The impact between peritoneal closure and non-closure on the risk of adhesion in cesarean section: a systematic review

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ABSTRACT

Background: Caesarean section is one of the most frequently performed major surgical procedures worldwide. Peritoneal sutures in the cesarean section are performed via absorbable or delayed sutures. There is controversy over the choice of technique (continuous or interrupted) to close this layer, even among surgeons who believe in closing this layer. Overall, there are still differing opinions regarding the closure of this layer. This study examines how the study of the impact of peritoneal closure with no closure at the cesarean section on the risk of adhesions.

Methods: Systematic Literature Review Research is the method selected by researchers in this study. Researchers will describe facts, data and information obtained from literature studies such as books and journals to research results related to the research topic. The quality of the articles was reviewed based on PRISMA and PICO guidelines so that as many as 7 articles were synthesized in the final review report from the literature.

Results: It is known that the incidence of births worldwide by Caesarean section (CS) is increasing. Many births after CS have previously been performed by repeat surgery, either with elective CS or after an unsuccessful delivery attempt. The formation of these adhesions is associated with increased maternal morbidity in patients with recurrent CS. In studies, non-closure of the peritoneum appears to save time and costs and therefore lacks the adhesions that cause infertility. However, not closing the parietal peritoneum will cause adhesions without causing infertility. These adhesions can cause long operating times, recovery, and increased postoperative pain in the second cesarean section. In studies, non-closure of the peritoneum appears to save time and costs and therefore lacks the adhesions that cause infertility.

Conclusion: Caesarean section is a very common surgical procedure worldwide. Suturing the peritoneal lining in the cesarean section can provide benefits or not. Therefore it is necessary to evaluate whether this step should be omitted.

Keywords: Adhesion, Caesarean, Peritoneal, Risk.

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INTRODUCTION

The well-being of babies and mothers is the cornerstone of midwifery. Childbirth was accomplished by vaginal birth for many years. With the increasing use of antibiotics and the number of operations, infant and maternal mortality and morbidity become important after vaginal delivery. Surgeons prefer Caesarean Section (CS) over vaginal delivery to reduce fetal and maternal mortality. Currently, the increasing number of unnecessary cesarean sections is a big problem in the global world. Many countries are trying to use different procedures to increase vaginal births. All policies encouraging patients and doctors to vaginal delivery are not enough to reduce the number of unnecessary cesarean sections worldwide. Cesarean section is one of the most frequently performed major surgical procedures worldwide, accounting for up to 70% of deliveries, depending on the facility being assessed and the country involved. Worldwide rates are around 5% to over 20% of all deliveries. Figures between 20% and 25% have been reported from the UK, the US and China. A rate of 57% was reported from a private hospital in South Africa. There are many possible ways to perform a cesarean section and the surgical techniques used for a cesarean section vary. The technique may depend on many factors, including the clinical situation and operator choice. Some of these techniques have been evaluated through randomized trials.

Generally, a laparotomy is called an incision in the abdomen that opens the abdominal cavity. The incisions commonly used in abdominal exploration are vertical, transverse incisions and oblique/transverse incisions. Vertical incisions include midline and paramedian incisions. Nearly all abdominal and retroperitoneal surgical interventions can be performed with a midline incision. Generally, the term laparotomy is called a midline incision. The peritoneum is the innermost layer of the abdominal wall, which, once opened, the abdominal cavity becomes available. After abdominal surgery, some surgeons suture this lining...
and believe that this action can strengthen the wound and abdominal wall, but on the other hand, some surgeons close the abdominal cavity without suturing this lining and believe that closing this layer can extend the time and cost of surgery and even postoperative pain for patients. Peritoneal sutures are performed via absorbable or delayed sutures. There is controversy over the choice of technique (continuous or interrupted) to close this layer, even among surgeons who believe in closing this layer. Overall, there are still differing opinions regarding the closure of this layer. Some surgeons choose to suture this lining to preserve the anatomical structure of the abdominal wall and reduce the risk of infection, rupture and incisional hernias, bleeding and adhesions. These adhesions are the most common sequelae of intra-abdominal and pelvic surgery and are a significant cause of morbidity among postoperative patients. The incidence of adhesive small bowel obstruction (SBO) is 2%. Among patients with a known cause of SBO, adhesions are the most common cause. Using good surgical techniques is recommended as the first step in preventing adhesions. However, evidence of different surgical techniques to reduce adhesion formation needs confirmation.

