



## An observational comparative study on Pfannenstiel incision versus modified Joel Cohen incision in terms of operative, postoperative and neonatal outcome

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### Abstract

**Background:** Cesarean section is the combination of laparotomy followed by hysterotomy. Nowadays, a lower abdominal transverse incision is used for most cesarean sections, with the Pfannenstiel incision being the classic method described in 1900. This study aims to evaluate the operative, postoperative, and neonatal outcomes of the Pfannenstiel incision compared to the Modified Joel-Cohen incision.

**Materials and Methods:** This institution-based, prospective, comparative study was conducted from January 2023 to March 2024 at Medical College, Kolkata. A total of 192 patients undergoing their first cesarean section were divided into two groups of 96 each (Pfannenstiel and Modified Joel-Cohen). Parameters such as operative time, blood loss, postoperative pain, analgesia requirements, and neonatal APGAR scores were compared.

**Results:** The Modified Joel-Cohen incision significantly reduced operating and delivery times compared to the Pfannenstiel group. Postoperative pain and the number of days requiring analgesics were also significantly lower in the Joel-Cohen group. There were no statistically significant differences in intraoperative blood loss or neonatal outcomes between the two groups.

**Conclusion:** The Modified Joel-Cohen incision is a superior alternative to the Pfannenstiel incision for cesarean sections, offering shorter operative times and improved postoperative recovery without compromising neonatal safety.

**Keywords:** Pfannenstiel incision, modified Joel Cohen incision, operative period, blood loss, postoperative analgesia requirement, neonatal outcome

### Introduction

Cesarean section (CS) is one of the most frequently performed major surgeries worldwide, and the choice of abdominal incision is a critical factor in determining maternal morbidity. While the midline vertical incision was historically preferred for rapid entry, modern obstetrics favors lower transverse incisions for their aesthetic and functional benefits. The Pfannenstiel incision, though widely used, involves extensive tissue dissection that may contribute to increased postoperative pain and longer operative times. The Joel-Cohen incision and its modifications propose a more streamlined approach, aiming to reduce surgical trauma and expedite recovery.

### Material and Methods

This observational comparative study was carried out on patients of Department of Obstetrics and Gynecology at Eden building, Medical College, Kolkata, West Bengal from November 2014 to November 2015<sup>[14]</sup>. A total of 192 female of aged  $\geq 18$ , years were for in this study.

### Study Design

Observational, comparative, institution-based study

### Study Location

This was a tertiary care teaching hospital-based study done in Department of Obstetrics and Gynecology at Medical College, Kolkata, West Bengal.

### Study Duration

January 2023 to March 2024.

### Sample Size

192 (96 in each group).

### Sample Size Calculation

At least 96 patients of each incision type (Pfannenstiel and modified Joel Cohen) underwent for caesarean section for the first time in OT of dept. of Obstetrics and gynaecology to be interviewed and examined as devised by formula

$$N = (z^2pq)/e^2 = \{(1.96)^2 \times 0.5 \times 0.5\} / (0.1)^2 = 96.04 \approx 96$$

Where, N = Sample size

Z = Critical value of the normal distribution at  $\alpha/2$  (for a confidence level of 95%,  $\alpha$  is 0.05, and the critical value is 1.96)

P = Expected proportion as a conservative estimate = 0.5

Q = 1-p = 0.5

E = Acceptable margin of error at 10% (0.1).

Control: one incision group is being compared with another.

### Subjects & Selection Method

The study population was selected from the antenatal mothers attending Eden Hospital, Medical College, Kolkata for safe confinement without any major medical comorbidity. Study subjects were chosen from the mothers who eventually were advised caesarean section with emergency or elective indication. The mothers with previous abdominal scar were not included in the study. 96 out 192 were decided to undergo LSCS using the conventional pfannenstiel method and rest 92 using modified Joel Cohen method randomly.

**Inclusion Criteria**

Patients of all age group irrespective of gravida and parity, who has undergone Caesarean section for first time.

**Exclusion Criteria**

- Patient with previous abdominal surgery.
- Patients with previous Caesarean section.
- Patients with other major diseases that can interfere with post operative healing procedure like uncontrolled Diabetes, Eclampsia, severe anemia.
- Patients who were complicated with unilateral or bilateral extension of uterine incision during caesarean.
- Patients with morbid obesity.
- Patients with antepartum haemorrhage.
- Patients with postpartum haemorrhage due to uterine cause.

