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Rectus muscle re-approximation in cesarean section — a surgical dilemma: to close or not to close?

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ABSTRACT

Objectives: Cesarean section is one of the most common operations worldwide since decades. However, the optimum surgical cesarean section technique is still being discussed. Closure or non-closure of the rectus muscles is also unclear among obstetricians. We aimed to evaluate the effect of rectus muscle re-approximation (RMR) in cesarean section on postoperative pain among singleton primi gravida elective cesarean sections at term.

Material and methods: The current study was planned as a prospective, blinded, randomized controlled trial. A total of 279 elective primi gravida singleton cesarean sections; 142 undergoing RMR and 137 not-undergoing RMR were included in the study. All participants were managed with our clinic's postoperative protocol and obstetric outcomes were also recorded. The patients' pain was assessed face to face 24 hours and 48 hours after operation by using visual analog scale (VAS) score.

Results: The elective singleton primi gravida cesarean sections with and without RMR exhibited no significant difference with respect to maternal age, Body Mass Index, delivery week and other obstetric outcomes. The VAS scores at 24th and 48th hours (67 ± 24 versus 69 ± 25, p: 0.635; 47 ± 25 versus 52 ± 26, p: 0,126, respectively) were similar between the RMR and non-RMR group.

Conclusions: RMR has not any negative effect on postoperative pain, operation time, analgesic use and hospital stay in singleton primi gravida elective CS at term. Additionally, RMR did not lead to any adverse postoperative risks such as increased blood loss and sub-rectus hematoma.

Keywords: cesarean section; rectus muscle re-approximation; postoperative pain

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INTRODUCTION

The frequency of cesarean sections (CS) in the world rises each year. The global rate in 1990 was 7% to 21% today [1]. This accelerating trend is even higher in Turkey with 57.6% in a recent data between 2018–2023 [2–4]. Despite this high frequency of CS, obstetricians do not agree about the optimal surgical closure technique [5]. There are various surgical closure techniques at CS like the double-layer-hysteretomy, the closure of the parietal-visceral peritoneum and the rectus muscle re-approximation (RMR) [6]. In all techniques obstetricians aim to avoid postoperative complications like adhesions, infections and morbidity.

Objectives

There are only a few numbers of studies proofing the advantage and disadvantages of RMR [7–13]. Apart from this, recent studies do not confirm the postoperative effects of RMR [7–13]. It is still being debated whether RMR prevents diastasis recti abdominis (the separation of the two rectus abdominis muscles along the linea alba mostly during pregnancy) [7]. Furthermore, there is still a conflict about the impact of RMR on pain after CS [8–13]. Therefore, we aimed to search the effect of RMR on pain after cesarean section once more to find out the most comfortable CS technique for women regarding postoperative pain.

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MATERIAL AND METHODS

The present study was designed as a prospective, blind, randomized controlled trial conducted at Balikesir University Medical Faculty Department of Obstetrics and Gynecology between January 2021 and July 2023. The trial is registered on ClinicalTrial.gov with the number NCT05260970. The study protocol was approved by the Local Ethics Committee of Balikesir University and all patients gave informed consent. The research was designed in accordance with the declaration of Helsinki. Sample size calculation was estimated using MedCalc statistical software (version 10.3.0.0). Sample size was calculated with an alpha of 0,05, a power of 80, and medium effect size (f) 0,25. 324 primi gravidas were randomly divided into two groups: group 1 with 162 patients undergoing RMR and group 2 with 162 patients not undergoing RMR. Group assignments were made by a simple randomization method using a computer-generated sequence at a 1:1 ratio. Including criteria were 37–40-week singleton primi gravidas at the age of 18–45 who did not have any systematic disorder. Excluding criteria were multigravidas, pelvic or abdominal surgery history, disorders during pregnancy like gestational hypertension, preeclampsia or gestational diabetes mellitus, pelvic inflammatory disease, > 40 body mass index (BMI), surgical drain use, chronic use of analgesia, allergy to analgesia, neurological and muscle disorders. CS was performed under spinal anesthesia for both groups. Intrathecal Bupivacaine 10 mg and Fentanyl 20 mcg was used for spinal anesthesia. All surgeries were done by the same associate professor with an assistant doctor who was variable. Except these two surgeons, all participants of the study were blinded. The surgical techniques during CS were standardized. First, the skin was opened with a Pfannenstiel incision. The abdominal wall was dissected with a scalpel. Then, the rectus muscles were separated from the fascia. After that, the surgeon opened the parietal peritoneum with his fingers. Next, a transverse incision was made on the uterus and the extraction of the fetus, and the placenta was completed. This transverse uterine incision was closed by using continuously and locked suturing. The parietal peritoneum was closed continuously as well. In group 1, the obstetrician re-approximated the whole of the rectus muscles by continuous suturing without excessive tension. This step of rectus muscle re-approximation was skipped in group 2. Afterwards, the abdominal fascia was sutured continuously, whereas the subcutaneous fat was closed by three interrupted sutures. Lastly, the skin was sutured subcuticular. Our suture material was Vicryl (Ethicon Johnson & Johnson, USA). Just its number for thickness variated in each layer (uterus and abdominal fascia: Vicryl 1.0 — parietal peritoneum, RMR and subcutaneous fat: Vicryl 2.0, skin: Vicryl 3.0).

