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The relationship between preoperative cervical dilatation degree and uterine incision defect in caesarean section: A prospective cohort study

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Abstract

The purpose of this research was to explore the link between cervical dilatations before a caesarean section and the presence of a uterine incision defect. We conducted this study as a prospective cohort study. Patients undergoing caesarean section for various indications were included. Before the caesarean section, cervical dilatation in centimetres was measured and documented for each patient. Pfannenstiel and Kerr incisions to the skin and uterus were used, respectively. After six weeks postoperatively, all patients were evaluated by transvaginal ultrasonography (TVUS) for the presence of uterine incisional defect. The height of incisional defects was measured and recorded. A total of 172 patients were enrolled, but only 126 attended the six-week ultrasound follow-up. Group 1 (less than 4 cm), Group 2 (4–7 cm), and Group 3 (greater than 7 cm) were the three groups into which the study participants were assigned based on the degree of cervical dilatation. Uterine incision defects were detected in 31 patients (53.4%) in Group 1, 26 patients (57.8%) in Group 2, and 12 patients (52.2%) in Group 3. Statistical results showed that the likelihood of developing a uterine incision defect was comparable in all three groups (p= 0.66). While previous literature has suggested that multiple factors may influence uterine incision defect formation after caesarean section, the findings of this study demonstrate that cervical dilatation before caesarean section is not associated with the development of uterine incision defects.

Keywords: Cesarean section, cervix uteri, uterine scar, transvaginal ultrasonography, prospective studies

Introduction

Caesarean section is the most frequently performed surgical procedure in women worldwide, with a steadily increasing rate [1]. It is crucial that the uterine incision line heals properly following caesarean section. A uterine incision defect, also referred to as a 'niche,' is defined as a wedge-shaped healing defect at the Kerr incision site. There is an association between uterine incision defects and several adverse outcomes in subsequent pregnancies, including ectopic pregnancy, uterine rupture, placenta previa, and placenta accreta [2]. Uterine incision defects are linked to chronic pelvic pain, dysmenorrhoea, abnormal uterine bleeding, postmenstrual spotting, and many other clinical problems experienced by patients during non-pregnancy periods of their lives [3,4]. These issues signify the clinical importance of uterine incision defects in gynecology research.

The uterine incision defect may be evaluated postoperatively using hysterectomy specimens, saline infusion sonography (SIS) and TVUS [5–7]. Though the uterine incision defect after caesarean section may vary according to the methods of assessing the defect, a typical rate for defect presence is in a range of 50-60% [5].

In the literature, researchers have examined the association between uterine incision defects and several other factors, such as the effect of a single layer or double layer closure of the uterus [8–10], the effect of suture materials used [11], the effect of anteverted or retroverted uterus [12], and the effect of the degree of preoperative cervical dilatation [13-15]. We conducted this prospective cohort study to investigate the relationship between

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the degree of cervical dilatation before caesarean section and development of uterine incision defects.

Material and Methods

This study was carried out in our hospital's Obstetrics and Gynecology Department from February 2011 to August 2012. The study was planned as a prospective cohort study. The approval of local ethics committee (Committee for Clinical Research Ethics, Istanbul Faculty of Medicine of Istanbul University) was obtained on February 10, 2011 with an issue number of 312. Every participant was fully informed about the study, and their written consent was acquired.

The exclusion criteria for the study included the following: pregnant women who refused to participate, women under the age of 18, preterm labour (<37 gestational weeks), multiple pregnancies, a history of uterine surgery other than caesarean section, the presence of maternal diseases, uterine malformations, the presence of chorioamnionitis and Kerr incision expansion during the operation, and the presence of fibroids in the Kerr incision line. All obstetric patients admitted to the delivery room were evaluated and appropriate patients without exclusion criteria were selected. Contact details and demographic data of patients who agreed to participate in the study were recorded on the study form; demographic data included information on age, gravidity, parity, abortion and body mass index (BMI). The indications for a caesarean section and the degree of dilatation of the cervix prior to the surgical procedure were also recorded.

Patients were divided into three groups according to the degree of cervical dilatation assessed by vaginal examination before caesarean section; group 1: patients with <4 cm dilatation, group 2: patients with 4–7 cm dilatation, group 3: patients with >7 cm dilatation.

