Closure vs Non-Closure of the Visceral and Parietal Peritoneum at Cesarean Delivery: 16 Year Study

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Objective : *To determine whether non-closure of visceral and parietal peritoneum at LSCS has advantages over peritoneal closure with regard to postoperative complication and adhesions.*
Study design : *Prospective randomized controlled trial.*
Setting : *Paholpolpayuhasena Hospital, Kanchanaburi province, Thailand.*
Subjects and Method : *Three hundred and sixty full-term pregnant women undergoing first cesarean section were divided into 3 groups (N = 120). Group A: non-closure of both visceral and parietal peritoneum. Group B: non-closure of only visceral peritoneum. Group C: closure of both visceral and parietal peritoneum. Postoperative complications were compared. Adhesions were evaluated in 65 patients returning for a second LSCS and compared for severity of adhesions. The three groups were compared using statistical analysis.*
Result : *There was no significant statistical difference between group A and C , group B and C for postoperative complications or number of adhesion formation. However, adhesions in the closure group were more severe.*
Conclusions : *Closure of visceral and parietal peritoneum has no benefit over non-closure of visceral peritoneum and non-closure of both visceral and parietal peritoneum at LSCS.*

Keywords : *Cesarean delivery, Non-closure peritoneum, Adhesion, 16 year study.*

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Closure of the peritoneum during lower segment cesarean section (LSCS) has long been considered a standard procedure to 1) restore the normal anatomy and approximate the tissue for healing, 2) reestablish the peritoneal barrier to reduce the risk of infection, 3) reduce the risk of wound herniation or dehiscence, and 4) minimize adhesion formation. Numerous human and animal studies have shown that there are no disadvantages to non-closure of the peritoneum. The arguments against peritoneal closure involve the following. 1) Peritoneum has the innate ability to rapidly heal itself. Being a mesothelial organ with the capacity to initiate multiple sites of repair, the peritoneum can simultaneously heal throughout the wound. Experimental studies have shown that if the peritoneum is left open, a spontaneous reperitonealization will appear within 48 to 72 hours with complete healing after 5-6 days. 2) Studies have shown that there is no difference in postoperative complications between closure and non-closure. 3) Non-closure of the peritoneum contributes to less adhesion. When injured, the peritoneum responds initially by producing a fibrin matrix and proceeds with fibrinolysis to break down the fibrin. Reaproximation of the peritoneal edges with suture material is suspected to result in tissue ischemia, necrosis, foreign body tissue reaction, suppression of fibrinolysis and thus increased risk in adhesion formation. Animal studies have shown that adhesion formation is a common consequence of peritoneal closure. 4) Non-closure of the peritoneum reduces the amount of surgical intervention and saves on valuable operating time and cost[1-12].

Peritoneal adhesions are of major medical importance and are associated with clinical problems such as chronic pain, infertility, and bowel obstructions. Therefore, it is important to design a study to investigate ways to decrease the incidence of surgical adhesions. The purpose of this study was to compare

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the short and long-term postoperative effects of closure versus non-closure of the visceral and/or parietal peritoneum in LSCS, with the hypothesis that non-closure of the peritoneum would reduce the amount of postoperative complications and adhesion formation.

Material and Method

The study approved by the hospital review board for research, was conducted at Paholpolpayuhasena Hospital, Kanchanaburi province, Thailand. From September 1, 1987 to August 31, 1991; 360 full-term single fetus, primipara, being women of Kanchanaburi province, delivered by LSCS, were included in the study. Women with preoperative diseases or infections, previous complications of pregnancy, or previous laparotomy were excluded. The women were controlled for age, indication for LSCS and procedure (excluding visceral/parietal peritoneal closure). One patient who had been found to present adhesion at 1st LSCS was also excluded from the study. All women underwent a low midline abdominal incision under general anesthesia (same anesthetic agent used throughout). All the staff who recorded the operative data performed the procedures. Each surgeon randomized and separated the women by running number into 3 groups. The visceral and parietal peritoneum were left unclosed in group A. The parietal peritoneum was closed in Group B. Group C was the control group whose visceral and parietal peritoneum were closed routinely.

