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The impact of parietal peritoneal closure on postoperative recovery following cesarean section: A prospective observational study

Sezaryen keside parietal periton kapatılmasının postoperatif iyileşme üzerine etkisi: Prospektif gözlemsel çalışma

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ABSTRACT

Aim: Caesarean section is one of the most frequently performed surgical procedures in obstetrics. Supporting early functional recovery in the postoperative period is of critical importance for maternal health and healthcare efficiency. This study aimed to investigate the short-term effects of parietal peritoneal closure on postoperative recovery following caesarean delivery.

Materials and Methods: This prospective observational study included women aged 18–45 years who underwent elective caesarean section under spinal anesthesia between January 15 and June 15, 2025. Emergency cases, procedures performed under general anesthesia, and high-risk pregnancies were excluded. Postoperative recovery was evaluated multidimensionally using the EQ-5D Quality of Life Scale, the Katz Index of Independence in Activities of Daily Living, and the Obstetric Quality of Recovery (ObsQoR) score. Additional outcomes included pain scores, return of gastrointestinal function, requirement for additional analgesics, and hematological parameters (NLR, PLR).

Results: A total of 120 women were enrolled, with 60 in the peritoneal closure group and 60 in the non-closure group. On postoperative day 5, EQ-5D scores were significantly higher in the closure group ($p < 0.05$). No statistically significant differences were observed between groups in terms of pain intensity, gastrointestinal recovery, additional analgesic requirement, or hematological parameters (NLR, PLR).

Conclusion: The findings suggest that routine parietal peritoneal closure does not provide additional benefits for short-term postoperative recovery when considering early return to daily activities and inflammatory markers. Therefore, the decision to close the peritoneum may be better guided by surgical preference and intraoperative conditions rather than routine practice.

Keywords: Quality of life, cesarean section, peritoneal closure

ÖZ

Amaç: *Sezaryen doğum, obstetride en sık uygulanan cerrahi girişimlerden biridir. Postoperatif dönemde erken fonksiyonel iyileşmenin desteklenmesi, anne sağlığı ve sağlık hizmetlerinin etkinliği açısından kritik öneme sahiptir. Bu çalışma, sezaryende parietal periton kapatılmasının kısa dönem postoperatif iyileşme üzerindeki etkilerini araştırmayı amaçlamaktadır.*

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Gereç ve Yöntem: *Bu prospektif gözlemsel çalışmaya, 15 Ocak–15 Haziran 2025 tarihleri arasında spinal anestezi altında elektif koşullarda sezaryen uygulanan, 18–45 yaş aralığındaki kadınlar dahil edilmiştir. Acil sezaryenler, genel anestezi uygulananlar ve yüksek riskli gebelikler dışlanmıştır. Postoperatif iyileşme; EQ-5D Yaşam Kalitesi Ölçeği, Katz Günlük Yaşam Aktiviteleri İndeksi ve Obstetric Quality of Recovery (ObsQoR) skoru ile multidisipliner biçimde değerlendirilmiştir. Ayrıca ağrı skorları, gastrointestinal fonksiyonların geri dönüşü, ek analjezik gereksinimi ve hematolojik parametreler (NLR, PLR) karşılaştırılmıştır.*

Bulgular: *Çalışmaya toplam 120 olgu alınmış olup, 60'ı periton kapatma, 60'ı kapatmama grubunda yer almıştır. Parietal periton kapatma grubunda postoperatif 5. günde EQ-5D skorları anlamlı düzeyde daha yüksek bulunmuştur ($p < 0.05$). Bunun dışında ağrı skorları, bağırsak fonksiyonlarının geri dönüşü, analjezik ihtiyacı ve hematolojik parametreler (NLR, PLR) açısından gruplar arasında istatistiksel olarak anlamlı fark saptanmamıştır.*

Sonuç: *Bulgular, erken yaşama dönüş ve inflamatuvar belirteçler dikkate alındığında, rutin parietal periton kapatılmasının kısa dönem postoperatif iyileşmeye ek bir katkı sağlamadığını göstermektedir. Bu nedenle kapatma kararının rutin uygulamadan ziyade cerrahın tercihine ve klinik koşullara göre verilmesi daha uygun görünmektedir.*

