



**Comparison of Caesarean Deliveries by Pfannenstiel and Joel-Cohen Abdominal Entry Incision in Short-Term Outcome Measures: At Omdurman Maternity Hospital from March -August 2016**

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## Introduction

A Caesarean section (C-section) is often performed when benefits outweigh vaginal delivery risk as, for instance in cases of obstructed labour, breech birth, placental abnormalities, and previous C-section.

Both Joel-Cohen and Pfannenstiel are horizontal incisions. The primary difference is that the former is at a slightly higher level than the latter and the dissection of tissues is by finger separation. Hence, theoretically, less nerve fibres damage and a better outcome of pain relief in the Joel-Cohen method [5]. Joel-Cohen method involves blunt dissection and, therefore, leads to less operating and delivery times [19, 20] and less intraoperative blood loss, fewer adhesions, faster wound healing rate, return of peristalsis and shorter hospital stay [8].

However, at the practical daily clinical practice level the evidence base remains somewhat inconclusive. On one hand, a series of randomized controlled trials managed to confirm how advantageous the Joel-Cohen method could be in comparison to the Pfannenstiel incision [12, 13, 15, 19]. On the other hand, many other trials failed to record substantial difference between the two methods [14].

The primary aim of the current investigation was to compare Pfannenstiel versus Joel-Cohen abdominal entry incision use in Caesarean deliveries performed at Omdurman Maternity Hospital in a period from March to August 2016, in terms of intra-operative time, operative blood loss, pain rating and analgesics use post-operatively, and postoperative recovery and oral intake start.

## Methods

The current investigation is a prospective, randomized clinical trial that was conducted between March and August 2016 in Omdurman Maternity which is one of the large specialized national training centres in Sudan. Our target population encompassed all Caesarean deliveries conducted during the study period according to the trial protocol. The size of the sample was calculated as ( $n = 84$  deliveries) in line with 5% significance level, 80% power to detect a difference, based on a standard deviation of 26.3 minutes and difference of intraoperative time of 11.4 minutes reported by Mathai et al [2013] 13.

We have included all pregnant ladies undergoing elective or emergency caesarean section, but excluded women with past caesarean delivery or any previous pelvic operations, comorbid medical illness that could affect post-operative recovery (cardiac, asthmatic, etc.)

Data was collected using a predesigned questionnaire that contained the socio-demographic data as well as the clinical information

The two arms were compared at baseline in terms of age, gestational age and parity and indications for elective caesarean. Women were randomized into each arm using computer-generated pseudorandom numbers.

In the Pfannenstiel group, the incision of about 15 cm length was made at the lowermost transverse crease (2 cm above symphysis pubis) with a gentle curve upwards. After the skin was entered, the subcutaneous tissue was incised sharply with a scalpel. Once the fascia was exposed the rectus sheath, separation of rectus muscles and opening of peritoneum were carried out in the traditional way.

In the modified Joel-Cohen group, a straight transverse incision deep enough to cut the cuticle of about 12 cm length was made 3 cm below the arbitrary line joining two anterior superior iliac spines. The incision in the midline was deepened with the scalpel in a short transverse cut of about 2-3 cm through the fat, down to the rectus sheath. A small transverse incision was made in the midline over the rectus sheath and the incision was enlarged bilaterally about 2 cm on either side underneath the fat and subcutaneous tissue without disturbing them. The fascial borders were gently separated caudally and cranially, using the fingers to make room for the next step. That made an oval opening of about 4cm by exposing the rectus muscle underneath. Following this, the surgeon and assistant pulled the rectus muscles on their corresponding side by pushing their index and middle fingers in the midline between the rectus muscles, encircling the whole muscle bellies by smooth, balanced and increasing force. It was often necessary for both to place their other index and middle fingers over the two fingers initially placed in order to attain the force needed to make a large enough opening. The pulling force was mostly from the wrists. The parietal peritoneum was opened transversely, using the surgeon's fingers to stretch the tissues until a small hole was made. The hole was enlarged by stretching with the surgeon's two index fingers in a caudal and cranial direction simultaneously, the peritoneum opened by blunt way using the fingers .the myometrium opened by scalpel only and extended by fingers only .the rest of caesarean operation was the same with the pfannstiel group.

Intra-operative time was calculated using stop-watch device throughout the study. The amount of blood loss during caesarean section was estimated by weighting the amount of the blood in ml in the standard laparotomy sponge 45\*45 (as 1gm equals 1ml of blood)17,18. As the maximum capacity of a saturated large 45\*45-cm surgical swab is 350 ml 17,18.

