sheath was closed by vicryl 1. The deep subcutaneous layer was closed with multiple layers using absorbable suture. The skin in all patients was closed by subcuticular non absorbable polypropylene sutures. No drains were inserted and a pressure dressing was placed over the wound for 12–24 hours, then the wound was left uncovered, all the patients received the

same doses of NSAID and paracetamol as regular pain killers during the postoperative period. The pain score was assessed by the likert pain scale 0-10 and the need for opioid analgesia in addition to the regular NSAID and paracetamol was observed.

Any wound issues were monitored and treated as necessary after being noted and reported at discharge, suture removal (postoperative day 7–10), and the 6-week postpartum visit.

The following images are examples from the patients recruited in our study, some showing normal healing and others showing the complications.

The following are pictures of serial follow up of a suprapannicular incision.

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FIGURE 3: Serial follows up of a suprapannicular incision

The following picture shows the 6 weeks postoperative follow up of a suprapannicular incision in a patient complicated with a wound

seroma, which needed repeated dressing for 10 days.



FIGURE 4: Six weeks follow up of a suprapannicular incision complicated by seroma

The following picture show normal healing of a Pfannenstiel incision 6 weeks postoperative.



FIGURE 5: Six weeks follow up of a Pfannenstiel incision with normal healing

Sample size

This is a pilot study as the previous studies in literature compared the Cohen and Pfannenstiel incision, but our study compares a suprapannicular Cohen and infrapannicular Pfannenstiel incision. One hundred and sixty patients were recruited, after the exclusion of some patients and removing the drop outs, we were left with 50 patients who underwent cesarean section through infra pannus Pfannenstiel Incision and the other 50 had a supra pannus high transverse Cohen incision. The incision was randomized over the 100 patient using computerized randomization through the online service. (www.sealedenvelop.com)

Statistical Methods

The statistical program SPSS (Statistical Package for the Social Sciences) version 26 was employed to code and input the data (IBM Corp., Armonk, NY, USA). An analysis utilizing the Chi square (2) test was done to compare categorical data.

When the anticipated frequency is less than 5, an exact test was utilized instead (Chan, 2003b). A P value of 0.05 or less was regarded as statistically substantial.

The patients were randomized to the choice of incision using computerized randomization through the online service. (www.sealedenvelop.com).

RESULTS

During the ANC visits 160 patients were recruited, 30 of them refused to participate in our study, 8 of them were excluded as they didn't meet with the inclusion criteria, and 11 of them had an emergency CS.

The remaining were randomized among two study groups, 56 patients were randomized to have a Pfannenstiel incision, 6 of which dropped out of their postoperative follow up, and 55 were randomized to have a suprapannicular incision, 5 of which dropped out of their follow up visits.

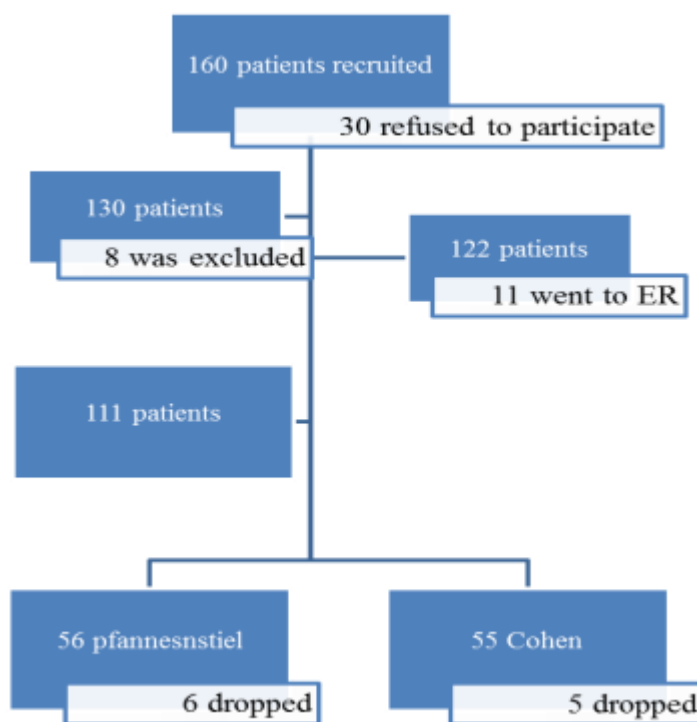


FIGURE 6: Chart of enrollment

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Regarding the pannicular grading in our study 10% grade 3 and only 1 % of the recruited patients population, 68% had grade 1, 21 % grade 2, had a grade 4 panniculus.

