

THE EFFECT OF PERITONEAL NONCLOSURE VERSUS CLOSURE AT CAESAREAN SECTION ON SHORT TERM POST-OPERATIVE COMPLICATIONS – A PROSPECTIVE COHORT STUDY

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Received : 27/03/2024
Received in revised form : 23/05/2024
Accepted : 08/06/2024

Keywords:
Caesarean, Peritoneum, Visual analog scale, Non closure.

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DOI: 10.47009/jamp.2024.6.3.96

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (3); 467-472



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Abstract

Caesarean section is a very common surgical procedure worldwide. The surgical approach of lower segment caesarean section has traditionally included closure of the visceral and parietal peritoneum. This is a prospective cohort study conducted in the Department of Gynecology, Mata Gujri Memorial Medical College, Kishanganj from 1st September 2022 to 30th April 2024. All patients undergoing caesarean section were included in the study. Postoperative pain assessment was done at regular intervals by a 100 mm visual analog scale. The need for additional analgesic was significantly higher in closure group in comparison to non-closure group. Mean time to regain first bowel sound post-surgery was statistically longer in closure group than non-closure group. Non-closure of peritoneum reduces the length of hospital stay, intensity of pain in the postoperative period.

INTRODUCTION

According to the World Health Organization (WHO), caesarean section use continues to rise globally, now accounting for more than 1 in 5 (21%) of all childbirths. National Family Health Survey (NFHS-5), 2019-21 showed a high geographical variability within India, with prevalence ranging from 5.2% in Nagaland to 60.7% in Telangana.^[1]

The techniques to perform a caesarean section depend on a number of factors including the clinical situation and the preference of the operator. The peritoneum is a thin membrane made of primitive cells called mesothelium and supported by a thin layer of connective tissue. It lines both the abdominal and pelvic cavities where it is called parietal peritoneum. When it covers the external surface of internal organs like the intestine, the bladder and the uterus, it is termed visceral peritoneum, and during caesarean section these peritoneal surfaces have to be cut through in order to reach the uterus and for the baby to be born. Following a caesarean section, it has been standard practice to close the peritoneum by stitching (suturing) the two layers of tissue that line the abdomen and cover the internal organs, to restore the anatomy. It has however been suggested that peritoneal adhesions may be more likely rather than less likely when the peritoneum is sutured, possibly as a result of a tissue reaction to the suture material.^[2]

In Caesarian section, surgical complications such as fever, wound infection, post-operative pain and bleeding occur more frequently than in normal vaginal delivery and these conditions may affect the postnatal care of newborn infants. Traditionally, suturing of peritoneal layers in caesarean sections have been done, but in many randomized clinical trials, this stage could be easily eliminated since it does not increase the rate of morbidity.^[3]

A series of studies evaluated the effects of leaving the peritoneum open and compared it with closing after Caesarian section. Reasons noted for closure of the peritoneum include restoring anatomy and re-approximating tissues, reducing infection by re-establishing an anatomical barrier, decreasing wound dehiscence, reducing hemorrhage and minimizing adhesions.

Reasons cited for non-closure of the peritoneum include: reduction of operation duration, shortening of hospitalization stay, use of less analgesic, earlier return of bowel function, reduction of urinary bladder adhesion following next CS, and immediate post-operative recovery. It would also reduce the number of stitches, which is the preferred option given that the body responds to stitches as if they were a foreign material.^[4]

Traditionally, suturing of the visceral and parietal peritoneum at caesarean section has been widely accepted, despite the lack of evidence establishing its benefits. The aim of this study was to compare

closure versus non-closure of visceral and parietal peritoneum during primary caesarean section regarding early postoperative outcomes.

MATERIALS AND METHODS

This is a prospective observational study conducted in the Department of Obstetrics and Gynaecology, Mata Gujri Memorial Medical College and Lions Seva Kendra, Kishanganj, Bihar, India, between first of 1st September 2022 to 30th April 2024.

One forty (140) patients were included in this study. Patients were divided into two cohorts: In one group, women had both visceral and parietal peritoneum closure, whereas the other group included women whose peritoneal layers (both visceral and parietal) were left unsutured. All patients received similar anaesthetic and surgical techniques. Postoperative pain assessment was done at regular intervals by a 100 mm visual analog scale (VAS). Per rectal diclofenac was given as an on demand analgesic and recorded with dose.

Inclusion Criteria

- Primary caesarean section for obstetric indications

Exclusion Criteria

- Prior caesarean section.
- Prior gynecologic abdominal surgery.
- Patient having any previous surgical lower abdominal operation.
- Medical disorder with pregnancy (diabetes mellitus or liver and heart disease).
- Patients presented with febrile morbidity prior to operation.
- Cases unable to understand VAS will be excluded from the study.

