A comparison of 2 cesarean section methods, modified Misgav-Ladach and Pfannenstiel-Kerr: A randomized controlled study

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Advances in Clinical and Experimental Medicine, ISSN 1899-5276 (print), ISSN 2451-2680 (online) *Adv Clin Exp Med*. 2018;27(3):357–361

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Funding sources
None declared

Conflict of interest
None declared

Received on June 7, 2016
Reviewed on September 21, 2016
Accepted on October 21, 2016

Abstract

Background. The modified Misgav-Ladach method (MML) is a minimally invasive cesarean section procedure compared with the classic Pfannenstiel-Kerr (PK) method.

Objectives. The aim of the study was to compare the MML method and the PK method in terms of intraoperative and short-term postoperative outcomes.

Material and methods. This prospective, randomized controlled trial involved 252 pregnant women scheduled for primary emergency or elective cesarean section between October, 2014 and July, 2015. The primary outcome measures were the duration of surgery, extraction time, Apgar score, blood loss, wound complications, and number of sutures used. Secondary outcome measures were the wound infection, time of bowel restitution, visual analogue scale (VAS) scores at 6 h and 24 h after the operation, limitations in movement, and analgesic requirements. At 6 weeks after surgery, the patients were evaluated regarding late complications.

Results. There was a significant reduction in total operating and extraction time in the MML group ($p < 0.001$). Limitations in movement were lower at 24 h after the MML operation, and less analgesic was required in the MML group. There was no difference between the 2 groups in terms of febrile morbidity or the duration of hospitalization. At 6 weeks after the operation, no complaints and no additional complications from the surgery were noted.

Conclusions. The MML method is a minimally invasive cesarean section. In the future, as surgeons' experience increases, MML will likely be chosen more often than the classic PK method.

Key words: cesarean section, postoperative pain, Pfannenstiel incision, modified Misgav-Ladach technique, operating time

DOI
10.17219/acem/66215

Introduction

Cesarean sections (C/S) are among the most common abdominal surgical procedures in women. Approximately 15% of all deliveries are performed by the abdominal route worldwide.[1–3] According to the national registry of the Turkish Health Ministry, in 2014 the proportion of abdominal deliveries was 67% in medical school hospitals, 37% in public hospitals and 71% in private hospitals. The percentage at Sifa University Medical School Hospital in 2014 was 65%.

Cesarean sections are performed in both elective or emergency cases. Fetal distress, a previous C/S history, cephalo-pelvic disproportion, eclampsia, preeclampsia, malpresentation, and placenta previa are the main indications for C/S.

Various surgical procedures have been defined for C/S. In the early 20th century, Pfannenstiel described a transverse incision of the abdomen, which is still the most commonly used method.[4] In 1926, Kerr proposed a transverse lower uterine segment incision and double-layer uterine suture with peritoneal closure.[5] Joel-Cohen described a new transverse incision technique in 1972, and Stark modified it in 1994.[6,7] This technique is also called the Misgav-Ladach method. In the modified Misgav-Ladach method (MML), skin closure is achieved with continuous subcuticular sutures or clips and mattress stitches, according to the surgeon's preference.

In this prospective study, we sought to compare the MML and Pfannenstiel-Kerr (PK) methods in terms of intraoperative and short-term postoperative outcomes.

Material and methods

This randomized controlled trial involved 252 pregnant women scheduled for primary emergency or elective C/S. All the procedures were performed at Sifa University Medical School Hospital between October, 2014 and July, 2015. The approval of the university ethics committee was obtained before beginning the study. Written informed consent was obtained from each patient.