In the postoperative period of both groups, our treatment was again standardized: All patients received 100 mL Paracetamol intravenous (IV) and Tramadol Hydrochloride 100 mg IV directly after operation. In the first postoperative day, all patients got Diclofenac Sodium 75 mg intramuscular (IM) every 8 hours. If the patient still complained about pain despite our routine management, one more dose of Diclofenac Sodium 75 mg IM was made. If the pain persisted thus this last dose of Diclofenac Sodium 75 mg IM, one dose of Meperidine 100 mg IM was allowed. In the second postoperative day, we switched to Dexketoprofen Trometamol 50 mg IV once a day. If the patients' pain did not decrease, one dose of Diclofenac Sodium 75 mg IM was made additionally. Besides, all patients received Cefazoline 1 gr IV every 8 hours during the whole hospitalization and Methylergometrine 0,2 mg IM in the first postoperative day. All the patients were mobilized at postoperative sixth hours. The visual analog scale (VAS) was used to measure postoperative pain, in which 0 points represent "no pain" and 100 points represent "worst pain". The patients' pain was assessed face to face 24 hours and 48 hours after operation. Additionally, data like maternal age, BMI, delivery week, birthweight, operation time and blood loss (hemoglobin deficit) were also considered during the study.

Descriptive values were demonstrated as mean, and standard deviation. The student's *t*-test was used to compare continuous variables. A Chi-Square test was used to compare categorical variables. Statistical significance levels were considered as 5%. The SPSS (IBM SPSS Statistics for Windows, Version 22.0. IBM Corp. Released 2013. Armonk, NY: IBM Corp.) statistical program was used for all data.

RESULTS

A total of 279 elective CSs; 142 undergoing RMR (Group 1) and 137 not-undergoing RMR (Group 2) were included to the study population (Fig. 1). The clinical characteristics, obstetric outcomes and VAS scores were presented in Table 1. Group 1 and Group 2 exhibited no significant difference with respect to maternal age, BMI, delivery week and other obstetric outcomes (Tab. 1). The VAS scores at 24th hours (67 ± 24 versus 69 ± 25, p = 0.635) were lower in group 1 than in group 2. The VAS scores at 48th hours (47 ± 25 versus 52 ± 26, p = 0.126) were lower in group 1 than in group 2, too. However, there was no significant difference between the groups in either VAS scores. The operation time, blood loss (hemoglobin deficit) and analgesic use (Diclofenac Sodium and Meperidine) after CS were similar between the groups (p = 0.572, p = 0.700, p = 0.619, p = 0.801, respectively) (Tab. 1). Rectus sheath hematoma occurred once only in Group 2 (Tab. 1).