**Procedure Methodology**

After written informed consent was obtained, a well-designed questionnaire was used to collect the data of the recruited patients retrospectively.

**Study Variables**

- **Demographic and obstetric parameter:** Age (in years), BMI (kg/ meter square), gravida, presence of associated comorbidity, indication (emergency/ elective).
- **Intraoperative findings:** Blood loss during section, total operative time, need of special hemostatic procedure during closure of abdominal wall.
- **Postoperative outcome:** Need of analgesics in post operative days, dose of analgesics (usual dose of paracetamol and Ibuprofen / other than these), time of ambulation (in hours), time to get audible bowel sounds (in hours), hospital stay (in days), post operative hemoglobin drop.

**Wound complications:** surgical site infection and presence of wound discharge, presence of wound dehiscence, need of secondary suture, hematoma formation.

- **Neonatal outcome:** APGAR score at 5 minutes and presence of birth injury.
- Appearance of scar after 12 weeks.

**Study tools**

1. Patient proforma.
2. Informed consent form.

3. Medical records
4. Laboratory reports
5. Patient information sheet.
6. Stethoscope.
7. Wound swab stick. Data collection and interpretation:

**Data collection and interpretation**

1. Demographic data such as age, height, weight, calculation of BMI, gravida, parity.
2. Records checking regarding indication of cesarean section, presence of associated comorbidity.
3. Checking of medical records like post operative notes, OT record books were done for duration of surgery, intraoperative blood loss, use of special hemostatic procedure during abdominal closure. Exact amount of blood loss measurement is difficult and there may be subjective error. Blood loss is measured the metered collecting chamber of suction machine and weighing soaked mops.
4. Information regarding post operative pain and requirement of analgesics (both dose and duration) were also obtained from bed head tickets and treatment cards.
5. Post operative haemoglobin drop (complete blood count) and wound infection (wound swab for culture and sensitivity) measured from laboratory.
6. Other relevant post operative informations were also collected from Bed Head Tickets and medical record books and thorough history taking and examination of wound.
7. Examination of intestinal peristaltic sound, wound for discharge and dehiscence done.
8. Data regarding neonatal outcome (APGAR score, birth injury) also obtained from medical records.
9. Scar was examined at 12 weeks for its appearance (fine, broad or thick).

**Statistical Analysis**

Data collected has been entered in Microsoft Excel and analysed by appropriate statistical methods. Data analysis has been done using Statistical Package for Social Sciences (SPSS) for Windows. For continuous parametric variables unpaired t test has been used to compare two means. For non-parametric variables, Chi square test has been used to compare two proportions. The level  $P < 0.05$  was considered as the cutoff value or significance.

**Result**

**Table 1:** Comparison of two groups according to demographic profile

Characteristics	Pfannenstiel Group (n= 96)		Joel Cohen Group (n= 96)		P value	95% CI
	Mean	SD	Mean	SD		
Age (in years)	24.9	± 4.05	25.1	± 4.04	0.594	-0.84-1.46
BMI (kg/m. Sq)	23.36	± 2.84	23.83	± 2.89	0.415	-1.15-0.47
Gravida	1.7	±1.2	1.6	±0.9	0.418	-0.17-0.42

**Comment:** Mean age, BMI and gravida are almost equal in pfannenstiel incision group and modified Joel Cohen incision group.

**Table 2:** Distribution of subjects according to duration of surgery

Duration of surgery (minutes)	Pfannenstiel Group (n= 96)		Joel Cohen Group (n= 96)	
	No	Percentage (%)	No	Percentage (%)
≤ 30	26	27.1	80	83.3
31-35	62	64.6	14	14.6
≥36	8	8.3	2	2.1

**Comment:** Majority in Joel Cohen incision needed ≤ 30 minutes for surgery whereas majority in pfannenstiel needed 31-35 minutes.