Inclusion criteria were: a gestational age >36 weeks, the first C/S (the women could have delivered vaginally before) and an obstetric indication for C/S. The same 2 surgeons performed all the C/S procedures. Exclusion criteria were: the presence of any additional surgical procedure, such as myomectomy, cystectomy or tubal ligation, placenta previa, placental abruption, preeclampsia, eclampsia, or HELLP syndrome. A flow diagram showing the selection of the study population is presented in Fig. 1. The patients were randomized into 2 groups using a computer-generated random number list: PK (n = 126) and MML (n = 126). The organizer informed the surgeons (SG, NS) of the patient's group assignment immediately before the surgery. The nurses who recorded the VAS scores were blinded to the patient's group. VAS scores were used to assess pain after the operation (on a scale where 0 = no pain and 10 = maximum pain). The anesthesiologist decided on the type of anesthesia (general was used in 19% of the patients, spinal or epidural in 81%).

Description of the modified Misgav-Ladach technique

A Joel-Cohen skin incision was performed with a straight superficial transverse cut in the skin about 3 cm below the line of the spinae iliacae anteriores superiores, and the subcutaneous tissue was opened upwards in the midline so as to reach the rectus sheath above the insertion of the pyramidalis muscles.[7] The parietal peritoneum was opened digitally at the upper level of the intermuscular space. The fetus was extracted from a transverse lower uterine segment incision, and the placenta was removed by transabdominal uterine massage combined with light

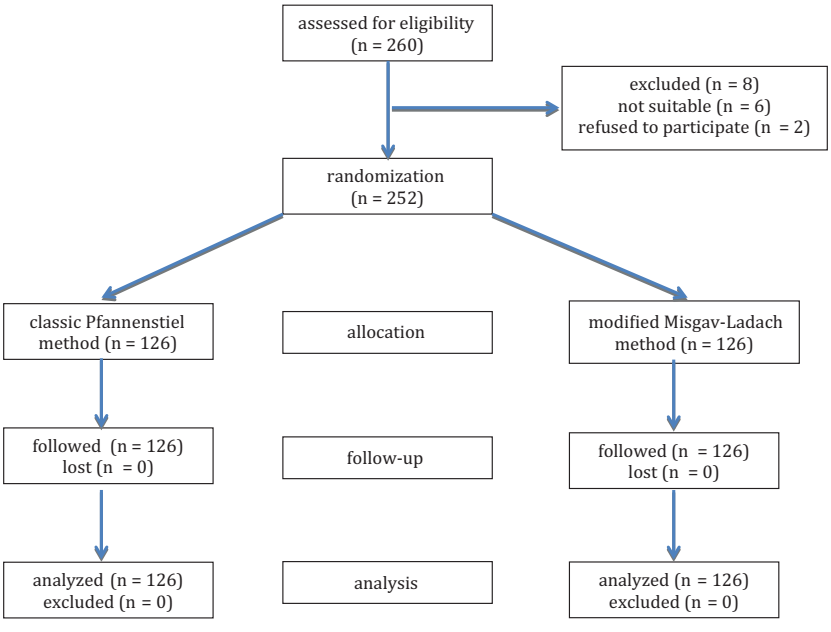

Fig. 1. The selection of the study population

cord traction. Closure of the uterine incision was accomplished with a 1-layer continuous No. 1 polyglactin 910 suture (Vicryl, Ethicon Inc., Somerville, USA), using additional hemostatic stitches as required. The visceral and parietal peritoneum and the rectus muscles were left unsutured. The rectus sheath was closed using a continuous No. 1 polyglactin 910 suture. The subcutaneous tissue was sutured if its depth exceeded 2 cm. The skin was closed with a continuous subcuticular suture.

Description of the Pfannenstiel-Kerr technique

The skin was opened with a Pfannenstiel incision, and the incision was extended through the subcutaneous tissue until the rectus sheath was exposed; the latter was then opened in the midline.[4] Scissors were used to extend the rectus sheath incision laterally, and to separate it from the pyramidalis and rectus muscles. After lateral extension of the uterine incision with uterine scissors, fetal extraction and removal of the placenta using transabdominal uterine massage combined with light cord traction were performed. Closure of the uterine incision was accomplished with a 1-layer continuous No. 1 polyglactin 910 suture. The visceral and parietal peritoneum were closed with a continuous No. 2/0 polyglactin 910 suture. The rectus sheath was closed with a continuous No. 1 polyglactin 910 suture. The subcutaneous tissue was sutured if its depth exceeded 2 cm. The skin was closed with a continuous subcuticular suture.

