Two techniques of pyramidalis muscle dissection in Pfannenstiel incision for cesarean section

Dwie techniki preparowania mięśni piramidowych podczas cięcia cesarskiego sposobem Pfannenstiela

Joanna Skręt-Magierło[1,2], Paweł Soja[1], Anna Drozdzowska[1], Anna Bogaczyk[1], Paweł Szczerba[1], Tomasz Góra[1], Katarzyna Kalandyk-Osinko[1], Adam Chruściel[1], Edyta Barnaś[2], Andrzej Skręt[1]

[1] Clinical Department of Obstetrics and Gynecology, Rzeszow State Hospital, Rzeszow, Poland
[2] Institute of Obstetrics and Emergency Medicine, University of Rzeszow, Rzeszow, Poland

Abstract

Objectives: *The aim of the study was to compare two techniques of pyramidalis muscle dissection during cesarean section.*

Material and methods: *A total of 108 patients undergoing a cesarean section were randomly allocated to group I (N=57), with the pyramidalis muscle left attached to the rectus muscles, and group II (N=51), with preservation of the connection between the pyramidalis muscle and the rectus sheath.*

Results: *There were no statistically significant differences between the groups regarding surgery duration, blood loss and postoperative pain. After three months, patients from group II more frequently reported paresthesia in the scar region (47.1 vs. 28.1%; p=0.041), but their self-assessment of the abdominal appearance and presence of the bulging below the wound were comparable with group I.*

Conclusions: *None of the two techniques of pyramidalis muscle dissection appear to be superior to the other. The technique leaving the pyramidalis muscle attached to the fascia gave more frequent paresthesia during a 3-month follow-up.*

Key words: **cesarean section** / **Pfannenstiel incision** / **pyramidalis muscle** /

Correspondence address:
Joanna Skręt-Magierło
Clinical Department of Obstetrics and Gynecology
Chopin Street 2, 35-055 Rzeszow, Poland
tel.: + 48 178666352; fax: + 48 178666351
e-mail: joannaskret@wp.pl

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Streszczenie

Cel pracy: *Celem pracy było porównanie dwóch technik preparowania mięśni piramidowych podczas cesarskiego cięcia.*

Materiał i metoda: *108 pacjentek zakwalifikowanych do cięcia cesarskiego zostało na drodze randomizacji przydzielonych do: grupy I (N=57), w której mięśnie piramidowe pozostawiono w łączności z mięśniami prostymi i grupy II (N=51), w której zachowane było połączenie mięśni piramidowych i pochewki mięśni prostych.*

Wyniki: *Nie stwierdzono znamiennych statystycznie różnic między grupami odnośnie czasu trwania operacji, utraty krwi i bólu pooperacyjnego. Po 3 miesiącach pacjentki z grupy II częściej odczuwały parestezje w okolicy blizny pooperacyjnej (47,1 vs. 28,1%; p = 0,041), ale ich samoocena wyglądu powłoki brzusznej i obecności wybrzuszenia poniżej rany była porównywalna z grupą I.*

Wnioski: *Żadna z dwóch metod preparowania mięśni piramidowych nie okazała się przewyższać drugiej. Technika pozostawienia mięśnia piramidowego na powięzi wiązała się z częstszym odczuwaniem parestezji podczas 3-miesięcznego follow-up.*

Słowa kluczowe: **cięcie cesarskie** / **nacięcie Pfannenstiela** / **mięsień piramidowy** /

Introduction

According to evidence-based surgery for cesarean section, transverse skin incision is recommended due to better cosmetic effect and less postoperative pain [1]. Various methods of this incision were developed, but the most common are Pfannenstiel incision, Joel-Cohen, and its modification incision [2, 3, 4]. Some studies compared the Pfannenstiel technique with others, however there are still no clear indications to perform one of these techniques [5, 6]. As far as the Pfannenstiel incision technique is concerned, there are no precise instructions associated with dissection of the pyramidalis muscle [7]. The pyramidalis muscle can be separated from the rectus sheath and left attached to the rectus muscles. On the other hand, the pyramidalis muscle can be left on the internal surface of the rectus sheath. The choice of the surgeon is commonly based on experience and preference. The aim of the study was to determine the benefits of these two options.