Anahtar Sözcükler: *Sezaryen, parietal periton kapatılması, yaşam kalitesi*

INTRODUCTION

Caesarean section (CS) is one of the most frequently performed major surgical procedures in modern obstetrics, with its incidence having increased substantially in many countries over recent decades (1). Since Kerr first described the lower segment caesarean section technique in 1926, routine closure of both the visceral and parietal peritoneum has become a standard surgical practice, traditionally justified by potential benefits such as restoring anatomical integrity, reducing infection risk, preventing wound dehiscence, and minimizing postoperative adhesion formation (2). However, the clinical evidence supporting these theoretical advantages remains limited and inconsistent (3).

Proponents of peritoneal closure argue that reconstructing the anatomical barrier may reduce early postoperative complications and lower the risk of adhesion-related morbidity during future abdominal or pelvic surgeries. In contrast, several randomized controlled trials and systematic reviews have suggested that omitting peritoneal closure could offer certain benefits, including shorter operative time, reduced exposure to anesthesia, earlier return of bowel function, decreased need for analgesics, and shorter hospital stays (4). Furthermore, because the parietal peritoneum is richly innervated with somatic pain fibers, avoiding its manipulation and suturing may limit tissue trauma, ischemia, and inflammation, thereby reducing postoperative pain and potentially decreasing adhesion formation (5). Despite these proposed advantages, some studies have reported no significant differences between closure and non-closure techniques regarding pain scores, infection rates, or length of hospital stay. These conflicting results underscore the need for further prospective research to clarify the short-term clinical effects of parietal peritoneal closure versus non-closure (6).

Given the global rise in CS rates and the possible influence of surgical techniques on maternal recovery, even small improvements in postoperative outcomes could have meaningful implications for healthcare systems and patient quality of life. Determining whether peritoneal closure affects early recovery parameters such as pain intensity, mobility, analgesic use, and time to discharge could guide evidence-based surgical decision-making and support optimization of postoperative care in obstetrics.

The present prospective observational study aims to evaluate the impact of parietal peritoneal closure versus non-closure in elective CS on short-term surgical outcomes, including postoperative pain, functional recovery, analgesic requirements, and length of hospital stay. These outcomes will be assessed using the EQ-5D Quality of Life Scale, the Katz Index of Independence in Activities of Daily Living, and the Obstetric Quality of Recovery (ObsQoR) score.

MATERIALS and METHODS

This prospective, non-randomized observational study was conducted at the Department of

Obstetrics and Gynecology of a tertiary center, between January 15, 2025, and June 15, 2025, following approval by the institutional ethics committee. (Desicion No: 2025/04-01). Written informed consent was obtained from all participants. The inclusion criteria were defined as women aged 18–45 years who underwent elective caesarean section under spinal anesthesia during the study period. Exclusion criteria included emergency caesarean deliveries, cases performed under general anesthesia, multiple pregnancies, high-risk pregnancies such as preeclampsia, gestational diabetes mellitus, and placenta accreta spectrum disorders, chronic systemic diseases (e.g., cardiac disorders, coagulopathies), and morbid obesity (BMI > 40 kg/m²). Sample size estimation was based on the study entitled “Parietal peritoneal closure versus non-closure at caesarean section: which technique is feasible to perform?”, which indicated that 100 participants (50 per group) would be sufficient to achieve 80% power at a 5% significance level.

All procedures were performed by experienced obstetric surgeons using a Pfannenstiel incision. After entering the abdomen and creating the bladder flap, a transverse lower uterine segment incision was made, the baby delivered, and the placenta allowed to separate spontaneously. The myometrium was closed in a single continuous locked layer using absorbable suture material (Vicryl 1-0). In the closure group, the parietal peritoneum was closed with a continuous absorbable suture (Vicryl 2-0); in the non-closure group, this layer was left unsutured. In both groups, the fascia was closed with continuous absorbable sutures, rectus muscles were not sutured, and subcutaneous tissue was approximated only if thickness exceeded 3 cm. Skin closure was performed with continuous subcuticular sutures. All patients received 10 IU oxytocin after cord clamping and 1 g cefazolin prophylactically. Spinal anesthesia was administered in the sitting position using a 25G pencil-point needle to inject 15–20 mg bupivacaine, achieving a sensory block up to the T4 level. Postoperative analgesia consisted of intramuscular diclofenac 75 mg twice daily during the first 24 hours. From the second postoperative day onward, patients received oral paracetamol 500 mg twice daily. Additional analgesics were given if required.