On the other hand, other surgeons will not suture this lining because of its rapid healing within 48 to 72 hours without sutures and reduced operative time, analgesic requirement, wound infection and length of stay. Peritoneal closure persists, even exceeding the technique that should be done. Based on a previous study, there appears to be agreement regarding peritoneal closure in obstetric operations such as hysterectomy and cesarean section, but the disagreement seems to continue in other fields of surgery. Thus, despite the disagreements, this systematic literature review aims to compare the impact of peritoneal closure versus non-closure on the risk of adhesions in cesarean section.

**METHODS**

The literature review in this study was carried out through a systematic selection that was traced from international databases. The author searches data sources from various databases, including PubMed (https://pubmed.ncbi.nlm.nih.gov/) and Google Scholar. The literature search technique uses keywords that match the questions from the research. The keywords used as the basis for the literature search are Peritoneal, Caesarean and Adhesion. Search articles using English and the year of publication is limited to the last 10 years (2013-2023).

**Figure 1** illustrates the process of selecting articles using the guidelines from Preferred Reporting Systematic Reviews and Meta-analysis (PRISMA). An initial search found that the number of articles from 2013-2023 was 276 articles. Next, the articles are screened. A total of 7 articles were entered into the next stage. The quality of the articles was reviewed so that as many as 7 articles were synthesized in the final review report from the literature.

**RESULTS**

The researcher selected the articles and extracted data on each article obtained from each database. The article's results were reviewed regarding the study of the impact of peritoneal closure with non-closure on the risk of adhesions in the cesarean section in Table 1.

**DISCUSSION**

Cesarean Section (CS) is the most common surgical procedure performed worldwide. The traditional lower segment cesarean section surgical approach includes visceral and parietal peritoneum closure. Suggested advantages of peritoneal closure include restoring normal anatomy and adjacent tissue, reducing the incidence of infection by rebuilding the natural anatomical barrier, reducing wound dehiscence, reducing bleeding, and minimizing the incidence of adhesion formation. Adhesions that develop after CS procedures are associated with several side effects, manifesting as chronic pain, delayed female conception, and varying degrees of intestinal obstruction. In addition, postoperative adhesions have been associated with prolonged delivery of the baby during recurrent CS. Peritoneal healing has been previously reported to occur with metaplasia of the underlying connective tissue. The peritoneum regenerates within 5-8 days after surgery.

Adhesions are one of the most important postoperative complications seen after laparotomy. Development of adhesions after a CS procedure will increase the time of subsequent CS operations; increase the incidence of unintentional trauma to the bowel, bladder, and ureters; and increase bleeding complications. It has been reported that 6 and 8% of women who undergo cesarian section are readmitted to the operating room to manage complications of adhesions that develop after a previous CS. So, adhesions can be considered one of the important causative factors in secondary female infertility. Controversy still exists regarding the formation of adhesions after the closure of the peritoneum or leaving it open.
To compare the short-term and long-term benefits of peritoneal closure with non-closure in an academic medical center

To assess maternal and neonatal outcomes of skin scars are related to the presence and severity of abdominal or pelvic adhesions in women who have undergone a previous cesarean section

To investigate whether characteristics of skin scars are related to the presence and severity of abdominal or pelvic adhesions in women who have undergone a previous cesarean section

To determine the non-closing of the parietal peritoneum on the cesarean section

To compare the results of peritoneal and non-closure during a cesarean section

To assess the effect of non-closure as an alternative to peritoneal closure in the cesarean section on intraoperative and immediate and long-term postoperative outcomes