Material and methods

This randomized double-blind study was conducted at the Department of Obstetrics and Gynecology, Rzeszow State Hospital, between January and September 2011. The Institutional Review Board approved of the study (No 2/07/2010). One hundred and eight pregnant women were included in the study. The inclusion criteria were: informed patient consent to participate in the study, first cesarean section, and gestational age of ≥37 weeks. Emergency cesarean deliveries (regarded as immediate threat to the life of the woman or fetus) were excluded.

The patients completed a questionnaire and self-assessed the appearance of the abdomen before pregnancy on a 10-point scale (1 – the worse; 10 – excellent). They were allocated into two study groups using computer-generated random numbers. Information about the randomly chosen technique was communicated only to the operator, not to the patients, and the researchers who supplied postoperative questionnaire to the patients.

The first steps of the procedure were similar in both groups. All patients received antibiotic prophylaxis for 30 min. before skin incision, in accordance with the recommendations on the perioperative antibiotic prophylaxis. The skin and subcutaneous tissue were incised with a lower transverse incision at the level of the pubic hairline. After the subcutaneous tissue was separated from the underlying fascia (rectus sheath), it was incised transversely for the full length of the incision. The superior edge of the fascia was grasped, elevated and separated from the underlying rectus muscles by blunt dissection. Next, the posterior edge of the fascia was grasped and separated according to randomization. Fifty-seven patients assigned to group I underwent cesarean

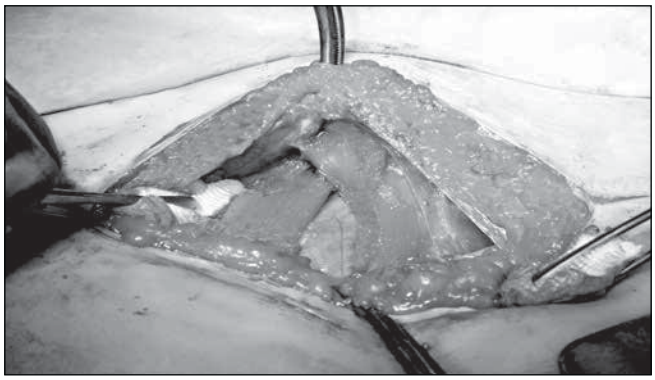

Figure 1a. The pyramidalis muscle was removed from the internal surface of fascia and left attached to the right rectus muscle, access to the peritoneum was obtained between the left edge of the pyramidal muscle and the left rectus muscle.

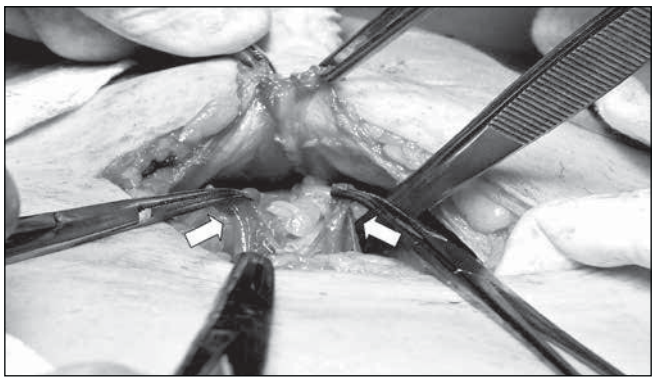

Figure 1b. The pyramidalis muscle was left on the internal surface of the fascia and access to the peritoneum was obtained between the right and the left rectus muscle. Proximal parts of the pyramidalis muscle were left in the clamps (arrows).

delivery with the pyramidalis muscle left attached to the rectus muscles. The inferior part of the fascia was separated from the rectus muscles and the pyramidalis muscle, and access to the peritoneum was obtained between the left edge of the pyramidalis muscle and the left rectus muscle (Figure 1a). In 51 patients from group II, the pyramidalis muscle was released from the rectus muscles and left on the internal surface of the fascia (Figure 1b). Access to the peritoneum was obtained between the right and the left rectus muscles. After this step, the two cesarean section procedures were identical.