Demographic and clinical variables including age, gravidity, parity, BMI, gestational age, operative time, estimated blood loss, and pre- and postoperative hemoglobin levels were recorded. Primary outcomes were postoperative pain intensity (measured by the Visual Analog Scale at postoperative 12 hours and 24 hours). functional recovery (assessed by the EQ-5D Quality of Life Scale and the Katz Index of Independence in Activities of Daily Living at both time points), and obstetric recovery (measured by the Obstetric Quality of Recovery-11 [ObsQoR] score). Secondary outcomes included time to first passage of flatus, additional analgesic requirement, and length of hospital stay. Statistical analyses will be performed using SPSS version 23 (IBM Corp., Armonk, NY, USA). Continuous variables will be presented as mean ± standard deviation or median (interquartile range) depending on distribution, while categorical variables will be expressed as frequencies and percentages. The distribution of continuous variables was tested using the Kolmogorov–Smirnov test. Normally distributed variables were compared using the Student’s t-test, while non-normally distributed variables were analyzed with the Mann–Whitney U test.”

RESULT

A total of 120 women who met the inclusion criteria were enrolled, with 60 in the peritoneum not closed group and 60 in the peritoneum closed group. The baseline demographic and clinical characteristics of the participants are presented in Table-1. There were no statistically significant differences between the two groups in terms of mean age (27.80 ± 6.09 vs. 29.03 ± 5.66 years, p = 0.253), body mass index (31.26 ± 2.83 vs. 32.01 ± 3.62 kg/m², p = 0.208), gravidity (2.65 ± 1.40 vs. 2.92 ± 1.64, p = 0.340), or previous abdominal surgery (73.3% vs. 61.7%, p = 0.170). (Table-1)

Perioperative and early postoperative outcomes are summarized in Table-2. No significant differences were found between the groups regarding time to first defecation (29.57 ± 16.07 vs. 33.13 ± 14.29 hours, p = 0.227), time to first solid food intake (11.70 ± 4.62 vs. 12.50 ± 3.86 hours, p = 0.305), time to first passage of flatus (11.18 ± 4.22 vs. 11.33 ± 3.86 hours, p = 0.839), operation time (60.48 ± 24.80 vs. 62.53 ± 21.05 minutes, p = 0.190), or perioperative hemoglobin decrease (1.23 ± 0.74 vs. 1.34 ± 0.75 g/dL, p = 0.410) (Table-2).

Mean VAS scores at 12 and 24 hours postoperatively did not differ significantly between the peritoneum not closed and closed groups (12 h: 7.53 ± 1.31 vs. 7.55 ± 1.32, $p = 0.945$; 24 h: 5.73 ± 1.22 vs. 5.88 ± 1.32, $p = 0.518$). Similarly, no significant differences were found in Katz Index scores on postoperative day 1 (4.87 ± 1.46 vs. 4.63 ± 1.38, $p = 0.369$) and day 5 (5.77 ± 0.62 vs. 5.78 ± 0.56, $p = 0.877$), EQ-5D scores on day 1 (9.90 ± 1.43 vs. 10.15 ± 1.53, $p = 0.357$), or QR-11 scores on day 1 (42.20 ± 7.20 vs. 44.19 ± 11.53, $p = 0.272$) and day 5 (54.25 ± 2.93 vs. 53.04 ± 5.12, $p = 0.121$). However, EQ-5D scores on postoperative day 5 were significantly higher in the peritoneum closed group compared with the non-closure group (8.53 ± 1.08 vs. 7.48 ± 1.37, $p < 0.05$) (Table-3).