Primary and secondary measures of postoperative outcomes

The primary outcome measures were the duration of surgery (between skin incision and skin closure), extraction time (until delivery of the neonate), Apgar score, blood loss, wound complications, and number of sutures used.

Secondary outcome measures were the wound infection, time of bowel restitution, VAS scores from 0 to 10 at 6 h and 24 h after the operation, limitations in movement, and analgesic requirements. At 6 weeks after the surgery, patients were evaluated for late complications.

Statistical analysis

All statistical analyses were performed using RStudio v. 0.98.501 (RStudio Inc., Boston, MA, USA). The Mann-Whitney U test was used to compare the study groups. Probability values <0.05 were considered statistically significant. For each group, a minimum of 126 subjects was required to have 80% power (α: 0.05) with a 10% difference in Apgar scores.

Results

The patient characteristics are shown in Table 1. There was no difference between the groups in terms of mean maternal age, gestational age, BMI, C/S indication, or the type of anesthesia. There was a significant reduction in total operating time in the MML group (16.9 min) compared with the PK group (35.2 min; $p < 0.001$), and the mean extraction time was significantly shorter in the MML group ($p < 0.001$). There was no difference in Apgar scores. Primary outcomes are shown in Table 2.

All the patients began a regular diet 6 h after the surgery and were mobilized at 10 h after the surgery. The 6-hour post-op VAS score (VAS0) and the 24-hour score (VAS1) were significantly lower in the MML group (MML: 3.54 VAS0, 1.46 VAS1; PK: 6.36 VAS0, 3.64 VAS1; $p < 0.001$). Limitation in movement, evaluated 24 h after the operation, was lower in the MML group (Fig. 2), and less analgesic was required in the MML group (1.8 doses; Fig. 3). There were no differences in febrile morbidity or the duration of hospitalization. At 6 weeks after the operation, we received no complaints or reports of additional complications related to the surgery.

Table 1. Patients' demographic data

(Mean ±SD)	MML (n = 126)	PK (n = 126)	p-value
Age [years]	31.4 ±4.7	30.2 ±5.4	0.080
BMI [kg/m^2]	29.22 ±3.97	30.23 ±5.09	0.251
Gestational age [weeks]	38.82 ±0.6	38.42 ±1.6	0.120
Type of anesthesia n (%) general regional	 22 (17.5) 104 (82.5)	 31 (23.6) 95 (76.4)	0.155

MML – modified Misgav-Ladach method; PK – Pfannenstiel-Kerr method.

Table 2. Operation details

(Mean ±SD)	MML (n = 126)	PK (n = 126)	p-value
Operating time [min]	16.89 ±2.45	35.24 ±4.81	<0.001
Extraction time [s]	85.2 ±40.1	190.3 ±78.6	<0.001
Apgar score (1 min)	8.8 ±2.7	8.3 ±2.4	0.121
Blood loss [mL]	205 ±146	370 ±251	0.001
Post-op – pre-op [g/dL]	0.36 ±0.95	0.56 ±0.83	0.001
Post-op – pre-op [%]	0.95 ±3.08	1.36 ±2.85	0.011
Number of sutures used	3.2 ±1.2	5.3 ±2.5	0.001

MML – modified Misgav-Ladach method; PK – Pfannenstiel-Kerr method.