The postoperative care was standardized and included intravenous analgesia using Buprenorphine (0.3mg every 8 hours) and Paracetamol (1g every 6 hours) for 24 hours. The choice of the analgesic doses (Paracetamol) in the following days was left to the patient. Each woman was visited daily until discharge from hospital for assessment of the clinical data and level of pain. Postoperative pain was assessed with the use of a 10-cm visual analog scale (VAS scale) once a day (0 - no pain, 10 - unbearable pain). Typically, patients were discharged on postoperative day 3, but time of discharge was an individual choice of each patient.

Three months after the cesarean section, all patients completed questionnaires to assess their satisfaction with the appearance of the postoperative abdomen on a 10-point scale (1 – the worse; 10 – excellent), the presence of abdominal bulging below the wound (using a Likert Scale), paresthesia, and complications of wound healing.

The following variables were analyzed in our study: clinical characteristics, operative and postoperative data, neonatal parameters, data obtained from the questionnaires before cesarean section and 3 months later.

Chi-square and t-student tests were used to perform the analysis of association with the use of STATISTICA 8. The value of $p<0.05$ was considered as statistically significant.

Results

Out of 108 patients included in the study, 57 women were allocated to group I (with the pyramidalis muscle removed from the surface of the fascia) and 51 to group II (with the pyramidalis muscle left on the surface of the fascia). Demographic and clinical characteristics were similar in both groups (Table I).

A higher rate of cephalic presentation was observed in group I (89.5%), as compared to group II (74.5%). Breech and other presentations were more frequent in group II, but the differences did not reach statistical significance.

General anesthesia was applied in 10.5% and 3.9% of patients from groups I and II, respectively, but the difference was not statistically significant (p=0.19; Table II).

Mean times from skin incision to delivery and duration of the surgery were similar. No intraoperative complications, e.g. hemorrhage, bladder injury, or uterine atony, were observed. There were no statistically significant differences between the two groups regarding pre- and postoperative hemoglobin and hematocrit levels (Table III).

Table I. Demographic and clinical characteristics of the study population.

Characteristics		Group I (N=57)	Group II (N=51)	p value
Age (years)		28.49 (±5.39)	28.14 (±5)	0.72
BMI before delivery (kg/m^2)		28.36 (±3.93)	28.56 (±3.8)	0.78
Gestational age (weeks)		39.3 (±1.24)	39 (±1.79)	0.26
Parity	Primigravida Multipara	46 (80.7%) 11 (19.3%)	39 (76.5%) 12 (23.5%)	0.59
Pregnancy	Single Multiple	56 (98.2%) 1 (1.7%)	47 (92.1%) 4 (7.8%)	0.13
Fetal presentation	Cephalic Breech Other	51 (89.5%) 5 (8.8%) 1 (1.7%)	38 (74.5%) 8 (15.7%) 5 /(9.8%)	0.08
Abdomen appearance before pregnancy – self assessment (1 – the worst 10 – excellent)		8 (±1.76)	8.6 (±1.68)	0.06
Duration of ruptured membranes (hours)		3.78 (±4.09)	3,44 (±4.48)	0.68
Cervical dilatation (cm)		4.9 (±3.31)	4,2 (±2.97)	0.25
Type of cesarean delivery[1]	I II III	13 (22.8%) 41 (71.9%) 3 (5.2 %)	6 (11.7%) 39 (76.5%) 6 (11.7%)	0.19
Main indication for cesarean delivery[2]	Fetal distress Cephalopelvic disproportion Failure to progress Fetal presentation Suspected infection Preeclampsia Maternal illness	15 (26.3%) 12 (21%) 27 (47.3%) 8 (14%) 6 (10.5%) 1 (1.7%) 9 (15.7%)	15 (29.4%) 6 (11.7%) 18 (35.2%) 13 (25.4%) 2 (3.9%) 3 (5.8%) 3 (5.8%)	0.71 0.19 0.2 0.13 0.19 0.25 0.1

[1] I - delivery timed to suit the woman and staff (elective); II - no maternal or fetal compromise but early delivery required; III - maternal or fetal compromise that is not immediately life-threatening; [2] more than one indication for one patient.

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Table II. Operative data.