Written informed consent was obtained when posted for CS after discussing study aims, the use of intravenous/per rectal analgesics and the use of visual analog scale (VAS). All patients received spinal anaesthesia using a 25G Quincke needle, and 2 mL of 0.5% bupivacaine heavy was injected in a sitting position to achieve a good sensory block to at least T5. No intrathecal opioid was used.

Caesarean section was done with low transverse incision on skin, rectus muscle separating approach for entry further, transverse uterine incision in lower segment, two layered uterine wound closure after delivery of baby and afterbirths, peritoneal closure done according to usual practice, rectus sheath sutured continuously with delayed absorbable suture and skin by interrupted mattress stitch using non-absorbable suture. Total operative time (skin—incision to closure) was recorded.

Pre-operative intravenous antibiotic (ceftriaxone 1 g) (45 to 60 minutes before incision, and 10 IU oxytocin IM) was given immediately after the delivery of the baby. The end of surgery was taken as zero hour. 10 IU oxytocin was charged in the first two infusion bottles. For the first 24 hours, paracetamol IV infusion 1 g 8 hourly was scheduled for all cases.

Primary outcome measure was postoperative pain intensity assessed at 6, 12, 24, and 48 hours after CS by 100 mm VAS (0 mm = no pain, 100 mm = unbearable pain).

Secondary outcome measures included:

- Operative time recorded in minutes from skin incision to the last suture.
- Need for additional analgesics
- Abdominal distension and time to regain of bowel sounds using the stethoscope auscultation in the right iliac region and in the umbilical region.
- Wound infection diagnosed when there is serous or purulent discharge from the skin incision with erythema and indurations, with or without fever.
- Duration of hospital stay starting from the time of caesarean delivery was counted.

RESULTS

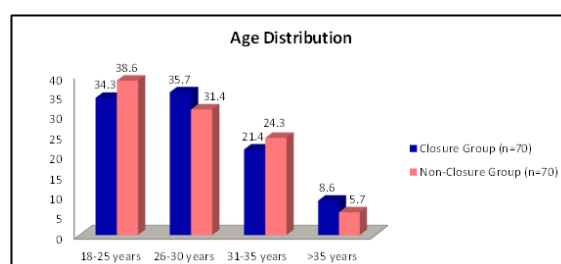


Figure 1: Age distribution

The mean age among patients in closure and non-closure group was 27.41 ± 5.80 years and 27.43 ± 5.44 years respectively.

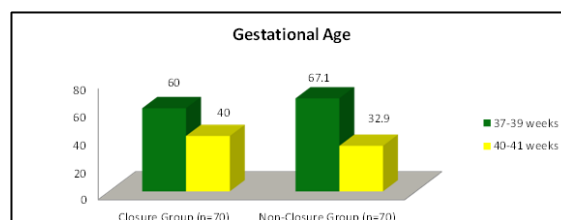


Figure 2: Gestational age

Mean gestational age in closure and non-closure group was 38.93 ± 1.46 weeks and 38.77 ± 1.46 weeks respectively.

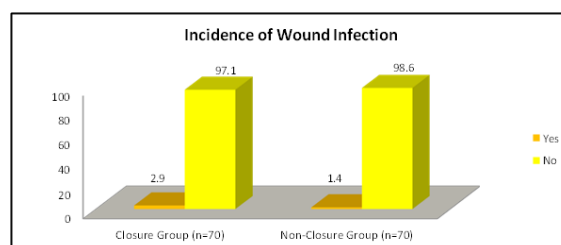


Figure 3: Incidence of Wound Infection

Incidence of wound infection was not statistically different between closure (2.9%) and non-closure (1.4%) group (p value = 0.559).

Most of the study participants in the present study were primiparous (70% in closure vs. 74.3% in non-closure group) with no statistically significant difference between closure and non-closure group (p value = 0.572). [Table 1]

Closure and non-closure group was not statistically different in terms of indication for caesarean section (p value = 0.676). [Table 2]

Mean duration of surgery in closure and non-closure group was 65.27 ±7.01 minutes and 50.26 ±9.25 minutes respectively. Above analysis we found mean duration of surgery was significantly lower in non-closure group (p value = <0.0001). [Table 3]

In the present study post-operative pain intensity was assessed through 100 mm VAS scale. According to this scoring system post-operative pain was significantly lower at 12hr, 24 hr and 48 hr interval

in non-closure group compared to closure group (p value = <0.0001, <0.0001 and 0.003 respectively). [Table 4]