Blood transfusion & number of blood bags needed was announced. Also the difference between pre and post-operative HB was calculated. Easiness of the operation was also estimated.

Primary outcome measures included postoperative pain using a visual analogue scale (VAS). The same preoperative antibiotics (cefuroxime 1.5gm BID) and postoperative analgesics (Diclofenac sodium 75mg IM OD) was given to both groups, additional Diclofenac sodium or Pethidine 50mg IM PRN.

The data was fed to Statistical Package for Social Sciences (SPSS) Inc., Chicago, IL, USA; version 20.0. Frequencies, means, standard deviations, and correlation tests was conducted. The parametric t-test and the non-parametric Mann Whitney U test was used for comparing the mean difference in intraoperative time. Chi-square test was used to determine the significance of association between categorical variables and t-test was used for correlation in the numerical data. Significance level was taken for values at  $P = 0.05$  with 95% confidence interval.

The study was approved from the ethics review committee of Sudan Medical Specialization Board, council of Obstetrical & Gynaecology and the administration of Omdurman Maternity Hospital. Patients' personal information were kept strictly confidential. Written informed consent was obtained from the participants ahead of recording any clinical data.

## Results

The study took place between April 2016 and July 2016 in Omdurman Maternity Hospital. The total number of patients included in the study was (n=84) women who had Caesarean Section CS during the study period; of whom (n=42) were randomized into the Joel-Cohen incision group and (n=42) to the Pfannenstiel incision group.

The mean age in the Joel-Cohen incision group was 27.4 years compared with the mean age of 28.9 years for the Pfannenstiel incision group.

Table (1) shows the Indications of performing caseation section.in which the most frequent was breech presentation (n=24, 28.6%) followed by Failure to Progress FTP (n=17, 20.2%).

Table (1) Indications of performing caseation section

Indication	Number	Percentage
Abruptio-placentae	1	1.2%
Breech	24	28.6%
Previous baby with Cerebral Palsy	1	1.2%
		1.2%
Cord Prolapse	3	3.6%
Difficult Labour	1	1.2%
Fetal Distress	5	6.0%

Failure of Decent	3	3.6%
Fetal Growth Restriction	2	2.4%
Forceps	3	3.6%
Failure To Progress	10	20.2%
Gestational Diabetes	4	8.3%
Grand Multipara	2	3.6%
Failure of Induction	2	2.4%
Decreased Fetal Movement	3	3.6%
Severe Preeclampsia	4	4.8%
Primary Herpes	1	1.2%
Primary Infertility	1	6.0%
Senior Primigravida	3	3.6%
Sizable Baby	3	4.8%
Grand multipara Tubal Ligation	2	2.4%
Twins	5	15.5%
PPROM	1	1.2%

Table (2) shows of the number of previous pregnancies. While the mean was 1.3 pregnancies, the median number of pregnancies was 0 pregnancies. The shear majority were primigravidas (n= 45, 53.6%), followed by those who had two past pregnancies (n=11, 13.1%).

Table (2) Number of previous pregnancies

Past Pregnancies	Joel-cohen	Pfannestiel	Total Number	Percentage
0	23	22	45	53.6%
1	2	6	8	9.5%
2	6	5	11	13.1%
3	1	3	4	4.8%

4	2	0	2	2.4%
5	0	1	1	1.2%
8	1	3	4	4.8%
12	0	1	1	1.2%

The mean gestational age in the Joel-Cohen incision group was 39.32 weeks compared with the mean gestational age of 38.95 weeks for the Pfannenstiel incision group

The majority were university post-graduates (n=37, 44%) and more than a fifth reached secondary education (n=19, 22.6%). There were (n=3, 3.6%) who received primary education only, and further (n=9, 10.7%) who were university graduates

Most participants were housewives (n=29, 34.5%) and about a fifth were employees (n=16, 19%). There were (n=7, 8.3%) who were students. The mean Systolic BP SBP was 117.3 mm Hg (Standard Deviation (SD) = 15.7 mm Hg, Range between 90 and 110 mm Hg). The median SBP was 120 mm Hg. The mean SBP in the Joel-Cohen incision group was 112.7 mm Hg compared with the mean SBP of 121.9 mm Hg for the Pfannenstiel incision group

Regarding baseline diastolic Blood Pressure DBP, the mean was 75.2 mm Hg (Standard Deviation (SD) = 10.9 mm Hg; Range between 50 and 115 mm Hg). The median DBP was 80 mm Hg. The mean DBP in the Joel-Cohen incision group was 72.9 mm Hg compared with the mean SBP of 77.4 mm Hg for the Pfannenstiel incision group.