The same surgeon performed all of the caesarean sections. Pfannenstiel and Kerr incision techniques were applied to skin and uterine incisions, respectively. The first layer of uterine incision was closed in a locked configuration, while the subsequent layer was closed in an unlocked form. For all patients who participated in the study, an appointment for a detailed TVUS examination was scheduled for six weeks after the operation. The same surgeon performed all TVUS assessments. TVUS examination was performed with the patient in the lithotomy position and an empty bladder, using a 5–6 MHz high-frequency probe (Siemens Acuson Antares, Model 10032747, SN: 113207, Germany). The integrity of the uterine incision was assessed in transverse and sagittal views with ultrasonographic examination. Wedge-shaped discontinuities in the integrity of the uterine incision were defined as scar defects. The height of each defect (in millimeters) was measured and documented in the patient records.

Statistical Analysis

Statistical analysis was conducted with Statistical Package for the Social Sciences (SPSS), version 16.0 (SPSS Inc., Chicago, IL, USA). For parametric continuous variables, comparisons among the three groups were made using one-way analysis of variance (ANOVA). Nonparametric continuous data and ordinal variables were examined with the Kruskal–Wallis test. If overall group differences reached statistical significance, post-hoc pairwise testing was carried out using the Bonferroni correction for ANOVA, or the Mann–Whitney U test with Bonferroni adjustment for Kruskal–Wallis results. Categorical data were assessed with the chi-square test, and Fisher's exact test was applied when appropriate. Statistical significance was set at $p<0.05$.

Results

The research study comprised a total of 172 patients. However, only 126 patients participated in the postoperative examination of incisional uterine defects using TVUS, which was incorporated into the statistical analyses. Forty-six patients did not attend the six-week ultrasound follow-up due to relocation, personal preference, or scheduling difficulties. The baseline demographic and obstetric characteristics of these patients were comparable to those who completed the follow-up; therefore, this attrition is unlikely to have introduced bias or affected the main results.

There were 58 patients in group 1, 45 patients in group 2 and 23 patients in group 3. There was homogeneity in the demographic data distribution among the groups ($p>0.05$ for all) (Table 1). The mean gestational age for the entire cohort was 38.3 weeks (±1.2 weeks), with a median gestational age of 38 weeks.

When the indications for caesarean section were examined, the most common reason in Group 1 was a history of previous caesarean (53.4%), while cephalopelvic disproportion (35.6%) was more frequently seen in Group 2. In Group 3, fetal distress emerged as the leading indication (34.8%) (Table 1).

Uterine incision defects were detected in 31 patients (53.4%) in Group 1, 26 patients (57.8%) in Group 2, and 12 patients (52.2%) in Group 3. These rates did not differ significantly between groups ($p=0.66$), suggesting that the degree of cervical dilatation prior to surgery was not associated with the presence of a scar defect (Table 2).

The mean myometrial thickness for the entire patient cohort was 13.25±1.5 mm. As presented in Table 2, there was no statistically significant difference in myometrial thickness among the three groups, either in patients with uterine incision defects ($p=0.11$) or in those without defects ($p=0.30$). The patients with uterine incision defects were further examined on the basis of the height of the defects and there was no statistically significant difference ($p=0.14$).

The mean days to discharge after caesarean section was 2.48±1.72 for all patients. After caesarean section, all patients were followed up for early and late postoperative complications. Subinvolution was observed in one patient. There were no statistically significant differences in postoperative complications between groups ($p>0.05$).

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Table 1. Demographic and clinical characteristics of the study groups

Characteristics	Group 1 (n=58)	Group 2 (n=45)	Group 3 (n=23)	p value
Maternal age (years)	28.43±5.44	27.77±5.30	30.17±5.29	0.88
Gravidity	2 (1–3)	2 (1–3)	3 (2–3)	0.16
Parity	1 (0–1)	1 (0–1)	1 (1–2)	0.08
BMI (kg/m²)	29.48±4.23	29.86±4.25	30.37±2.24	0.18
CS indications				
Elective (%)	3 (5.2)	0	0	
Previous CS (%)	31 (53.4)	7 (15.6)	2 (8.7)	
CPD (%)	15 (25.9)	16 (35.6)	4 (17)	
Presentation anomaly (%)	6 (10.3)	3 (6.7)	2 (8.7)	
Macrosomia (%)	0	4 (8.9)	2 (8.7)	
LP or AP progression pathologies (%)	1 (1.7)	5 (11.7)	5 (21.7)	
FD (%)	2 (3.4)	10 (22.2)	8 (34.8)	

BMI: body mass index, CS: cesarean section, CPD: cephalopelvic disproportion, LP: latent phase of labour, AP: active phase of labour, FD: fetal distress. $p<0.05$ was considered statistically significant

Table 2. Myometrial thickness and uterine incision defect characteristics of the patients