**Table 3:** Distribution of subjects according to approximate volume of blood loss

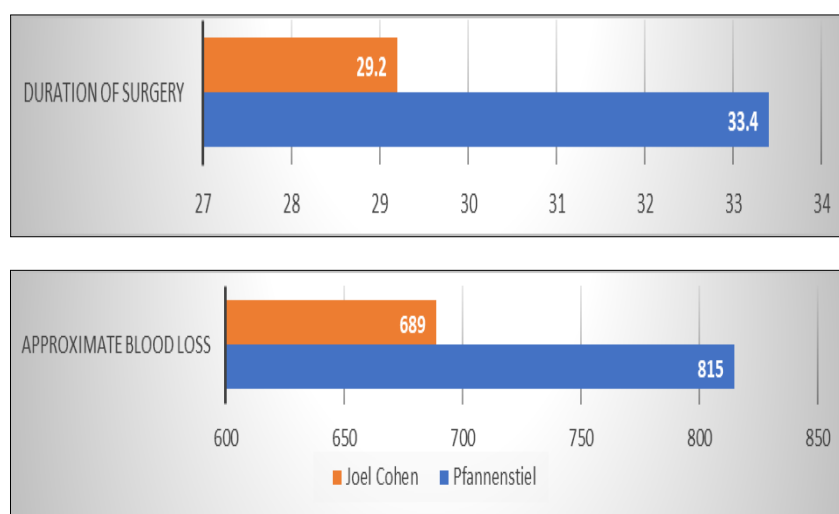
Volume of blood loss (ml)	Pfannenstiel Group (n= 96)		Joel Cohen Group (n= 96)	
	No	Percentage (%)	No	Percentage (%)
≤ 700	14	14.6	77	80.2
701-999	69	71.9	16	16.7
≥1000	13	13.5	3	3.1

**Comment:** Majority in pfannenstiel incision had almost 701-999 ml of blood loss, on the other hand in Joel Cohen incision majority had ≤700 ml of blood loss.

**Table 4:** Comparison of two incision types according to intra-operative outcome

Characteristics	Pfannenstiel Group (n= 96)		Joel Cohen Group (n= 96)		P value	95%CI
	Mean	SD	Mean	SD		
Duration of surgery (mins)	33.4	±3.7	29.16	±2.4	0.0001	3.389-5.214
Approximate blood loss(ml)	815	±116	689	±92	0.050	95.51-155.52

**Comment:** Mean duration of surgery in pfannenstiel incision is 33.4 ± 3.7 minutes, whereas modified Joel Cohen incision needed 29.16±2.4 minutes average duration, which is significantly less [ P value 0.0001, CI 3.389- 5.214]. Approximate blood loss also was less (689±92 ml) in modified Joel Cohen incision than in pfannenstiel incision (815±116 ml), the difference in blood loss in the two incision techniques is not statistically significant [ P value 0.05, 95.51 - 155.52]

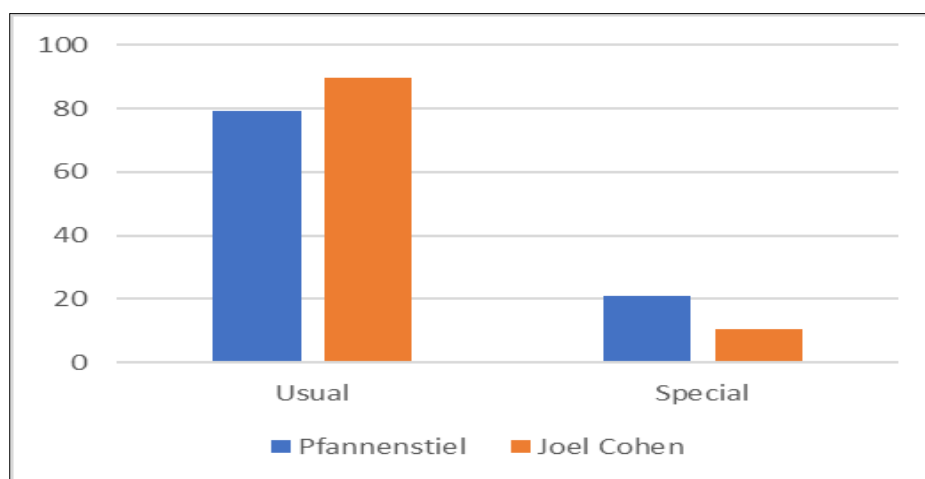


**Comment:** Mean duration of surgery is significantly less in modified Joel Cohen incision than pfannenstiel incision. Approximate blood loss is less in modified Joel Cohen incision than pfannenstiel incision but the difference is not statistically significant.