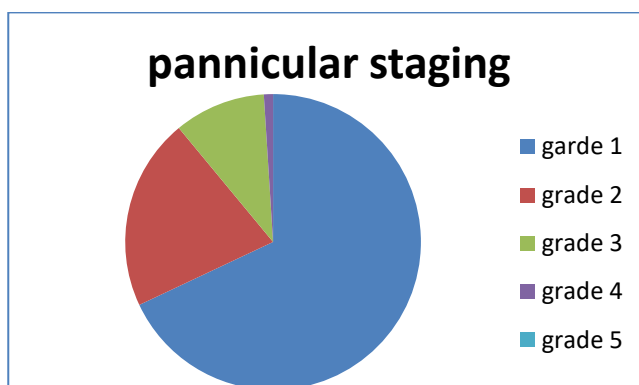


FIGURE 7: Pie chart showing the pannicular grading among our study group.

TABLE 1: The difference between the demographic data of the two groups

		Skin incision				P value
		Pfannenstiel		transverse suprapannicular		
		Mean	Standard Deviation	Mean	Standard Deviation	
Age		31.34	3.42	30.88	5.49	0.616
Parity		2.30	1.09	2.00	1.20	0.193
No of prev cs		1.80	0.97	1.80	0.99	1.000
gest age		37.96	0.92	38.00	1.11	0.845
BMI		41.03	3.12	40.36	3.26	0.296
Medical disorder	PIH	3	6.0%	4	8.0%	0.784
	DM	3	6.0%	1	2.0%	
	free	44	88.0%	45	90.0%	

The patients' demographic characteristics were comparable in terms of age, parity, gestation age, and the number of past cesarean sections. The average age, gestational age, and BMI of the

participants in our research were 31.4 years, approximately 38 weeks, and 40.7 kg/m² respectively. (Table1)

TABLE 2: Time taken from skin incision to fetal delivery and to skin closure.

	Pfannenstiel		transverse suprapannicular		P value
	Mean	Standard Deviation	Mean	Standard Deviation	
Skin incision to fetal delivery time (min)	8.89	0.72	7.87	0.84	< 0.001
Skin incision to closure time (min)	76.90	10.17	75.11	8.96	0.353

The time needed for fetal delivery was significantly less in the transverse suprapannicular (Mean 7.87 min, SD 0.84) compared to (Mean 8.89, SD 0.72) in the Pfannenstiel group Table (2)

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TABLE 3: Average Hb fall.

	skin incision				P value
	Pfannenstiel		transverse suprapannicular		
	Mean	Standard Deviation	Mean	Standard Deviation	
HB fall (gm/dl)	0.76	0.32	0.51	0.24	< 0.001

The hemoglobin drop in gm/dl was significantly reduced in the suprapannicular group. (Table 3)

TABLE 4: Average APGAR score.

	skin incision				P value
	Pfannenstiel		transverse suprapannicular		
	Mean	Standard Deviation	Mean	Standard Deviation	
APGAR 5	8.44	0.93	7.78	0.93	0.001

We also found that the APGAR score at 5 minutes were substantially reduced in the suprapannicular group than the Pfannenstiel group. Table (4)

TABLE 5: Difference between the two groups as regarding need for NICU.

		skin incision				P value
		Pfannenstiel		transverse suprapannicular		
		Number	%	Number	%	
Need for NICU	Yes	3	6%	2	4.0%	1
	No	47	94.0%	48	96.0%	

TABLE 6: Difference between the two groups as regarding intraoperative adhesions

		skin incision				P value
		Pfannenstiel		transverse suprapannicular		
		Number	%	Number	%	
Adhesion	Yes	8	16.0%	4	8.0%	0.218
	No	42	84.0%	46	92.0%	

There was no statistical substantial difference between the two groups as regards NICU admission and the presence of intraoperative adhesions (Table 5, 6).

TABLE 7: Incidence of surgical complications in our study

		Skin incision				P value
		Pfannenstiel		Transverse suprapannicular		
		Number	%	Number	%	
Surgical complication	Yes	8	16.0%	6	12.0%	0.564
	No	42	84.0%	44	88.0%	
	angle hamatoma	1	2.0%	2	4.0%	0.756

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Surgical complication details	bladder injury	1	2.0%	0	0.0%
	broad hematoma	2	4.0%	0	0.0%
	uterine artery injury	1	2.0%	2	4.0%
	uterine atony	3	6.0%	2	4.0%
	No	42	84.0%	44	88.0%

The incidence of different surgical complications that were met during our study is shown in table 7. The complications met included: uterine atony, incision-angle hematoma, broad ligament hematoma, and bladder injury. In our study no cases were complicated by intestinal or other visceral organ injury.