A standard technique for LSCS was performed. The uterine incision was closed with 2 layers of continuous 1 chromid cat gut suture, the peritoneum with a continuous 000 chromid cat gut, and the fascia with a continuous 2 polyglactin suture. The skin was approximated by interrupted 000 plain cat gut subcutaneous sutures, then skin suture with interrupted 000 mersilk sutures. A urinary catheter was routinely inserted throughout the operation and was removed after skin closure. Intermittent catheterization was done if the patient could not void within 8 hours. Prophylactic antibiotics were used with the discretion of the surgeon. The postoperative care staff recorded all postoperative data and were blinded to which procedure was performed on each patient. During first 24 hour postoperative period, pain was released with opioid injection $\underline{q}$ 4 hrs then changed to paracetamol 1,000 milligrams $\underline{q}$ 4 hrs on day 1 as the patient requested when oral diet was started (the operative day was day 0). The dry dressing wound was applied on day 4 and stitches were removed on day 7 prior to patient discharge. A postpartum examination was done 6 weeks after delivery by PV and PAP smear. All data was collected systematically.

Febrile morbidity was defined as a non-specific fever above 38°c lasting for more than 24 hours. Endomyometritis was diagnosed from uterine tenderness and offensive lochia with fever. Wound infection was diagnosed by erythema, induration, or purulent discharge. Cystitis was diagnosed by clinical dysurination or frequent micturation, with wbc >10 cells/HF from microscopic examination of midstream or catheterized urine.

The surgeon performing the second LSCS, noted the operative findings concerning intra-abdominal adhesion, including the site and degree of adhesion. The surgeon was blinded to which procedure had been done during the previous LSCS. The women were classified into four groups; group I no adhesion, group II mild adhesion ($\leq$ 3 cm band), group III moderate adhesion (> 3 – 5 cm band), group IV severe adhesion (>5 cm band and or difficult to lysis). Sixty-five of the 360 patients underwent a second LSCS between September 1988 and December 2003 (20 patients in group A, 20 patients in group B, and 25 patients in group C). All of them had no other abdominal operations between the two LSCS. The shortest interval period between the 2 operations was 1 year, the longest 11 years. Most of the patients underwent the second LSCS within 3 to 5 years.

Chi-square test or Fisher exact test were used for statistical analysis, with a $p < 0.05$ considered significant.

Results

Postoperative complications at first LSCS are shown in Table 1. There was no statistical significance when comparing group A to group C and group B to group C for postoperative complications. One patient was readmitted 3 weeks postoperative from puerpural sepsis. Prophylactic antibiotics were more often used in group C, but no statistical significance was found. Three patients (one of each group) had prolonged hospitalization to day 8 due to infected wound and secondary suture.

Table 2 presents the results of adhesion formation at 2nd LSCS of the 65 patients. There was no significant statistical difference between the groups, however the authors did find more severe adhesion in patients in group C. The details of the patients who had intra-abdominal adhesion are shown in Table 3.

Table 1. Postoperative complications at first LSCS operations

Complications	Group A N=120	Group B N=120	Group C N=120
- Febrile morbidity	22	19	17
- Wound infection	4	1	4
- Endomyometritis	2	1	0
- Cystitis	9	18	9
- PPH	-	- PPH 3rd wk 1	- PPH 1
- Others infection	-	- Pneumonia 1	- Puerpural sepsis, readmission 3rd wk
Total complications	37	41	32
Prophylactic AB	58	52	63

Table 2. Intra-abdabdominal adhesions found in 2nd LSCS

Adhesion	Group A N=20	Group B N=20	Group C N=25
- no adhesion	16	17	22
- mild adhesion	1	1	0
- Moderate adhesion	2	1	0
- Severe adhesion	1	1	3
total adhesion	4	3	3

The more serious the indication for LSCS in group A and B resulted in more severe adhesion. One patient from group A (A-1) who had severe adhesion, had febrile morbidity with antibiotic use (F morbid + AB) lasting for 5 days after first LSCS. Another patient from group A (A-4) also had previous prolonged febrile morbidity, but presented with mild adhesion. Three cases from group C had only low grade fever with prophylactic antibiotics, of the 2 cases (C-1, C-2) yet resulted in severe adhesion. All of mild adhesions appeared along the incision of the abdomen, always involving the omentum. The more severe adhesions, extended to the lower uterine segment and bladder wall area. The mild and moderate adhesions in group B also appeared on the abdominal wall along the incision line. There were no other sites of adhesions in the abdominal cavity. The authors did not find any intra-abdominal infections, wound herniation, or wound dehiscence. During the 16 year period. Five patients safely had trans vaginal delivery. Two patients suffered from endometriosis, and one patient died from HIV infection in October 2000.