In terms of baseline body mass index BMI, the mean was 28.3 Kg/m<sup>2</sup> (Standard Deviation (SD) = 3.8 Kg/m<sup>2</sup>, Range between 20 and 37 Kg/m<sup>2</sup>). The median BMI was 28 Kg/m<sup>2</sup>. The mean BMI in the Joel-Cohen incision group was 28.6 Kg/m<sup>2</sup> compared with the mean BMI of 27.9 Kg/m<sup>2</sup> for the Pfannenstiel incision group. This difference, however, was not statistically significant (t = 0.7549, degrees of freedom = 76, p-value = 0.4527). As to baseline Haemoglobin level, The mean Haemoglobin level in the Joel-Cohen incision group was 11.3 gm compared with the mean Haemoglobin level of 11.4 gm for the Pfannenstiel incision group.

#### Inferential/Outcome Statistics

As to the intraoperative time between the start of the operation and the time of delivery of the baby, the mean time in the Joel-Cohen incision group was 12.38 minutes which was 4.52 minutes less than the mean time of 16.90 minutes for the Pfannenstiel incision group.

In relation to the total intraoperative time between the start and the finish of the operation, the mean time in the Joel-Cohen incision group was 28.00 minutes which was 6.10 minutes less than the mean time of 34.10 minutes for the Pfannenstiel incision group.

Regarding the total intraoperative blood loss, the mean blood loss in the Joel-Cohen incision group was 285.2 mL which was 122.3 mL less than the mean blood loss for the Pfannenstiel incision group that was 407.5 mL. The 95% Confidence Interval CI for this difference was (56.4 to 188.3 mL)

Table (3) explains the of the rating of the immediate postoperative pain, the majority of women rated their initial pain as 7/10 (n=18, 21.4%). Using binomial regression modelling, the initial rating of pain was significantly lower in the Joel-Cohen group than the Pfannestiel group even after adjusting for the effect of length of operation .This indicates that a woman who underwent the Joel-Cohen incision has 63% (95% CI :54.1% to 71.5%) less pain rating.

Table (3) immediate postoperative pain following the surgery

Initial pain	Joel-cohen	Pfannestiel	Total Number	Percentage
9	0	10	10	11.9%
8	0	9	9	10.7%
7	3	15	18	21.4%
6	8	3	11	13.1%
5	8	2	10	11.9%
4	8	2	10	11.9%
3	7	1	8	9.5%
2	5	0	5	6%
1	3	0	3	3.6%

Successive postoperative pain in 1 hour, 6 hours, and 24 hours

In order to measure the effect of the CS incision type on the longitudinal pain perception of the women who underwent CS, we adopted a recently proposed robust statistical method called Generalized Estimating Equations that take into account the correlation between successive measurements of pain rating. We used the method to estimate the effect of the incision using generalized linear binomial regression model with

exchangeable correlation structure.

The women who had Joel-Cohen incision reported significantly less pain rating compared with women who had Pfannestiel incision even after adjusting for the length of operation ( $\beta = -1.159176$ ,  $SE = 0.14065$ ,  $p\text{-value} < 0.00000001$ ). This is indicative of a 68.6% less pain rating on average by women in the Joel-Cohen group. The mean temperature 6 hours postoperatively in the Joel-Cohen incision group was 37.3 0C which dropped to 36.8 0C in 24 hours' time. This is compared to mean temperature in 6 hours postoperatively of 37.4 0C that dropped in 24 hours' time to 37.0 0C for the Pfannenstiell incision group.

Table (4) calculates the total number of ampoules required to treat postoperative pain, the majority of women required only one ampoule of diclofenac ( $n=47$ , 56%). The number of analgesic ampoules required postoperatively was significantly lower in the Joel-Cohen group (51 ampoules in total) than the Pfannestiel group (75 ampoules in total). This indicates that a woman who underwent the Pfannestiel incision will be 37.7% more likely to need analgesic medications than the Joel-Cohen incision.

Table (4) the number of analgesic ampoules required postoperatively

Number of ampoules	Joel-cohen	Pfannestiel	Total Number	Percentage
0	1	1	2	2.4%
1	30	17	47	56%
2	9	15	24	28.6%
3	1	8	9	10.7%
4	0	1	1	11.9%

Regarding comparison of the postoperative haemoglobin level; the mean in the Joel-Cohen incision group was 11.0 mg which was 0.3 mg higher than the mean haemoglobin for the Pfannenstiell incision group that was 10.7 mg.