Characteristics		Group I (N=57)	Group II (N=51)	p value
Type of anesthesia	General Subdural	6 (10.5%) 51 (89.5%)	2 (3.9%) 49 (96.1%)	0.19
Time from skin incision to delivery (minutes)		3.44 (±1.38)	3.33 (±1.03)	0.62
Duration of surgery (minutes)[1]		28.75 (±7.55)	29.56 (±7.32)	0.57

[1] from skin incision to the end of skin closure.

Table III. Postoperative data.

Characteristics	Group I (N=57)	Group II (N=51)	P value
Δ[1] hemoglobin level (g/dl)	1.61 (±1)	1.72 (±0.92)	0.57
Δ[1] hematocrit level (%)	4.36 (±3.4)	4.51 (±2.72)	0.8
Postoperative temperature >38°C (No. of patients)	1 (1.7%)	4 (7.84%)	0.3
Time to mobilization (hours)	12.49 (±2.5)	12.35 (±1.9)	0.75
Time to oral intake (hours)	3.61 (±2.7)	3.41 (±2.5)	0.69
Time to breastfeeding initiation (hours)	12.49 (±2.5)	12.35 (±1.9)	0.75
Time with Foley catheter (hours)	13.15 (±4.8)	14 (±6.1)	0.42
Length of postoperative hospital stay (hours)	92.64 (±48.6)	78.04 (±18.68)	0.046
Pain on the day of surgery (VAS)	5.71 (±1.6)	5.9 (±1.34)	0.52
Pain 24 hours after surgery (VAS)	4.68 (±1.3)	5.12 (±1.47)	0.11
Pain 48 hours after surgery (VAS)	3.45 (±1.1)	3.49 (±1.39)	0.88
Analgesics requirement 24 h after surgery [2]	2.52 (±1)	2.5 (±0.98)	0.93
Analgesics requirement 48 h after surgery [2]	0.47 (±0.9)	0.49 (±0.96)	0.92

[1] difference between pre- and postoperative (48 hours after delivery); VAS – visual analogue scale; [2] doses of Paracetamol.

Three patients from group II developed fever as compared to 1 patient in group I, but the difference was not statistically significant (p=0.13). No association between time to mobilization, oral intake, breastfeeding initiation, and Foley catheter was found in our analysis. Mean hospital stay was significantly longer in group I as compared to group II (p=0.046). There were no statistically significant differences in VAS score and analgesic requirements on the day of the operation, 24 and 48 hours postoperatively.

Table IV. Neonatal data.

Parameter	Group I (N=57)	Group II (N=51)	p value
APGAR <7 at 1 min.	3 (5.2%)	0	0.09
Neonatal weight (g)	3422 (±616.7)	3300 (±627.3)	0.7

Neonatal data are shown in Table IV.

There were 3 cases in group I and no cases in group II of APGAR score <7 at the first minute (p=0.09). Mean neonatal weight was similar in both groups (3422g vs. 3300g; p=0.7). There were no statistically significant differences.

As shown in Table V, the difference between preoperative and postoperative appearance of the abdomen 3 months after delivery was higher in group II, but it was not statistically significant (p=0.12).

Complications of wound healing (inflammation, hematoma, abscesses) after surgery were observed in 4 patients from group I and in 1 from group II (p=0.21). There was a significantly higher incidence of paresthesia around the scar in group II as compared to group I (47.1% vs. 28.1%; p=0.041). Extreme bulging of the abdominal wall below the wound was not reported by any of our patients. In fact, 28.1% patients in group I and 29.4% in group II did not observe this symptom at all, although most patients reported varying degrees of bulging. There were no statistically significant differences between these two groups regarding the incidence of bulging (p=0.36).

Discussion

Our study investigated different techniques of pyramidalis muscle dissection during cesarean section with Pfannenstiel incision. To the best of our knowledge, it has been the first study on the topic. Thus, it is not possible to compare our results with other studies. Kadir et al., investigated the benefits of non-dissection of the rectus sheath inferiorly in a Pfannenstiel incision during an elective cesarean section and found it to be associated with reduced postoperative pain and hemoglobin loss, and recommend this technique of abdominal incision for cesarean section [7]. However, data on the pyramidalis muscle separation for the inferior dissection of the rectus sheath towards the pubis symphysis cannot be found in their report.