Discussion

The peritoneal defect is restored simultaneously by "metastasis" of nearby mesothelial lining cells, and the duration of repair is independent of the size of the peritoneal defects[1-7]. Adhesion formation is suspected to relate to tissue ischemia and necrosis, infection, foreign body contamination and surgical technique. From animal studies, closure of the parietal peritoneum is associated with more adhesion formation when compared to non-closure for spontaneous healing[5-9]. Therefore, suturing the peritoneum may actually increase the risk of adhesion development.

In human subjects, many reports have expressed different findings, comparing closure and

Table 3. Patients of postoperative adhesions

Gr-no	Age	Indication for LSCS	Complication After 1st LSCS	Mild adhesion 1-3 cm	Mod. adhesion >3-5 cm	Severe adhesion > 5 cm
A-1	18	Prolong 2nd stage	F.Morbid 5d + AB	-	-	√
A-2	22	CPD	Low grade fever 2 days	√	-	-
A-3	21	CPD	Low grade fever 4 d +AB	√	-	-
A-4	35	CPD	F.Morbid 4d + AB	√	-	-
B-1	26	CPD	Morbid 2 d	√	-	-
B-2	23	Fail F/E	Low grade fever 2 days	-	√	-
B-3	21	PRM	Cystitis with fever	√	-	-
C-1	18	CPD	Low grade fever 3 d + AB	-	-	√
C-2	27	CPD	Low grade fever 2 d + AB	-	-	√
C-3	20	CPD	Low grade fever 2 d	-	-	√

non-closure of the peritoneum. Studies have found no difference in postoperative complications[10-14], febrile morbidity[15,16], wound dehiscence[1,3,4,16-18], return of bowel function[11,16,17], urinary tract infection [16,17], postoperative pain and length of hospital stay[15]. On the other hand, peritoneal closure correlated with a significantly higher incidence of febrile morbidity and wound infection[17,18,] cystitis[16], endometritis[18], increased postoperative pain with more narcotics use[10-12,18], prolonged hospital stay[11,17,18], and antibiotic use[18]. Tulandi, et al, performed second look laparoscopy one year after reproductive surgery (N= 333). They confirmed that non-closure of the parietal peritoneum (N = 57) did not increase adhesion formation, when compared to the closure group (N = 63)[13]. Roset E,et al, mentioned 29 patients of subsequent abdominal surgery after LSCS (N = 144). Fourteen patients presented with adhesion (8 in closure and 6 in the non-closure group; P=0.47)[16]. From many studies, it has been concluded that routine closure of visceral and or parietal peritoneum should be omitted during cesarean delivery[1,2,10,11,17,18]. Closure of the peritoneum also plays no role in other gynecologic surgery[13,19] and even radical abdominal hysterectomy and nodal resection[20]. However, today peritoneal closure is used as a routine standard procedure and is incorporated into the training experience. It is probable that this procedure has been used for a long time previously, since no definite serious complications were found. The present study compared primary LSCS among three groups; non-closure of visceral and parietal peritoneum, only visceral peritoneum non-closure, and both peritoneum closure. It is the longest study (16 years) investigating adhesion during second look operation at the second LSCS.

By short-term evaluation of postoperative and postpartum period of the first LSCS, the authors found no significant statistical difference of postoperative complications among the three groups. By process of operation, it is clear that operating time, anesthetic exposure, and operative cost were reduced in the non-closure group, so it was not studied. One puerperal sepsis patient (closure group) was admitted on the 3rd week of postoperative period; there was no other serious complication. Incision hernia and wound dehiscence were not found in the present study. Prophylactic antibiotics were frequently used in the present study since all primary operations were performed as emergency LSCS. Long term evaluation, during second LSCS, showed no significant statistical difference in the number of patients who had adhesions. However, the adhesions were more severe in the closure group.