No statistically significant difference was noted in the incidence of intraoperative surgical

complications. (Table 7).

In our study, we observed our study population for pain score and their need for opioid analgesia in addition to the regular NSAID and paracetamol. We found substantial reduction in the pain score in the suprapannicular incision group (4.86 vs 6.12, P value < 0.001). However, no substantial change was found in the need of opioid analgesia between both groups.

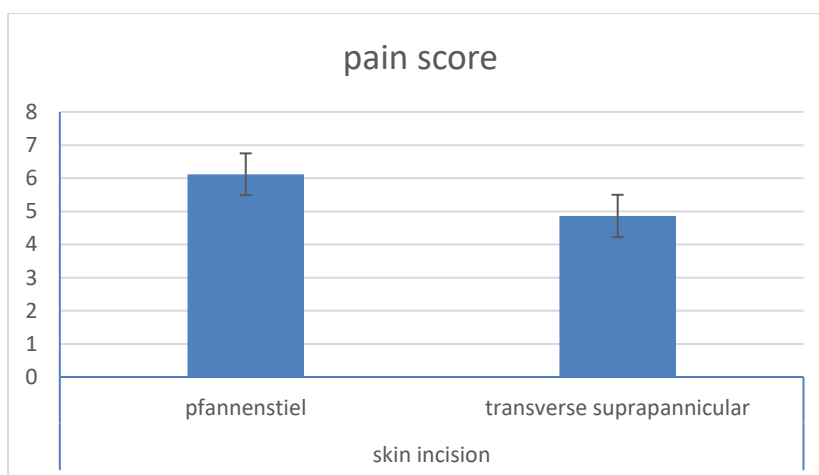


FIGURE 8: The mean pain score.

TABLE 8: The incidence of wound infections at 1 & 6 weeks postpartum

		Skin incision				P value
		Pfannenstiel		Transverse suprapannicular		
		Number	%	Number	%	
Wound infection in 1 week	Infection	15	30.0%	6	12.0%	0.027
	Free	35	70.0%	44	88.0%	
Wound in 6 week	Thick	6	12.0%	5	10.0%	0.414
	need secondary suture	4	8.0%	1	2.0%	
	Fine	40	80.0%	44	88.0%	

After 6 weeks of the caesarean delivery the results of the two groups were comparable. Six weeks postpartum the wound was observed for

healing (either fine scar, hypertrophied or thick scar) and the need for secondary sutures.

DISCUSSION

For obese women, a supraumbilical vertical incision is an option. (6) Due to the restricted access to the lower uterine section, this form of incision regrettably has a higher chance of a typical hysterotomy incision. (8)

In our research study, the average operating time was 76.01 minutes, and the time required to complete the operation ranges from 59 to 105 min in both groups with no substantial variation between the Pfannenstiel and Cohen groups (76.90 vs. 75.11mins respectively). The mean operative time in patients who underwent primary CS via a Cohen suprapannicular incision was 73.5 minutes vs.74.5 in those who underwent Pfannenstiel incision. However, the number of primary CS in both groups was limited.

Lakhi et al., studied 17 obese patients who had a suprapannicular transverse incision and reported a longer operating time. The mean operating time in their research was 108 minutes (range 85–148 minutes). (9)

Saha et al., in their study included 302 patients that were randomized into 2 groups: group A &B, who underwent CS through Cohen incision and Pfannenstiel incision respectively. They found that the total time needed to complete surgery was significantly lower in group A (29.81 min vs. 32.67 min, $p<0.0001$) which is lower than the time needed in our study. Saha et al., also found that the time needed to deliver the fetus was significantly lower in group A (142.16 seconds vs. 163.94 seconds, $p<0.0001$), also the Pfannenstiel group reported a greater level of need for powerful analgesics (other than paracetamol). (10)

Tixier et al., found that the average duration of a higher transverse skin incision either supra or subumbilical was 47 minutes (range 20-60). It took 8½ minutes to get to the lower uterine section. (11)

In our research, we discovered that the suprapannicular Cohen incision group's mean time to fetal delivery was substantially shorter than the Pfannenstiel incision group's (7.87 min vs. 8.89 min, $p\text{ value}<0.0001$).