Incidence of post-operative fever was not statistically significant different between closure (7.1%) and non-closure group (2.9%) (p value = 0.244). [Table 5]

Incidence of abdominal distension was also not statistically different between closure (8.6%) in non-closure (1.4%) group (p value = 0.052). [Table 6]

Mean time to regain first intestinal sound post-surgery was 8.46 ±1.00 in closure group which was statistically longer than non-closure (5.49 ±1.44) group (p value = <0.0001). [Table 7]

Mean duration of hospital stay was significantly lesser in non-closure group (4.04 ±0.87 days) in comparison to non-closure (6.14 ±0.89days) group (p value = <0.0001). [Table 8]

Table 1: Parity.

Parity	Closure Group (n=70)		Non-Closure Group (n=70)	
	Frequency	Percentage	Frequency	Percentage
Primiparous	49	70.0	52	74.3
Multiparous	21	30.0	18	24.7
Total	70	100.0	70	100.0
Statistical Inference	Chi square:0.32 p value:0.572			

Table 2: Indications for Caesarean section

Indication for Caesarean Section	Closure Group (n=70)		Non-Closure Group (n=70)	
	Frequency	Percentage	Frequency	Percentage
Feto-maternal Cause	33	47.1	28	40.0
Fetal Cause	23	32.9	25	35.7
Maternal Cause	14	20.0	17	24.3
Total	70	100.0	70	100.0
Statistical Inference	Chi square:0.783 p value:0.676			

Table 3: Duration of surgery

Duration of Surgery	Closure Group (n=70)		Non-Closure Group (n=70)	
	Mean	±SD	Mean	±SD
Mean Duration of Surgery (minutes)	65.27	±7.01	50.26	±9.25
Statistical Inference	p value:<0.0001			

Table 4: Post-operative pain intensity according to 100 mm VAS at different time intervals

Intervals	Closure Group (n=70)		Non-Closure Group (n=70)		p value
	Mean	±SD	Mean	±SD	
12 hr	83.43	10.48	68.71	7.21	<0.0001
24 hr	61.79	8.17	44.43	10.72	<0.0001
48 hr	43.14	6.92	39.00	8.87	0.003

Table 5: Incidence of Postoperative Fever

Incidence of Postoperative Fever	Closure Group (n=70)		Non-Closure Group (n=70)	
	Frequency	Percentage	Frequency	Percentage
Yes	5	7.1	2	2.9
No	65	92.9	68	97.1
Total	70	100.0	70	100.0
Statistical Inference	Chi square:1.353 p value: 0.244			

Table 6: Incidence of Abdominal Distension

Incidence of Abdominal Distension	Closure Group (n=70)		Non-Closure Group (n=70)	
	Frequency	Percentage	Frequency	Percentage
Yes	6	8.6	1	1.4
No	64	91.4	69	98.6
Total	70	100.0	70	100.0
Statistical Inference	Chi square:3.759 p value:0.052			

Table 7: Time to regain Bowel Sound

Time to regain Intestinal Sound	Closure Group (n=70)		Non-Closure Group (n=70)	
	Mean	±SD	Mean	±SD
Time to regain Intestinal Sound (hours)	8.46	±1.00	5.49	±1.44
Statistical Inference	p value:<0.0001			

Table 8: Duration of Hospital Stay

Duration of Hospital Stay	Closure Group (n=70)		Non-Closure Group (n=70)	
	Mean	±SD	Mean	±SD
Duration of Hospital Stay(days)	6.14	±0.89	4.04	±0.87
Statistical Inference	p value:<0.0001			

DISCUSSION

The present study was carried out to assess the short-term morbidity of non-closure of the visceral and parietal peritoneal at caesarean section as compared to suture peritonization.

The study comprised of 140 patients who were divided into two cohorts: In one group, women having both visceral and parietal peritoneum closure were studied, whereas the other group included women whose peritoneal layers (both visceral and parietal) were left unsutured. All patients received similar anaesthetic and surgical techniques.

Duration of surgery, post-operative pain score, need for additional analgesics, time to regain intestinal sound and duration of hospital stay were all lower in the non-closure group.

Incidence of postoperative fever, incidence of abdominal distension, and incidence of wound infection were however comparable in the two groups.