Table 1. Literature review of the impact between peritoneal closure and non-closure on the risk of adhesion in cesarean section

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Methods</th>
<th>Purposes</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tofigh AM et al.</td>
<td>Clinical Trial</td>
<td>To compare the short-term and long-term benefits of peritoneal closure with non-closure in an academic medical center</td>
<td>The non-peritoneal closure group had lower rates of fever, infection, and analgesic requirements than the peritoneal closure group, but these differences were not statistically significant. Adhesion rates and incidence of incisional hernia one year after surgery did not differ significantly between the two groups. Pain intensity was significantly lower in the non-closure group than in the closure group in the first two, six, and 24 hours.</td>
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<tr>
<td>Mooij Ret al.</td>
<td>Cross-Sectional</td>
<td>To assess maternal and neonatal outcomes and mortality after recurrent CS in a rural hospital in a low-income country (LIC) and to analyze the effect of surgical technique on adhesion formation.</td>
<td>Of 3966 births, 450 were with CS (11.3%), of which 321 were CS 1, 80 CS 2, 36 CS 3, 12 4 and one 5 CS (71, 18, 8, 3 and 0.2 respectively %). Adhesion was considered severe at 56% second CS and 64% third CS. In the 2nd CS, the adhesions were not associated with peritoneal closure in the 1st CS but were related to using a previous midline skin incision. There was no increase in maternal morbidity when there was severe adhesions. Adhesions after CS are common and occur more frequently after midline skin incisions in the first CS than with transverse incisions.</td>
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<tr>
<td>Kokanli D et al.</td>
<td>Prospective Study</td>
<td>To investigate whether characteristics of skin scars are related to the presence and severity of abdominal or pelvic adhesions in women who have undergone a previous cesarean section</td>
<td>During laparoscopic surgery, adhesions were detected in the upper part of the abdominal cavity in 30 women, in the middle in 46 women and the lower part in 82 women. The total abdominal scar score was significantly improved in women with adhesions in all three abdominal areas. Multiple C-section scars and palpable scars are more common in women with adhesions. A significant positive correlation was found between skin scar and adhesion scores in all abdominal regions.</td>
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<tr>
<td>Çim N et al.</td>
<td>Prospective Study</td>
<td>To assess whether abdominal scar characteristics and peritoneal closure are associated with pelvic adhesions</td>
<td>Adhesion after surgical operations is critical because of complications for the patient, complications of relaparotomy, and high costs. Depressed abdominal scars and hypopigmentation may be associated with pelvic adhesions. The results of this study suggest that covering or non-closing the parietal peritoneum is not associated with hip adhesions. The enclosure of the parietal peritoneum may take time during the first operation, but uncovering it will increase omentum adhesions to the Scarpa fascia. It will longer the time for the second re-cesarean. Therefore, recovery at the second operation will be delayed in non-closure patients</td>
</tr>
<tr>
<td>Gultekin N.</td>
<td>Retrospective Study</td>
<td>To determine the non-closing of the parietal peritoneum on the cesarean section</td>
<td>The non-peritoneal closure group had lower rates of fever, infection, and analgesic requirements than the peritoneal closure group, but these differences were not statistically significant. Adhesion rates and incidence of incisional hernia one year after surgery did not differ significantly between the two groups. Pain intensity was significantly lower in the non-closure group than in the closure group in the first two, six, and 24 hours.</td>
</tr>
<tr>
<td>Takream A.</td>
<td>Comparative Study</td>
<td>To compare the results of peritoneal and non-closure during a cesarean section</td>
<td>The results of this study suggest that covering or non-closing the parietal peritoneum is not associated with hip adhesions. The enclosure of the parietal peritoneum may take time during the first operation, but uncovering it will increase omentum adhesions to the Scarpa fascia. It will longer the time for the second re-cesarean. Therefore, recovery at the second operation will be delayed in non-closure patients</td>
</tr>
<tr>
<td>Bamigboye et al.</td>
<td>Intervention Review</td>
<td>To assess the effect of non-closure as an alternative to peritoneal closure in the cesarean section on intraoperative and immediate and long-term postoperative outcomes</td>
<td>Sixty-five cases of peritoneal closure and 30 cases of non-peritoneal closure were followed up. There were more cases of adhesions in the non-closure group (p&lt;0.05). Peritoneal closure is useful in routine cesarean sections.</td>
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</tbody>
</table>