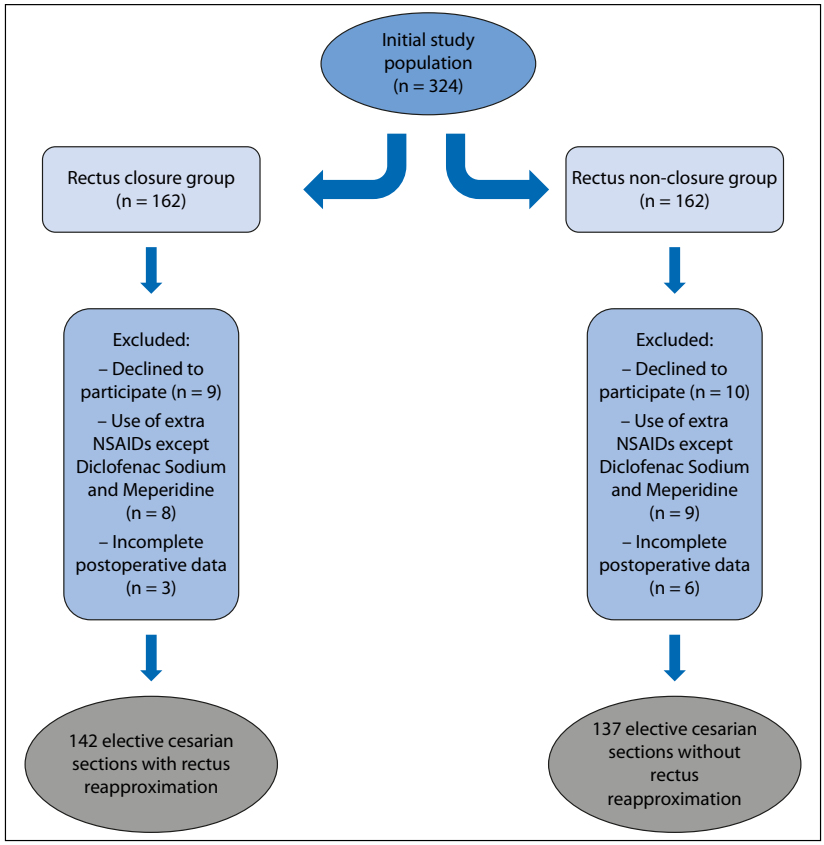

Figure 1. The flow diagram of the pregnant women recruited in the study; NSAID — nonsteroidal anti-inflammatory drug

Table 1. The clinical characteristics and perinatal outcomes of the pregnant women

	Group 1 (rectus closure) (n = 142)	Group 2 (rectus non-closure) (n = 137)	p value
Maternal age [years]	29.0 ± 5.5	28.6 ± 5.0	0.382[a]
BMI [kg/m^2]	27.5 ± 4.0	28.4 ± 4.8	0.105[a]
Gestational age at delivery [weeks]	38.4 ± 0.9	38.4 ±0.7	0.519[a]
Birthweight [g]	3265 ± 424	3311 ± 437	0.875[a]
Apgar, 1. minute	8 ± 1	8 ± 1	0.531[a]
Apgar, 5. minutes	9 ± 1	9 ± 1	0.217[a]
Operation time [min]	53 ± 14	52 ± 13	0.572[a]
Hb deficit	1.2 ± 0.7	1.2 ± 0.7	0.700[a]
Subrectus hematoma	0	1	0.309[b]
VAS at 24. hours	67 ± 24	69 ± 25	0.653[a]
VAS at 48. hours	47 ± 25	52 ± 26	0.126[a]
Extra diclofenac sodium (IM) use	30 ± 37	28 ± 36	0.619[a]
Extra meperidine (IV) use	4.2 ± 17.4	4.8 ± 17.0	0.801[a]

[a]Student's t-test was used to compare continuous variables; [b]Chi- square test was used to compare categorical variables; BMI — body mass index; Hb — hemoglobine; VAS — visuel analog scale; IM — intramuscular; IV — intravenous

DISCUSSION

The current prospective, randomized controlled trial was focused on postoperative pain severity after RMR which is a debated closure technique for CS. We found out that RMR has not any negative effect on postoperative pain, operation time, analgesic use and hospital stay in singleton primi gravida elective CS at term. Additionally, RMR did not lead to any adverse postoperative complications such as increased blood loss and rectus sheath hematoma.