When comparing closure and non-closure of both visceral and parietal peritoneum, peritoneal closure did not reduce the risks of infection, wound herniation or dehiscence, nor did it minimize adhesion formation. When the peritoneum was left unclosed, tissue healing allowed for restoration of normal pelvic anatomy. From the present study, it was suggested that closure of visceral and parietal peritoneum may be omitted in LSCS. Peritoneal closure did not demonstrate any benefits to more adhesions than non-closure. The limitation of this study was the small sample size. However, the results of the study are favorable on non-closure of both parietal and visceral peritoneum. Further studies are suggested to confirm this finding.

Conclusion

A prospective randomized controlled trial was done for 16 years. The hypothesis tested was that non-closure of the visceral and parietal peritoneum might benefit the patients of fewer postoperative complications and less adhesion formation. The research rejected the hypothesis because postoperative complications between the three groups were not statistically significant. Closure of visceral and parietal peritoneum showed no benefit over non-closure. However, adhesion formation was less severe in non-closure patients.

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16 ปีของการศึกษาการไม่เย็บปิดเยื่อบุช่องท้องในการผ่าตัดคลอดบุตร

วราพร วีรเวทวัฒน์, สายัณฑ์ บูรณวนิช, มนัส คณาวงษ์

วัตถุประสงค์ *: เพื่อเปรียบเทียบการเย็บปิดและไม่เย็บปิดเยื่อบุช่องท้อง ขณะทำการผ่าตัดคลอดบุตร ถึงผลความแตกต่างในด้านภาวะแทรกซ้อนหลังการผ่าตัด และการเกิดเยื่อพังผืดยึดติดภายหลังการผ่าตัด*

วิธีการ *: ตั้งแต่วันที่ 1 กันยายน 2530 ถึง 31 สิงหาคม 2534 จำนวนหญิงตั้งครรภ์เดี่ยว อายุครรภ์ครบกำหนด และเป็นครรภ์แรก ที่รับการผ่าตัดคลอดบุตร ณโรงพยาบาลพหลพลพยุหเสนา จำนวน 360 ราย แบ่งเป็น 3 กลุ่ม ๆ ละ 120 ราย กลุ่ม A ไม่เย็บปิดทั้ง visceral และ parietal peritoneum กลุ่ม B ไม่เย็บปิด visceral แต่เย็บปิด parietal peritoneum กลุ่ม C เย็บปิด peritoneum ทั้ง 2 แห่ง ทำการศึกษา เปรียบเทียบภาวะแทรกซ้อนภายหลังการผ่าตัด จนสิ้นสุดระยะหลังคลอด ภายหลังการเก็บข้อมูลต่อมา 16 ปี (สิ้นสุดวันที่ 31 ธันวาคม 2546) พบว่า ผู้ป่วยทั้ง 3 กลุ่มมารับการผ่าตัดคลอดบุตรครั้งที่ 2 จำนวน 20, 20 และ 25 รายตามลำดับ ศึกษาเปรียบเทียบการเกิดพังผืดยึดติดภายในช่องท้องขณะทำการผ่าตัด*

ผลการศึกษา *: การเกิดภาวะแทรกซ้อนหลังการผ่าตัดและการเกิดพังผืดยึดติดภายในช่องท้องของ ผู้ป่วยทั้ง 3 กลุ่ม ไม่มีความแตกต่างกันตามนัยสำคัญทางสถิติ (chi–square test, p > 0.05) แต่พบว่าการเย็บปิดเยื่อบุช่องท้องตามปกติ (กลุ่ม C) มีพังผืดเกิดขึ้นรุนแรงมากกว่า อีก 2 กลุ่ม*

สรุป *: การเย็บปิดเยื่อบุช่องท้องทั้ง visceral และ parietal peritoneum ในการทำผ่าตัดคลอดบุตรไม่ช่วยให้ภาวะแทรกซ้อนภายหลังการผ่าตัดลดลง และไม่ช่วยลดการเกิดพังผืดยึดติดภายในช่องท้องเมื่อเปรียบเทียบกับการปล่อยทิ้งไว้โดยไม่เย็บ*