in previous CS. Both opinions have a reasonable justification. Opinions in favor of nonclosure report that peritoneal healing occurs by simultaneous multisite healing due to migrating mesothelial cells with mesothelial matrix formation without needing peritoneal repositioning. They also added that peritoneal closure will cause foreign body reactions to the suture material, ischemia, and tissue necrosis, impairing natural healing and increasing adhesion formation. Recently, a meta-analysis compared adhesions after peritoneal closure or non-closure during CS based on three well-organized RCTs; the authors of this metaanalytic work concluded that peritoneal closure has the advantage of significantly
reducing adhesion formation. Because the CS procedure has many technical modifications, it is not sufficient to differentiate groups regarding adhesion formation by peritoneal closure alone and non-closure because other variables, such as a longer abdominal operating time or bladder compression, may also occur contributed to the development of adhesions after previous laparotomy.14

Most studies recommending peritoneal closure during CS procedures have never considered the long-term side effects and complications expected after successive surgical procedures, including adhesion formation.1 After a cesarean section, peritoneal closure has become standard practice, as it is considered possible by several factors such as 1) Restoration of anatomy and tissue approximation for healing; 2) Re-establishment of the peritoneal barrier to reduce the risk of infection; 3) Reduction of the risk of herniation or wound dehiscence; and 4) Minimizes the formation of adhesions.1

The peritoneum has the innate ability to heal itself quickly. As a mesothelial organ initiating multiple repair sites, the peritoneum can simultaneously heal all wounds. In the case of non-closure peritoneum, spontaneous reperitonealization will appear within 48 to 72 hours and complete healing after 5-6 days.20 Non-coverage of the peritoneum contributes to less adhesion. When injured, the peritoneum initially responds by producing a fibrin matrix and continues with fibrinolysis to break down the fibrin. Reapproximating the peritoneal rim with suture material is thought to result in tissue ischemia, necrosis, foreign body tissue reaction, suppression of fibrinolysis and thereby increasing the risk of adhesion formation.21 In addition, non-closure of the peritoneum reduces the number of surgical interventions and saves valuable operative time and costs. Previous studies, which compared post-caesarean pain intensity between the peritoneal closure and non-closure groups, have concluded no difference in postoperative pain in the two groups at successive caesarean sections.22-25

CONCLUSION

Cesarean section is a very common surgical procedure worldwide. Suturing the peritoneal lining in the cesarean section can provide benefits or not. Therefore it is necessary to evaluate whether this step should be omitted. In cesarean section, closure or non-closure of the parietal and/or visceral peritoneum has both short and long term advantages and disadvantages. Based on a review of the literature, it is known that peritoneal non-closure is recommended because it reduces the time of the surgical procedure and reduces the duration of anesthesia and drugs, in addition to faster recovery and early hospital discharge. During cesarean delivery, surgical time, hospital stay, pain, adhesion formation, febrile morbidity, and infection were less in non-closure patients.

CONFLICT OF INTEREST

There is no competing interest regarding the manuscript.

ETHICS CONSIDERATION

This study has obtained informed consent and followed COPE and ICMJE guidelines regarding publication ethics protocol.

FUNDING

None.

AUTHOR CONTRIBUTION

All authors equally contribute to the study from the conceptual framework, data acquisition, and data analysis until reporting the study results through publication.

REFERENCES