The time till postoperative mobility in the Joel-Cohen incision group was 5.9 hours which was 2.3 hours less than the mean time postoperatively for the Pfannenstiel incision group mobility; that was 8.2 hours.

The time till postoperative oral intake in the Joel-Cohen incision group was 5.8 hours which was 1.3 hours less than the mean time postoperatively for the Pfannenstiel incision group mobility that was 7.1 hours.

## Discussion

Our current study confirms the superiority of Joel-Cohen incision in terms of intraoperative time, time till postoperative mobility and oral intake, pain ratings and blood loss over Pfannenstiel incision. This could be due to the blunt dissection, which quickly separate tissues along natural lines of cleavage, ensuring the tissue splits entirely along the cleavage. The anatomical site of the Joel Cohen is far from the cutaneous branches of the subcostal and iliohypogastric nerves, thus it led to lower perceived pain scores postoperatively. This is consistent with the results found by Abuelghar et al 12, Wallin et al 21 and Saha et al 15. Some studies reported a less impressive time-saving difference though 14. Further large-scale studies could settle the current contradictory findings. Notably, Darj et al and Ferrari et al 22 found higher postoperative pain scores in the Pfannenstiel technique, likely caused by extensive tissue trauma and increased inflammatory response. Post-operative time lapse till full mobility is believed to be closely linked to pain perception. One study still 21 detected no significance pain advantage postoperatively.

We also found that postoperative haemoglobin level in the Joel-Cohen incision group was higher than Pfannenstiel incision group. This was in disagreement with Abuelghar et al 12 and Wallin et al 21 who didn't found significant difference in postoperative hemoglobin between the two groups .it might be due combined factors such as optimized HB level before operation and/or due to less blood loss intraoperatively.

Joel-Cohen incision in our trial did not influence the level of women satisfaction.

Time till postoperative oral intake in our Joel-Cohen incision arm was found not significant when compared to Pfannenstiel incision group after adjusting for the effect of the length of operation. Our result mirrors the recent Cochrane systemic review as both Joel-Cohen and Pfannenstiel techniques were similar regarding time to return of bowel function, time to mobilisation and time to the start of breastfeeding [12]. However, a series of studies found time to get out of bed, to walk straight without support, to detect audible intestinal sounds and to pass gases were significantly shorter in the Joel-Cohen because the shorter operating time which assists earlier return of peristalsis due to minimal tissue handling [12, 21]. Furthermore, return of bowel sounds was also shorter when the visceral and parietal peritoneum were left non sutured compared with when they were

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sutured as Irion et al 20 concluded.

We also found that women who had Joel-Cohen incision did not differ significantly compared with women who had Pfannenstiel incision in terms of the postoperative temperature readings. This was a counter-intuitive finding. We expected that the Pfannenstiel incision is associated with greater trauma, hence more likely to activate the cytokine response with higher likelihood of subsequent fever 23. Future trials should include postoperative levels of inflammatory cytokines as primary outcomes.

Although the advantages we have found for Joel-Cohen incision could be extrapolated to savings for the health system, our study does not provide information on long-term morbidity and mortality.

## Conclusion

Joel-Cohen incision has several desirable short-term advantages over Pfannenstiel caesarean in the non-scarred abdomen. Joel-Cohen incision provides faster technique for caesarean section, less intra-operative blood loss and operating time with less postoperative pain and earlier postoperative recovery in our circumstances.

## Recommendations

1. Use of Joel-Cohen technique in emergency situation such as foetal distress, cord prolapse .etc could be advantageous to gain time to rescue babies at acute risk because of its rapid entry than Pfannenstiel technique.
2. Use of Joel-Cohen technique to reduce the intrapartum blood loss and the need for blood transfusion.
3. Use of Joel-Cohen technique reduces the postoperative pain, the need and dose of analgesics.
4. Use of Joel-Cohen technique helps early mobilization and oral intake to reduce the risk of VTE and to increase mother satisfaction.

## Data Availability

Data can be provided by the corresponding author upon formal written request.

## Conflict of Interest

All authors declare no conflict of interest.

Declarations of interest: none

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No funding was received to conduct the current study.

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### Ethical Approval

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all patients for being included in the study. The paper was approved by the Research and Ethics Committee Sudan Medical Specialization Board, Khartoum, prior to commencement of respondents' recruitment.

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