**Fig 1:** Bar diagram showing Comparison of two incision types according to intraoperative outcome

**Table 5:** Distribution of subjects according to need of special hemostatic procedure during closure

Hemostatic procedure	Pfannenstiel Group (n= 96)		Joel Cohen Group (n= 96)		P value	Chi square value
	No	Percentage (%)	No	Percentage (%)		
Usual	76	79.2	86	89.6	0.047	3.95
Special	20	20.8	10	10.4		

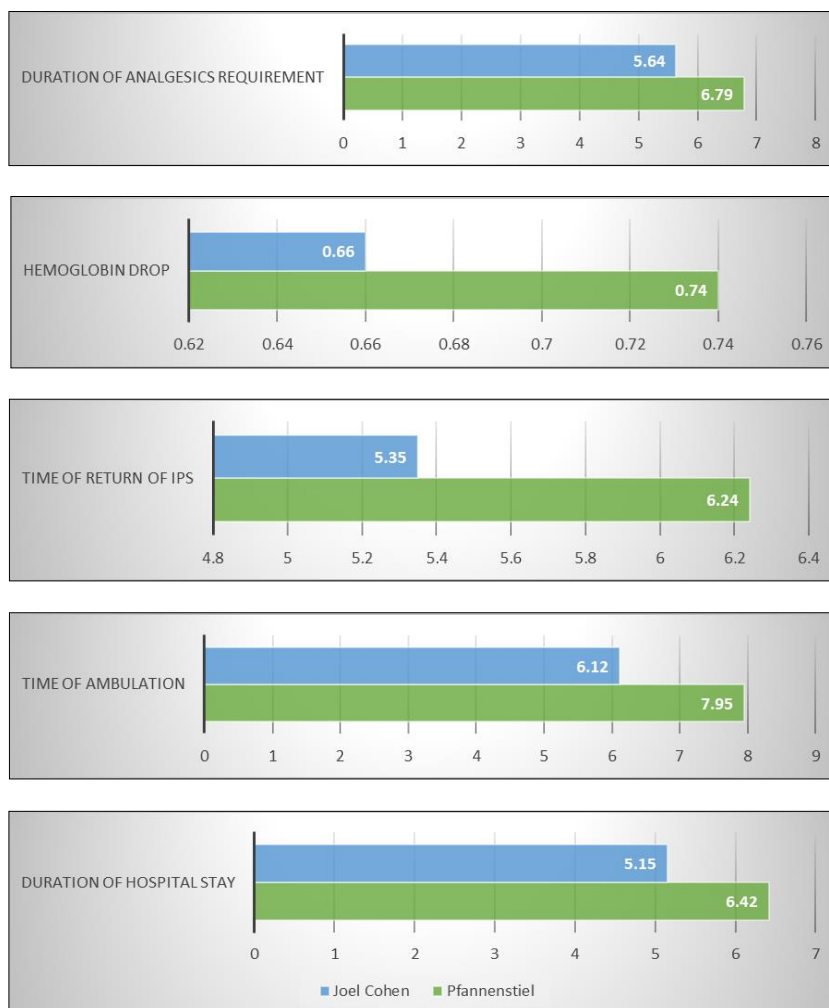


**Comment:** Need of special hemostatic procedure during closure of abdomen is less in modified Joel Cohen incision than pfannenstiel incision, [ 20.8% Vs 10.4%, P value = 0.047, Chi square value 3.95].

**Fig 2:** Bar diagram showing Distribution of subjects according to hemostatic procedure during closure

**Table 6:** Comparison of two incision types according to postoperative outcome

Characteristics	Pfannenstiel Group (n = 96)		Joel Cohen Group (n= 96)		P value	CI
	Mean	SD	Mean	SD		
duration of analgesics requirement (days)	6.79	±1.1	5.64	±0.83	0.001	0.862-1.429
Hemoglobin drop (gm%)	0.74	±0.45	0.66	±0.11	0.086	-0.012-0.178
Time of return of IPS (hours)	6.24	±0.64	5.35	±0.69	0.0001	0.694-1.076
Time of ambulation (hours)	7.95	±1.3	6.12	±0.71	0.0001	1.454-2.067
Duration of hospital stay (Days)	6.42	±1.04	5.15	±0.46	0.0001	1.040-1.501