In the comparison of hematological parameters between the two groups, no statistically significant differences were observed in preoperative or postoperative neutrophil, lymphocyte, and platelet counts (all $p > 0.05$). Similarly, both preoperative and postoperative NLR and PLR values, as well as their absolute (Δ) and percentage (%Δ) changes, did not show significant differences between the peritoneal closure and non-closure groups. Although postoperative neutrophil and NLR levels tended to increase compared to preoperative values in both groups, the intergroup comparison revealed no significant difference. These findings suggest that peritoneal closure status does not have a measurable impact on systemic inflammatory markers in the early postoperative period (Table-4).

Table-1. Baseline Demographic and Clinical Characteristics

Variable	Peritoneum not closed (Mean ± SD) N=60	Peritoneum closed (Mean ± SD), n(%) N=60	p-value
Age (years)	27.80 ± 6.098	29.03 ± 5.660	0.25
BMI (kg/m²)	31.26 ± 2.825	32.01 ± 3.621	0.20
Gravidity	2.65 ± 1.400	2.92 ± 1.639	0.34
Previous Abdominal Surgery	44(%73.3)	37(%61.7)	0.17

Table-2. Perioperative and Early Postoperative Outcomes by Peritoneal Closure Status in Cesarean Delivery

Parameter	Peritoneum Not Closed (Mean ± SD)	Peritoneum Closed (Mean ± SD)	p-value
Time to First Defecation (hours)	29.57 ± 16.07	33.13 ± 14.29	0.227
Time to First Solid Food (hours)	11.70 ± 4.62	12.50 ± 3.86	0.305
Time to First Flatus (hours)	11.18 ± 4.22	11.33 ± 3.86	0.839
Operation Time (minutes)	60.48 ± 24.80	62.53 ± 21.05	0.190
Decrease in hemoglobin (g/dl)	1.23 ± 0.74	1.34 ± 0.75	0.410

Table-3. Comparison of Postoperative Outcome Scores Between Peritoneal Closure and Non-Closure Groups"

Variable	Peritoneum not closed (Mean ± SD)	Peritoneum closed (Mean ± SD)	p-value
VAS 12 hours	7.53 ± 1.308	7.55 ± 1.320	0.945
VAS 24 hours	5.73 ± 1.219	5.88 ± 1.316	0.518
KATZ Day 1	4.87 ± 1.455	4.63 ± 1.377	0.369
KATZ Day 5	5.77 ± 0.621	5.78 ± 0.555	0.877
EQ-5D Day 1	9.90 ± 1.434	10.15 ± 1.527	0.357
EQ-5D Day 5	7.48 ± 1.372	8.53 ± 1.081	<0.05
ObsQoR-11 Day 1	42.20 ± 7.199	44.19 ± 11.526	0.272
ObsQoR-11 Day 5	54.25 ± 2.934	53.04 ± 5.118	0.121

Table-4. Comparison of Hematological Parameters and Inflammatory Ratios Between Peritoneal Closure and Non-Closure Groups

Parameter	Peritoneum Not Closed (Mean ± SD)	Peritoneum Closed (Mean ± SD)	p-value
Preoperative Neutrophil (×10⁹/L)	7.97 ± 2.32	8.02 ± 2.69	0.903
Preoperative Lymphocyte (×10⁹/L)	2.11 ± 1.55	1.99 ± 0.46	0.556
Preoperative Platelet (×10⁹/L)	229.40 ± 55.50	240.42 ± 70.05	0.342
Postoperative Neutrophil (×10⁹/L)	10.71 ± 3.28	10.86 ± 3.81	0.822
Postoperative Lymphocyte (×10⁹/L)	1.83 ± 0.55	1.70 ± 0.56	0.207
Postoperative Platelet (×10⁹/L)	232.70 ± 75.42	225.88 ± 62.83	0.592
Preoperative NLR	5.28 ± 5.56	4.33 ± 2.20	0.219
Postoperative NLR	6.56 ± 3.34	6.97 ± 3.26	0.493
Δ NLR	1.27 ± 6.33	2.64 ± 3.11	0.136
Pre PLR	146.46 ± 159.11	125.93 ± 42.12	0.336
Post PLR	135.64 ± 58.75	141.97 ± 53.74	0.540
Δ PLR	-10.82 ± 160.96	16.04 ± 33.86	0.208
%Δ NLR	0.87 ± 1.64	1.19 ± 4.18	0.578
%Δ PLR	0.19 ± 0.74	0.16 ± 0.32	0.782