The development of diastasis recti after CS is a debated topic in obstetric literature. Barghhela et al. [12] argue that RMR is unnecessary regarding reduction of diastasis recti. They support that the muscles will find their right anatomical position by themselves. Even more, they point out that bringing the muscles together by the surgeon may cause unnecessary pain. The prospective cross-sectional study of Çintesun et al. [7] corresponds with Barghela et al. [12] in which they once more outline that RMR has no effect on prevention of diastasis recti. Moreover, Lyell et al. [8] found out that RMR increases postoperative pain without any differences in operative time and surgical complications. The conclusions of Omran et al. [9] are not different: both suggest that RMR is associated with significant increase in postoperative pain and analgesic use. On the other side, some trials suggest just the opposite about RMR. Lyell et al. [13] found out that the closure of the rectus muscles at cesarean section may reduce adhesions. Furthermore, in Çaltekin et al's [11] study RMR increases muscle strength and core endurance in the early postoperative period. Also, they did not find any increase in postoperative pain in the RMR group which is similar to our study. Thus, RMR can shorten the time to return to daily activities by improving mothers' physical condition. In another study by Çintesun et al. [10] there was no increase in postoperative pain and analgesia use as well. Even more, they found significantly lower pain scores in the RMR group at postoperative 6^{th} and 12^{th} hours. So, all in all, there is a converging data about RMR at CS. The optimum CS closure technique is still discussed in obstetric units. Consequently, the rigid design of our study with selected primi gravida singleton elective CS, the same surgical team for all operations, routine spinal anesthesia procedure and standardized postoperative analgesia management can make a significant contribution to the literature. We suggest that RMR during CS would be a suitable and acceptable procedure during CS in routine obstetric practice. We also estimated that RMR shortens the time of the wound healing period as a short-term effect and strengthens the abdominal wall as a long-term effect. However, we did not focus on these effects in the current study. It might be the subject of our next study.

Our study has some limitations. First, we did not regard any quantitative measurements like the thickness of the rectus muscle or its strength. Postoperative pain was only measured by VAS score. Second, patients were only evaluated in the first and second postoperative day. We only considered the short-term outcomes of RMR, the long-term outcomes were not evaluated. And we had a relatively small sample size. Nonetheless, our study has important advantages. Above all, our standard and stringent randomized controlled trial protocol in a homogeneous subgroup (singleton primi gravida elective CSs at term) is the greatest strength of our study. Besides, our study included a high number of patients which makes the study more confident.

CONCLUSIONS

In the present study we concluded that RMR does not increase postoperative pain without any difference in operation time, analgesic use, hospital stay, increased blood loss and the occurrence of sub-rectus hematoma. In our opinion, obstetricians should add RMR in their own routine cesarean protocol to ensure maximum anatomical integrity and to maximize the patients' postoperative comfort. Besides, we support the idea that RMR decreases the diastasis recti incidence and increases the rectus muscle endurance. In this point, we must criticize our study because these possible long-term effects were not considered. In summary, the optimal cesarean technique is still discussing in clinical obstetric practice. Therefore, we suggest that larger randomized controlled studies about different CS closure techniques and their short and especially long-term results should be conducted in the future.

Article information and declarations

Data availability statement

The authors had full control of all primary data and we agree to allow the Journal to review our data if requested.

Ethics statement

The trial is registered on ClinicalTrial.gov with the number NCT05260970. The study protocol was approved by the Local Ethics Committee of Balikesir University and all patients gave informed consent. The research was designed in accordance with the declaration of Helsinki.

Author contributions

Orkun Cetin: 40% — corresponding author.
Kubra Ak: 30% — concept, article draft.
Tuba Bozhuyuk Sahin: 20% — analysis and interpretation of data.
Ipek Dokurel Cetin: 10% — concept, interpretation of data.

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Conflict of interest

The authors report no conflicts of interest.

Supplementary material

None.

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