**Comment:** Duration of analgesic requirement [P value = 0.001, 95% CI 0.862-1.429], time of return of IPS [P value = 0.0001, 95% CI 0.694 – 1.076], time of ambulation [ P value = 0.0001, 95% CI 1.454-2.067] and hospital stay [ P value = 0.0001, 95% CI 1.040- 1.501] all are significantly less in modified Joel Cohen incision than pfannenstiel incision. Drop of postoperative hemoglobin is less in modified Joel Cohen incision but the difference is not statistically significant [ P value = 0.086, 95% C I from – 0.012 to 0.178].

**Fig 3:** Bar diagram showing Comparison of two incision types according to postoperative outcome

**Table 7:** Distribution of subjects according to Condition of surgical wound

Condition of wound	Pfannenstiel Group (n= 96)		Joel Cohen Group (n= 96)		P Value	Chi square value
	No	Percentage (%)	No	Percentage (%)		
Healthy wound	80	83.33%	89	92.70%	0.07	4.01
Unhealthy wound (wound discharge)	16	16.6%	7	7.29%		

**Comment:** 16.6% of study subjects in pfannenstiel incision group had wound discharge and infection whereas 7.29% in modified Joel Cohen incision group had the same. But the difference is not statistically significant [ P value 0.07, Chi square value 4.01].

**Table 8:** Distribution of subjects according to wound complication

Need of secondary suture	Pfannenstiel Group (n = 96)	Percentage (%)	Joel Cohen Group (n = 96)	Percentage (%)	P value	Chi square value
Present	14	14.58	06	6.25%	0.059	3.57
Absent	82	85.41	90	93.75		

**Comment:** 14.58% of subjects in pfannenstiel Incision group had experienced wound dehiscence and needed secondary suture, 6.25% in modified Joel Cohen incision group had the same. There is no significant difference between the two [ P value = 0.059, Chi square value = 3.57].

**Table 9:** Comparison of two incision according to presence of hematoma

Hematoma	Pfannenstiell Group (n = 96)	Percentage (%)	Joel Cohen Group (n= 96)	Percentage (%)	P value	Chi squarevalue
Present	04	4.16	00	00	0.064	7.26
Absent	92	95.83	96	100		

**Comment:** 4.16% of subjects in pfannenstiell incision group developed hematoma and none in modified Joel Cohen incision group developed the same but the difference is not statistically significant [ P value = 0.064, Chi square value = 7.26].

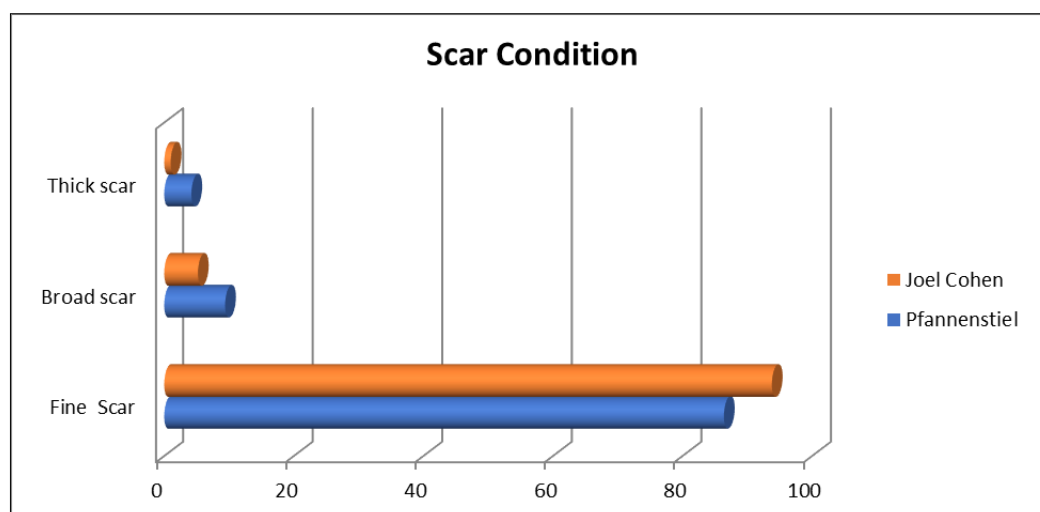
**Table 10:** Distribution of subjects according to Neonatal outcome