“”

NLR: Neutrophil-to-Lymphocyte Ratio **PLR**: Platelet-to-Lymphocyte **Ratio Δ: Change (difference between postoperative and preoperative values) Δ NLR**: Postoperative NLR – Preoperative NLR, **Δ PLR:** Postoperative PLR – Preoperative PLR **%Δ NLR** = ((Post-op NLR – Pre-op NLR) ÷ Pre-op NLR) × 100, **%Δ PLR** = ((Post-op PLR – Pre-op PLR) ÷ Pre-op PLR) × 100

DISCUSSION

This study was designed to evaluate the impact of parietal peritoneal closure during cesarean section on postoperative recovery, with a particular focus on the return to daily life. Our central hypothesis was that non-closure of the parietal peritoneum, by reducing tissue manipulation and inflammation at the surgical site, might alleviate postoperative symptoms such as pain and thereby facilitate an earlier return to normal activities. To address this, the study was prospectively planned not only to examine routine clinical parameters but also to provide a multidimensional assessment of maternal recovery. Specifically, validated instruments including the EQ-5D Quality of Life Scale, the Katz Index of Independence in Activities of Daily Living, and the Obstetric Quality of Recovery (ObsQoR) score were employed to evaluate both functional recovery and quality of life in the early postoperative period (7–9).

The baseline characteristics analysis demonstrated no statistically significant differences between the peritoneal closure and non-closure groups with respect to maternal age, body mass index, gravidity, or history of previous abdominal surgery. This comparability ensures that the two study arms were demographically and clinically well balanced at enrollment, thereby minimizing potential confounding factors and allowing the postoperative outcomes to be more reliably attributed to the surgical technique under investigation.

The Royal College of Obstetricians has recommended non-closure of the peritoneum, suggesting that this approach may be associated with fewer postoperative complications.(10) On the other hand, some studies have reported no significant differences between closure and non-closure with respect to short-term outcomes such as postoperative fever, wound infection, duration of hospitalization, and the need for analgesia.(11) These findings indicate that the impact of peritoneal closure on short-term recovery remains controversial in the literature, with studies yielding contradictory results.

Anatomically, the parietal peritoneum is a thin serous membrane lining the inner surface of the anterior abdominal wall, richly innervated by somatic sensory fibers through the lower intercostal, iliohypogastric, and ilioinguinal nerves. Trauma to this layer by incision, manipulation, or suturing may lead to localized pain perception. Peritoneal closure involves re-approximating this layer with continuous sutures and theoretically

restores the anatomical barrier, thereby potentially reducing the risk of postoperative adhesion formation. Conversely, the non-closure technique eliminates additional tissue manipulation and ischemia, which may reduce the inflammatory response. The clinical implications of these anatomical and physiological differences, however, remain a matter of debate in the literature (12).

Our findings demonstrated that there were no statistically significant differences between peritoneal closure and non-closure in terms of operative time, decrease in hemoglobin levels, and the recovery of gastrointestinal functions, including the time to first defecation, first solid food intake, and first passage of flatus. Similarly, previous prospective randomized controlled trials have reported no significant differences in short-term surgical outcomes between the two techniques, particularly regarding operative duration, postoperative fever, and length of hospital stay (13). These findings suggest that the effect of peritoneal closure on early postoperative recovery may be limited, and that the choice of technique is more likely influenced by the surgeon's experience and intraoperative conditions.

The assessment of postoperative recovery using multidimensional scoring systems allows for a more comprehensive understanding of maternal outcomes beyond conventional clinical parameters. In our study, pain intensity measured by the Visual Analog Scale (VAS) at 12 and 24 hours showed no statistically significant difference between the peritoneal closure and non-closure groups. This finding indicates that surgical manipulation of the parietal peritoneum does not have a clinically meaningful impact on early postoperative pain perception. Furthermore, the data are consistent with the existing literature, which likewise demonstrates no significant differences in short-term pain outcomes between closure and non-closure techniques (14).