Cesarean section is a widely used surgical procedure and all of its steps should be associated with evidence-based medicine. Many technical aspects of cesarean section have been the subject of various randomized trials. Only blunt expansion of the uterine and transverse uterine incision are recommended. The replacement of the pyramidalis muscle is only a small part of the cesarean section procedure, so it is impossible for it to bring substantial advantage for the patient.

The pyramidalis muscle is small, triangular and flat. It is located on both sides of the midline from the pubic crest to linea alba below the umbilicus, between the anterior surface of the

Table V. Data obtained 3 months after cesarean section.

Characteristics		Group I (N=57)	Group II (N=51)	p value
Difference between pre- and postoperative abdomen appearance (1 – the worst; 10 – excellent)		0.7 (±2.51)	1.41 (±2.23)	0.12
Complications in the wound		4 (7%)	1 (1.9%)	0.21
Paresthesia		16 (28.1%)	24 (47.1%)	0.041
Bulging presence 3 months after cesarean section?[1]	Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree	16 (28.1%) 17 (29.8%) 20 (35.1%) 4 (7%) 0	15 (29.4%) 18 (35.3%) 11 (21.6%) 7 (13.7%) 0	0.36

[1] Likert scale

rectus muscles and the posterior surface of the rectus sheath. It is a leftover remnant of highly-developed muscles of marsupium in marsupials and monotremes [8]. In humans, it has been atrophied in about 20% of the population. On the other hand, in some cases the pyramidalis muscle extends along rectus muscles to the xiphoid process. The functional role of the pyramidalis muscle in humans remains to be defined but the muscle, composed of smooth and striated fibers, has been speculated to play a significant role in tensing of the linea alba. Forces generated by the pyramidalis muscle are assessed as comparatively small [8].

Similar to other studies assessing the suitability of different access methods in cesarean section, our study evaluated the following parameters: clinical and obstetric characteristics, time from skin incision to delivery, duration of the surgery, intraoperative complications, type of postoperative anesthesia and neonatal data. There are parameters in our study that were not assessed in other studies, i.e. appearance of the abdomen before and after the surgery, paresthesia around the scar, and bulging of the abdominal wall 3 months after the cesarean section. The most important finding in our study was a significantly higher incidence of paresthesia when the pyramidalis muscle was left on the internal surface of the fascia and access to the peritoneum was obtained between the right and left rectus muscles. This can be explained by the fact that separation of the pyramidalis muscle from the rectus muscles is more traumatic as compared to the second method. Mean hospital stay was slightly but significantly longer for patients whose pyramidalis muscle was left on the rectus muscles.

Because the time of discharge was an individual choice of each patient, shorter hospitalization may only be explained by better convalescence in II group. This phenomenon cannot be explained by postoperative pain because assessment of pain intensity on the VAS sale was similar in both groups. We observed differences between the two groups of patients in terms of other parameters, but the differences were not statistically significant.

Conclusions

None of the two techniques of pyramidalis muscle dissection appear to be superior over the other. The technique of leaving the pyramidalis muscle on the fascia gave more frequent paresthesia but was connected with shorter hospital stay. Thus, we cannot unequivocally recommend one of these techniques and the choice should be left to the operator.

Oświadczenie autorów:

1. Joanna Skręt-Magierło – autor koncepcji i założeń pracy, przygotowanie manuskryptu i piśmiennictwa – autor zgłaszający i odpowiedzialny za manuskrypt.
2. Paweł Soja – zebranie materiału, analiza wyników, przygotowanie manuskryptu i piśmiennictwa.
3. Anna Drozdowska – współautor tekstu pracy i protokołu, korekta i aktualizacja literatury.
4. Anna Bogaczyk – analiza wyników, przygotowanie, korekta i akceptacja ostatecznego kształtu manuskryptu.
5. Paweł Szczerba – analiza wyników, przygotowanie, korekta i akceptacja ostatecznego kształtu manuskryptu.
6. Tomasz Góra – analiza wyników, przygotowanie, korekta i akceptacja ostatecznego kształtu manuskryptu.
7. Katarzyna Kalandyk-Osinko – analiza wyników, przygotowanie, korekta i akceptacja ostatecznego kształtu manuskryptu.
8. Adam Chruściel – analiza wyników, przygotowanie, korekta i akceptacja ostatecznego kształtu manuskryptu.
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