Neonatal outcome		Pfannenstiell Group (n= 96)		Joel Cohen Group (n= 96)	
		No	Percentage (%)	No	Percentage (%)
Healthy		82	85.4	81	84.4
Sick		14	14.6	15	15.6
Birth injury	Yes	00	0	00	0
	No	96	100	96	100

**Comment:** Nearly 85% of subjects in both groups delivered a healthy baby and neither of these two incision types is associated with increased risk of birth injury.

**Table 11:** Comparison of two incision according to appearance of scar after 12 weeks

Appearance of scar	Pfannenstiell Group (n= 96)		Joel Cohen Group (n= 96)		P value	Chi square value
	No	Percentage (%)	No	Percentage (%)		
Fine Scar	83	86.4	90	93.8	0.19	3.22
Broad scar	09	9.4	05	5.2		
Thick scar	04	4.2	01	1		



**Comment:** In pfannenstiell incision 86.4% of subjects developed a fine scar, 9.4% developed broad scar and 4.2% developed thick scar. In modified Joel Cohen incision 93% of subjects developed fine scar, 5.2% developed broad scar and 1% had thick scar. There is no significant difference in appearance of scar in two incision types [P value = 0.19, Chi square value = 3.22].

**Fig 4:** Bar diagram showing Comparison of two incision according to appearance of scar after 12weeks

## Discussion

The observational comparative study was conducted in the department of Obstetrics and Gynaecology, Medical College, Kolkata, Eden building. Total 192 study subjects were included in the study, 96 had undergone cesarean section using Pfannenstiell incision and rest 96 using Modified Joel Cohen incision.

Data were collected regarding their demographic and obstetrical profile, intraoperative findings and post-operative maternal and neonatal parameters in a retrospective manner. Then data were analysed. Table 1 is showing that demographic and obstetric profile are almost similar in both groups.

From the table 4 and figure 1, we can see that the mean duration of operative procedure (skin to skin) was 33.4±3.7 minutes and 29.1±2.4 minutes for pfannenstiell technique and modified Joel Cohen technique respectively. So modified Joel Cohen incision technique needs significantly

less duration (p value 0.0001, 95% CI 3.3 to 5.21) (table 4). Most of the population (83.3 %) needed ≤ 30 minutes for modified Joel Cohen incision and 64.4 % people needed 31-35 minutes for pfannenstiell incision (table 2). In a Randomized controlled trial by Saha *et al.* (21) mean operative time was significantly less in Joel Cohen incision than pfannenstiell incision (29.81 vs 32.67 minutes, p value < 0.0001, 95% CI 2.253 to 3.467).

Most of the subjects (71.9%) had a blood loss of 701-799 ml for pfannenstiell incision whereas 80.2% population in modified Joel Cohen group had blood loss ≤700 ml (table 3). The mean blood loss in pfannenstiell incision group and modified Joel Cohen incision group are 815±116 ml and 689±92.8 ml, respectively. But the difference is not statistically significant [ P value 0.05, CI 95.5 to 155.5] (table 4; figure 1). In 2008, Hofmeyr *et al.* (28) searched the Cochrane pregnancy and child birth group's trial Register and found there is less blood loss (five trials, 481 women) in

Joel Cohen technique than pfannenstiel technique difference 64.45 ml, 95% CI -91.34 to -37.56ml).

Table 5 and figure 2 is showing that 20% of subjects in pfannenstiel incision group needed special haemostatic procedure during closure, only 10% of subjects needed the same in modified Joel Cohen group (p value 0.047, Chi square value 3.95). This difference is statistically significant. Saha *et al.* (21) also found similar outcome in their study.