Discussion

The present study compared the PK and MML methods. In recent studies, shorter operating times have been reported with MML.[8–12] Franchi et al. reported similar operating times with both methods, but a shorter extraction

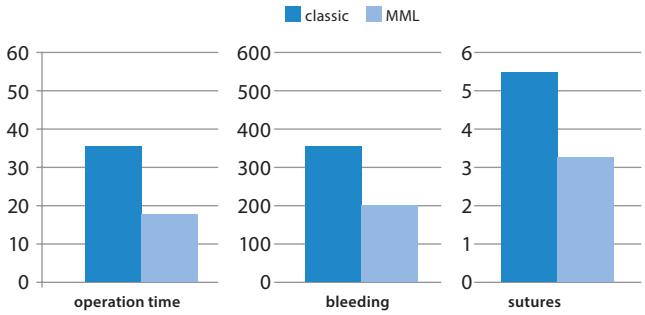

Fig. 2. Comparison of primary outcomes (operating time in min; bleeding in mL; sutures by number)

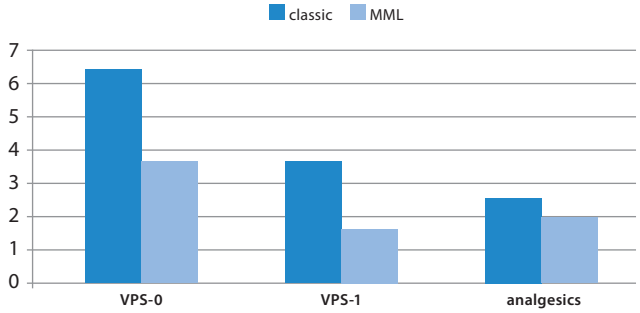

Fig. 3. Comparison of secondary outcomes (VAS scores and analgesics by number)

time with MML.[13] We also found a shorter operating time with MML than with the PK method. A shorter operating time may be particularly important in emergencies as opposed to elective cases. It is of primary importance that the duration between incision and entrance to the abdomen was shorter, which provides a shorter time for delivering the baby. Although better results for neonatal outcomes would be expected under this condition, in most studies addressing this issue, no difference has been reported for neonatal outcomes between the 2 methods.[9,10,13,14] We also found no difference in Apgar scores between the groups.

Another reason for the shorter operating time with MML is that the visceral and parietal peritoneal layers were left unsutured after the closure of the uterus. Suturing the peritoneal layers is an unnecessary step, because the peritoneum does not heal by the approximation of the wound edges; a new peritoneal layer is formed within 24–48 h. Adhesions are formed as vascular bridges to supply oxygen to ischemic areas of tissue, and necrosis often occurs around peritoneal sutures, providing focal points for adhesions.[15–17] Moreover, leaving the subcutaneous tissue unsutured does not increase the incidence of wound complications.[18,19] In the present study, we found that significantly fewer sutures were used in the MML group. The reduction in cost achieved in the MML method by using fewer sutures and less anesthesia is particularly important for developing countries.

Stark and Finkel demonstrated reduced use of antibiotics and less postoperative febrile morbidity with MML.[7] However, other studies have found similar results for wound infection in the 2 methods.[9,20] A prophylactic antibiotic was given to all the patients in the present study, and we did not note any infection in either group. As in other recent studies, we found significantly less blood loss in the MML group.[21] This was associated with several procedural differences: the subcutaneous tissue was not cut, the rectus muscles were stretched instead of being cut and the fascia layer was not opened upwards from the midline.

All the procedures were performed by the same 2 experienced surgeons to avoid variation. A nurse blinded to the patient group recorded the postoperative data (VAS scores, the need for analgesics, scores for movement limitation) to prevent bias during the study. Early mobilization is known to reduce the risk of thrombosis, ileus and infections. Early restitution of oral intake facilitates physical recovery through rapid replacement of protein loss. The lower analgesic requirements during the early postoperative period in the MML group are associated with lower tissue trauma due to blunt access to the abdominal cavity, without the blood vessels and nerves of the subcutaneous tissue being incised.[19]

Higher scores were recorded for VAS0 and VAS1 in the PK group than the MML group in our study. The patients in the MML group reported less postoperative discomfort, indicating that MML is a less traumatic C/S approach. In another study, it was demonstrated that the MML method resulted in better short-term quality of life scores, especially in terms of reduced bodily pain and postoperative complications compared with the PK method.[17]

Conclusions

We suggest that in the future, with increased experience on the part of surgeons, the minimally invasive MML cesarean section method will be chosen more often than the classic PK method.

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