The mean age among patients in closure and non-closure group was 27.41 ±5.80 years and 27.43 ±5.44 years respectively with no statistically significant difference (p value = 0.988). The age of our patients was comparable to study performed by Rafique et al.^[5]

The mean gestational age was 38.93 ±1.46 weeks in closure group and 38.77 ±1.46 weeks in non-closure group, in the study by Ghongdemath and Banale it was 37.5 ± 2.3 weeks in closure group and 37.6 ± 2.0 weeks in non-closure group.^[6]

In the present study mean duration of surgery in closure and non-closure group was 65.27±7.01 minutes and 50.26 ±9.25 minutes respectively. Above analysis we found mean duration of surgery was significantly lower in non-closure group (p value = <0.0001).

A randomized double blind clinical trial was conducted in Kashan Shabih-Khani Hospital (Iran) which concluded that the non-closure of the peritoneum was associated with shorter duration of surgery, significantly lower pain scores and less analgesic use compared to traditional practice (closure of the peritoneum).^[7]

Rafique et al. revealed a reduction in operative time (6 minutes) in the non-closure group than in the closure group. Ghongdemath and Banale revealed a reduction in operative time (11.2 minutes) in the non-closure group than the closure group.^[5,4] In the study

by Zareian and Zareian, operative time was shorter in non-closure group than closure group.^[8]

In the Cochrane collaboration 2014, 16 trials involving 15,480 women in analysis of CG and NCG of both peritoneal layers also found that operating time was significantly less in NCG by 7.33 minutes.^[9] Sharma et al in their study also reported that the mean duration of surgery was 29.1 ± 2.37 min when parietal peritoneum was left open and was significantly less than the closure group. They decrease in surgical time decreased the risks of anaesthesia.^[10]

The operating time was significantly more when peritoneum was closed as compared to when peritoneum was not closed (p=0.01), difference of additional 10 minutes was required in CG with standard error of mean for time being 3.7688 as reported by Prabhu S et al.^[11]

Ali El-Shabrawy et al also in their study reported that there was significant statistical difference regarding operative time, as the operative time was shorter (8.9 minutes) in the non-closure group than the closure group.^[12]

The decrease in operative time reduced the duration of anaesthesia time exposure and that of exposure of wound to the environmental contaminants. This is reflected in decreased incidence of febrile morbidity. The peritoneal epithelial lining is very sensitive and responds by releasing cytokines and interleukin which cause pain. On suturing the peritoneum, foreign body reaction is caused which results in peritoneal inflammation and causes pain. Postoperative pain could be due to blood clots in the space under the uterovesical fold when the peritoneum is closed.

In the present study post-operative pain intensity was assessed through 100 mm VAS scale. According to this scoring system post-operative pain was significantly lower at 12hr, 24 hr and 48 hr interval in non-closure group compared to closure group (p value = <0.0001, <0.0001 and 0.003 respectively). Need for additional analgesic was significantly higher in closure group (45.7%) in comparison to non-closure group (45.7%) (p value =0.0002).

Rafique et al. in a randomized controlled study of 100 women and Nagele et al. in a randomized trial of 549 women reported less postoperative analgesia when the peritoneum was not sutured at CS. In the former study, pain was the primary outcome measure and investigators found no overall difference in pain scores between the two groups, although there was a

trend of lower pain scores in non-closure group. In the latter study, analgesic use only was measured and authors found lower narcotic use in non-closure group. Both studies were corroborating with our findings.^[13]

There was a significant difference between two groups regarding pain scores and analgesic use in their investigation as reported by Tabasi et al. Women in non-closure group had lower pain scores and received fewer analgesics. Diclofenac was used 3 times and morphine 2.5 times more in the control group compared to the experimental group.^[14]

The pain score as noted by VAS scale difference between peritoneal closure and nonclosure group taken at 24 hours postoperatively was highly significant. The women in the closure group had higher pain score as compared to the nonclosure group as reported by Sharma et al.

Ali El-Shabrawy et al in their study reported that there was a significant statistical difference between both groups regarding mean degree of pain "using Visual Analogue Scale". Women in non-closure group had lower pain scores.^[15]

Incidence of post-operative fever was not statistically significant different between closure (7.1%) and non-closure group (2.9%) (p value = 0.244). Despite the lower incidence rate of fever and urinary infection in non-closure group in Nagele's study, several studies did not show any significant difference regarding wound infection, endometritis, and fever between the closure and non-closure groups which also supports our findings.

Noreen et al. found significant lower febrile and infectious morbidity in non-closure group and it was highly significant.^[16]

In the study done by Ghongdemath and Banale the febrile morbidity was high in closure group as compared to that in the non-closure; however it was not statistically significant. A systematic review by Bamigboye and Hofmeyr showed no statistical significant difference regarding wound infection and febrile morbidity.^[17] The study include large number of cases more than in our present study. In the study done by Tabasi et al, there were no cases of wound infection in either of the two groups; however in this study there was exclusion of previous caesarean section and high cover of antibiotics.^[18]

Cochrane database reported no difference in postoperative febrile and infectious morbidity in both the group.