We can see that 88.6% of subjects in modified Joel Cohen group required routine doses of analgesics for  $\leq 6$  days whereas most of the population in pfannenstiel group (55.7%) required the same for 7-8 days. The mean duration for analgesic requirement was  $5.4 \pm 0.08$  days and  $6.7 \pm 1.1$  days respectively and this difference is statistically significant (p value 0.016, CI 0.8 to 1.4) (table 6; figure 3). Even in terms of dose, a greater number of people (20.8%) in pfannenstiel group needed stronger dose of analgesics than modified Joel Cohen group (9.4%) which is statistically significant (P value 0.02, CI 0.02 to 0.04). Mathai *et al.* (27) on searching the Cochrane for pregnancy and child birth group's trial found almost similar outcome (WMD 0.89, 96% CI -1.19 to -0.39).

Table 6 and figure 3 are showing that mean post operative hemoglobin drop was  $0.74 \pm 0.45$  and  $0.66 \pm 0.41$  in pfannenstiel incision group and Joel Cohen group respectively but this is not a statistically significant difference (P value 0.086, CI -0.012 to 0.17).

In both groups' majority of subjects, 68.8% in pfannenstiel group and 91.7% in Joel Cohen group, got returned their bowel sound in  $\leq 6$  hours. The mean time for return of IPS in Joel Cohen group ( $5.35 \pm 0.69$  hours) is significantly less than pfannenstiel group ( $6.26 \pm 0.64$  hours) (P value 0.0001, CI 0.69 to 1.076) (table 6; figure 3).

Major number of subjects in pfannenstiel group (78%) could get out of bed in 7-9 hours, in the other hand majority in Joel Cohen group (78.1%) needed  $\leq 6$  hours for brisk ambulation. Joel Cohen group has significantly earlier ambulation than pfannenstiel group ( $6.12 \pm 0.71$  Versus  $7.95 \pm 1.3$ , P value 0.0001, CI 1.454 to 2.067) (table 6; figure 3). Wessean Maydy Abuelghar *et al.* (26) also found that time to get out of bed and walk straight and to detect an audible bowel sound is significantly less for Joel Cohen technique than pfannenstiel incision.

Mean duration of hospital stay in Joel Cohen technique is also significantly less in Joel Cohen technique ( $5.15 \pm 0.46$  days) than that of pfannenstiel incision type ( $6.42 \pm 1.04$  days), [P value 0.0001, CI 1.040 to 1.501] (table 6; figure 3). Saha *et al.* (21), in their randomized control trial, found that hospital stay is less in Joel Cohen group (P value 0.002) and Alireza *et al.* (24) also found similar outcome in term of hospital stay (P value 0.001, CI 1.4 to 0.03).

Table 7 is showing that 16.6% of subjects in pfannenstiel incision group had an unhealthy wound with wound discharge whereas 7.29% in Joel Cohen group had the same. There is no statistically significant difference in wound complication between two incision types [P value 0.07, Chi square value 4.01].

According to table 8, 14.29% and 6.25% in pfannenstiel group and Joel Cohen group respectively had a history of wound dehiscence, which needed secondary suturing. This difference between two incision group is also not statistically significant [P value 0.059 Chi square value 3.57]. The incidence of wound complications was a little bit

higher in pfannenstiel incision type but not significantly. In a multicentric surveillance Dumas AM *et al.* (25) found that nosocomial infection is higher with Joel Cohen incision. Saha *et al.* (21) found there is no statistically significant difference between these two-incision type.

There is no significant difference in incidence of hematoma formation also between pfannenstiel and modified Joel Cohen incision [P value 0.064, Chi square value 7.26] (table 9).

Neonatal outcome is similar in two incision group and none of these two is associated with increased risk of birth injury (table 10). Appearance of scar after 12 weeks of surgery is also similar in both incision technique (table 11, Figure 4) [P value is 0.19, Chi square value is 3.22].

## Conclusion

### The following conclusions can be drawn from the study

Modified Joel Cohen incision has better outcome than pfannenstiel incision for cesarean section in terms of intraoperative parameters like total operative duration and need of special hemostatic procedure during abdominal closure. There is no significant difference in intraoperative blood loss between two techniques.

- Post operative analgesic requirement (dose and duration) is less and post operative recovery (return of bowel sound, ambulation) is faster in modified Joel Cohen technique than pfannenstiel incision. Hospital stay is also shorter in modified Joel Cohen incision.
- There is no statistically significant difference in intraoperative blood loss, wound site infection, wound dehiscence, neonatal outcome and appearance of scar after 12 weeks between the two techniques.

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