Characteristics	Group 1 (n=58)	Group 2 (n=45)	Group 3 (n=23)	p value
Presence of defects in uterine incision (%)	31 (53.4)	26 (57.8)	12 (52.2)	0.66
Myometrial thickness in patients with defect (mm)	13.75±1.79	12.96±1.50	13.16±1.15	0.11
Myometrial thickness in patients without defect (mm)	13.18±2.60	13.45±1.60	12.78±1.13	0.30
Defect height (mm)	4.05±1.40	3.40±1.02	3.36±1.04	0.14

$p<0.05$ was considered statistically significant

Discussion

In the literature, some of the conditions, such as postmenstrual spotting and chronic pelvic pain, which can negatively affect women's health and quality of life, have been associated with uterine incision defects [15–17]. Menorrhagia and abnormal uterine bleeding may result from the presence of endometrial tissue or small polyps within the scar cavity, while lymphocytic infiltration and distortion of the lower uterine segment have also been implicated in the development of chronic pelvic pain and dyspareunia. Furthermore, adenomyosis characterized by the invasion of endometrial tissue into the myometrium has been observed in association with iatrogenic uterine scar tissue and reported to contribute to dysmenorrhea [12]. Additionally, some studies have suggested that uterine scar tissue may act as a reservoir, potentially leading to spotting and bleeding [18,19].

The literature reports a wide range of incidence rates for uterine incision defects, from 7% to 65%. Factors such as the timing of the ultrasound assessment, a history of prior caesarean sections, and the suturing method used for uterine closure contribute to this variability. In their study, Osser et al. investigated the causes of large caesarean scar defects. The researchers used TVUS to evaluate the caesarean scar six to nine months after the procedure, and found that 20% of patients had large defects. According to the study, a higher degree of cervical dilatation during caesarean delivery was linked to an increased likelihood of large scar defects [13]. In contrast, Kamel et al. classified cervical dilatation into three groups and assessed uterine incision defect formation three months postpartum, finding no statistically significant differences between groups [20]. Similarly, our study found no association between the degree of cervical dilatation prior to caesarean section and the presence of uterine incision defects ($p=0.66$).

In our study, we found a uterine incision defect rate of 54.8%, which is in line with what has been reported in earlier research. In the present study, uterine incision defects were evaluated six weeks after caesarean section. However, several studies have indicated that the wound healing process may continue for more than six months. Therefore, the relatively high uterine incision defect rate observed in our study may be attributed to the fact that the postoperative evaluation was conducted at an early stage, which is a limitation of our study.

Feldman et al. reported that women undergoing elective caesarean sections were more likely to develop uterine incision defects compared to those undergoing emergency procedures. Moreover,

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uterine incision defects were more frequently located above the vesicovaginal fold when the hysterotomy was performed at a cervical dilatation of ≤4 cm [21]. Similarly, Kamel et al. found that cervical dilatation ≥8 cm at the time of caesarean delivery was associated with a lower-positioned uterine incision defect, located at or below the internal cervical os [20]. Doğru et al. showed that the timing of delivery and cervical changes did not affect the frequency of uterine incision defect formation. They also identified a clear association between defect location and delivery circumstances: in caesarean sections performed during active labour and in preterm cases, the defect was located within the cervical canal, whereas in term caesarean sections, it was predominantly situated in the isthmic region [22]. In our study, the position of the uterine incision defect was not recorded, which constitutes another limitation of our research.

There have been some short-term benefits linked to single-layer uterine closure, including shorter recovery times and less blood loss. Although the single-layer technique is more commonly used in current practice, the double-layer closure has been suggested in observational studies to promote better scar healing and to reduce the risk of uterine rupture. Moreover, randomized trials have supported the appropriate use of double-layer closure [13]. Accordingly, in our study, we employed the classical double-layer closure technique for all caesarean sections, with all procedures performed by the same surgeon to minimise variability. As patients with a history of previous caesarean sections were not excluded, and prior surgery may influence uterine scar healing, this constitutes another limitation of our study. In addition, the relatively small number of patients in Group 3 (>7 cm dilatation) may have reduced the statistical power to detect subtle differences among groups. Nevertheless, the study's strengths include the use of a standardised surgical technique and the elimination of inter-surgeon variability.

Conclusion

According to current literature, uterine incisional defects may be associated with various factors, including the suturing technique used for uterine closure, uterine position (anteflexed or retroflexed), and a history of previous caesarean section [23,24]. However, in this study population, no statistically significant association was observed between the degree of preoperative cervical dilatation and the presence of uterine incision defects. Further large-scale, long-term studies are warranted to better understand the complex mechanisms underlying uterine scar healing.

Conflict of Interest
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
The study received ethical approval from the Clinical Research Ethics Committee of Istanbul University, Istanbul Faculty of Medicine on February 10, 2011 (Approval No: 312)

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