In the literature, prospective randomized controlled trials have generally emphasized that non-closure of the peritoneum during cesarean section may accelerate postoperative recovery, particularly by shortening the time to first oral intake and mobilization (15). These findings have often been interpreted as evidence that reduced surgical manipulation of the peritoneum facilitates earlier functional recovery in the immediate postoperative period (16). Our study, however, investigated recovery within a broader and more detailed framework. In addition to gastrointestinal parameters (time to first defecation, first passage of flatus, and first solid food intake), we analyzed ObsQoR-11, Katz ADL, and EQ-5D scores together with the need for additional analgesics and antiemetic medication, with repeated assessments on postoperative days 1 and 5. This comprehensive design allowed us to evaluate recovery across multiple domains—pain control, functional independence, quality of life, and gastrointestinal activity. Except for the EQ-5D score on day 5, no statistically significant differences were observed between the groups. Overall, these results suggest that the effect of peritoneal closure on short-term postoperative recovery is limited and may not play a decisive role in maternal outcomes. Although the EQ-5D score on postoperative day 5 was statistically higher in the peritoneal closure group, this difference (8.53 vs. 7.48) is unlikely to represent a clinically meaningful improvement. The EQ-5D is a general measure of health-related quality of life, and small numerical differences may reflect temporary postoperative discomfort rather than a sustained functional benefit. Therefore, despite achieving statistical significance, the clinical relevance of this finding should be interpreted with caution.

In this study, no significant differences were detected between the peritoneal closure and non-closure groups with respect to postoperative hematological parameters, particularly NLR and PLR. The postoperative rise in NLR observed in both groups likely reflects the expected systemic inflammatory response triggered by surgical stress (17). Previous studies have demonstrated that elevated NLR and reduced PLR are associated with impaired wound healing, prolonged hospitalization, and increased complication rates across different surgical disciplines, such as neck surgery, hernia repair, and gynecologic laparoscopy (18). These findings suggest that NLR and PLR are simple, inexpensive, and clinically useful biomarkers that reflect both the magnitude of surgical stress and interindividual variations in inflammatory response (19). The lack of intergroup difference in our study indicates that peritoneal closure itself does not significantly modulate systemic inflammatory response in the early postoperative period, and that the inflammatory burden may be more closely related to the surgical trauma of cesarean delivery rather than peritoneal management.

The major strength of our study is its prospective design, which minimizes recall bias and allows for systematic and standardized data collection. In addition, early postoperative recovery was evaluated comprehensively using three validated instruments—ObsQoR-11, Katz ADL, and EQ-5D—together with routine clinical parameters. By assessing these outcomes on both postoperative day 1 and day 5, the study captured not only the immediate but also the short-term trajectory of maternal recovery. This multidimensional and repeated assessment approach provides a more reliable and detailed understanding of the recovery process following cesarean section compared with studies limited to single-parameter or single-time-point evaluations.

The main limitations of this study are the relatively small sample size and the fact that it was conducted in a single tertiary care center, which may restrict the generalizability of the findings. Larger, multicenter studies with extended follow-up would provide more robust evidence, particularly regarding long-term outcomes such as adhesion formation, chronic pain, and fertility-related implications. Although adhesion formation was not evaluated in our study, the literature indicates that non-closure of the peritoneum during cesarean section is associated with an increased risk of adhesion formation in subsequent procedures (20).

CONCLUSION

The findings of this prospective study indicate that parietal peritoneal closure during cesarean section does not provide significant advantages in terms of perioperative outcomes or short-term postoperative recovery. With the exception of a modest improvement in the EQ-5D score on postoperative day 5, no meaningful differences were observed between the closure and non-closure groups across multiple clinical and patient-reported parameters. Taken together with the current body of evidence, these results suggest that there is insufficient justification to recommend routine peritoneal closure solely for the purpose of enhancing perioperative or early recovery outcomes.

Data availability: The data which supports the fndings of our study are not openly available due to reasons of privacy restrictions and sensitivity. The data are available from the corresponding author upon reasonable request.

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Ethical approval: *This study was performed in line with the principles of the Declaration of Helsinki. A* The study was approved by the local Ethics Committee of SBÜ İzmir Tepecik Training and Research Hospital, and patient data were handled in accordance with ethical guidelines and institutional policies (Desicion No: 2025/04-01).

Conflict of interest: The authors have no relevant financial or non-financial interests to disclose.

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