Stewart et al., studied 20 patients with BMI more than 35 kg/m² who underwent CS through a supraumbilical transverse incision. They reported that the median time from skin incision to fetal delivery was 9.5 minutes (range 4 - 24), and they suggested that this duration can be used as a criterion to evaluate the operative difficulties. (12)

Also, we found that hemoglobin drops and APGAR score at 5 minutes are substantially shorter in the suprapannicular group than the Pfannenstiel group. The estimated HB fall was 0.76gm/dl in the pfannenstiel group vs.0.51gm /dl in the suprapannicular group, $P\text{ value}<0.001$, thus in our study the suprapannicular incision had a good impact in decreasing the blood loss, but the 5-minute APGAR score was also lower than in the Pfannenstiel group.

Walton et al., in their study reported similar data regarding the 5-minute APGAR score. They compared 96 controls with low transverse incisions to 32 high transverse incisions, and found that those having high transverse skin incisions had lower five minute median APGAR scores (8.0 vs. 9.0, $p=0.0021$), which is consistent with our results. (13)

However, all the above mentioned -except Walton et al., studies addressed population with normal BMI, not only the obese population as we did in our study.

Regarding NICU hospitalization, the occurrence of intraoperative adhesions, or intraoperative surgical difficulties, there was no statistically substantial difference between the two groups.

In contrast to our study, Walton et al., found that NICU admissions were higher in the suprapannicular transverse group (28.13% vs. 5.21%, $p=0.0011$). (13)

In our study, there was no substantial difference between the two groups as regard the intraoperative surgical complications, and all the included patients had lower segment uterine incision.

Tixier et al., studied 18 patients who underwent CS through a higher transverse skin incision either supra or subumbilical. They also reported

that all of the involved patients were approached via a lower segment uterine incision. (11)

In our research, we observed our research population pain score and their need for opioid analgesia in addition to the regular NSAID and paracetamol. We found significant reduction in the pain score in the suprapannicular incision group (4.86 vs. 6.12, P value < 0.001) as evident by the likert pain scale 0-10. However, no substantial variation was found in the need of opioid analgesia between both groups.

Gizzo et al., reported lower rates of both acute and chronic pain in the Joel Cohen incision than the Pfannenstiel incision. (14)

Abuelghar et al., used visual analogue score for pain scoring. When compared to the Pfannenstiel group (67.5±12.1, 43.7±15.4 and 23.1±9.5, respectively), the median VAS score at 6, 12 and 18 hours postoperatively was substantially lower in the Cohen group (52.8±13.0, 31.5± 12.8 and 16.3±6.9) (p<0.001). They also reported less use of analgesic doses in the Cohen group. (15)

In our study, we observed that 1 week postpartum, the rate of wound complications was substantially greater in the Pfannenstiel group than the transverse suprapannicular group, p value 0.027.

However, after 6 weeks of the caesarean delivery the results of the two groups were comparable. Six weeks postpartum the wound was observed for healing (either fine scar, hypertrophied or thick scar) and the need for secondary sutures.

Elsayed et al., studied 72 morbidly obese women undergoing CS, 36 of them were approached via a supraumbilical transverse incision and the other 36 underwent the traditional Pfannenstiel incision. According to their findings, a supraumbilical transverse incision had a much-reduced risk of wound complications than an incision of the Pfannenstiel type (RR = 0.19, 95% CI = 0.07 to 0.5, p-value=0.0008). (16)

Walton et al., in their study found although the high transverse group had a lower risk of wound complications than the low transverse group (15.63% vs. 27.08%, p=0.2379), this difference was not statistically significant. (13)

Stewart et al., reported less postoperative complication rate among 20 studied patients. However, their study population was small to compare the postoperative adverse result with controls. (12)

Saha et al., found at 12 weeks after surgery, there were no discernible changes in the look of the scar between the two groups, nor were there any variations in the postoperative wound problems. (10)

CONCLUSION

Placing an incision higher than the Pfannenstiel incision placed in the crease, helps to reduce the risk of wound infection by avoiding the less oxygenated, moist area created by the crease. So a suprapannicular incision, whether supra or infraumbilical, has better wound healing and less wound complications. A higher suprapannicular incision makes it easier for the patient to take care of the wound and keep it clean. While comparing the Pfannenstiel incision and a higher transverse one, the Pfannenstiel incision posed more anesthesia risk due to retracting the pannus upwards which may impair ventilation, so in the suprapannicular incision this risk is eliminated.

Declarations

Consent for Publication

I attest that all authors have agreed to submit the work.

Availability of data and material

Available

Competing interests

None

Funding

No fund

Conflicts of Interest

no conflicts of interest.

Contribution of authors

Study design: Mohamed Momtaz.

Patient recruitment and data collection: Shaza Saad Allah, T.Eissa.

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