Sharma et al in their study reported incidence of febrile morbidity was significantly lower in non-closure group in comparison to closure group (p value = <0.0001) Ali El-Shabrawy et al in their study regarding febrile morbidity, there was no significant statistical difference between the two groups, as the mean temperature was $37.02 \pm 0.41^{\circ}\text{C}$ in the non-closure group, while it was 37.1 ± 0.47 in the closure group. Several studies did not show any significant difference regarding fever between the closure and non-closure groups, which also supports our findings.

Incidence of abdominal distension was also not statistically different between closure (8.6%) in non-closure (1.4%) group (p value = 0.052). Hull and Varner found no difference in the episodes of ileus or partial ileus in the closure or non-closure group. They observed that bowel stimulants were more frequently used in the closure group compared to the non-closure group.^[19] There was also no significant statistical difference regarding degree of distension in the study by Grundsell et al In these studies there was no exclusion of patients with GIT problems.^[20]

Mean time to regain first intestinal sound post-surgery was 8.46 ± 1.00 in closure group which was statistically longer than non-closure (5.49 ± 1.44) group (p value = <0.0001). The mean time of return of bowel sound in the non-closure group was $4.975 + 2.72$ hours and it was significantly less than the closure group as reported by Sharma et al. Postoperative pain can lead to unpleasant physiologic responses which could lead to paralytic ileus and increased usage of analgesics.^[21] Less duration of peritoneal cavity exposure intra-operatively in the nonclosure groups and less bowel handling could be the reason for earlier return of bowel sounds.^[22]

Bowel function took longer time to return to normal after closure of the peritoneum compared to non-closure and all cases regain intestinal motility within the first 12 hours postoperatively as reported by Ali El-Shabrawy et al.

Irion et al found that bowel function took a slightly longer time to return to normal after closure of the peritoneum compared to non-closure.^[23] There was no statistical significant difference between the two groups as regards to bowel function in the study by Galaal and Krolkowski.^[24]

Incidence of wound infection was not statistically different between closure (2.9%) and non-closure (1.4%) group (p value = 0.559).

Mean duration of hospital stay was significantly lesser in non-closure group (4.04 ± 0.87 days) in comparison to non-closure (6.14 ± 0.89 days) group (p value = <0.0001). Noreen Sarwat also found reduced hospital stay in the non-closure group.^[25] In the CORONIS trial no acceptable difference was seen in duration of hospital stay in the two groups.^[26]

Similar to the reports by Ying-Cheon et al and Zohreh et al there was no significant difference observed in their study in length of hospital stay in days in either group.^[27,28] Cochrane database reported length of hospital stay in days was less in NCG; the difference was not statistically significant.

Similarly Shakeel et al showed that there was statistically significant difference regarding length of post-operative hospital stay.^[29] In contrast to this result, Rafique et al. did not show any significant difference regarding length of post-operative hospital stay between the closure and non-closure groups.

The average duration of hospital stay in their study was 4.125 ± 0.515 days when peritoneum was left open, this was significantly less than the closure group with p value of 0.00003 as reported by Sharma et al.

Ali El-Shabrawy et al in their study reported there was also significant statistical difference regarding length of post-operative hospital stay between closure and non-closure groups.

In the present study we studied the short-term outcomes of closure versus non-closure of peritoneum at caesarean section (primary and repeated section), and compared postoperative morbidity of cited techniques and concluded that non-closure of the visceral and parietal peritoneum was associated with improvement in the short term postoperative outcome and is perhaps a preferred way to manage the CS patients which is corroborating with the studies cited.

CONCLUSION

A standardized approach that removes unjustified variability can independently improve safety, efficiency and effectiveness in a health care system. Routine closure of the peritoneum was evaluated in our cohort study.

In the present study we assessed the effects of non-closure as an alternative to closure of the peritoneum at CS on intra-operative and immediate postoperative outcomes. Based on our observation we can found that that non-closure of the peritoneum at caesarean section is associated with reduced operation time which in turn reduces the anaesthetic exposure. In the present study non-closure of the peritoneum was also associated with significantly less pain intensity, less demand for analgesia and shorter duration of hospital stay. However in the present study long term outcomes were not measured.

Our findings indicate that caesarean section without suture re-approximation of the peritoneal cut edges provides a number of significant advantages, as far as the immediate post-operative period is concerned. Future studies to address long term outcomes such as adhesions, intestinal obstruction and the functional integrity of the uterine scar during subsequent pregnancies, need to be done.

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