European Journal of Obstetrics & Gynecology and Reproductive Biology 182 (2014) 43–47

Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

journal homepage: www.elsevier.com/locate/ejogrb

Comparison of maternal outcomes from primary cesarean section during the second compared with first stage of labor by indication for the operation

Samuel Lurie [a,b,*], Nili Raz [a], Mona Boaz [b,c], Oscar Sadan [a,b], Abraham Golan [a,b]

[a] Department of Obstetrics and Gynecology, Edith Wolfson Medical Center, Holon, Israel
[b] Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel
[c] Epidemiology and Statistics Unit, Edith Wolfson Medical Center, Holon, Israel

ARTICLE INFO

Article history:
Received 14 May 2014
Received in revised form 6 August 2014
Accepted 16 August 2014

Keywords:
Cesarean section
Labor
Stages of labor
Maternal morbidity

ABSTRACT

Objective: To compare maternal outcomes when cesarean sections were performed in the second stage of labor to those performed in the first stage of labor by indication for the operation.
Study design: This is a retrospective cohort ($n = 383$) of term parturient women who underwent primary cesarean section during active labor. Cases were drawn from the Obstetrics Department, E. Wolfson Medical Center, a tertiary health care university facility, during a 24 month period. All cases were term singleton pregnancies in vertex presentation following unremarkable pregnancy. Maternal morbidity was assessed.
Results: A significantly higher rate of unintentional uterine incision extensions was observed in cesarean sections performed during second stage compared to first stage (17.1% vs. 4.6%, $p = 0.001$). It was higher whenever (at first or second stage) the fetal head was pushed (20.0% vs. 5.4%, $p = 0.0024$). Unintentional uterine incision extensions were significantly more frequent when the cesarean section was performed for non-progressive labor during the second stage compared to first stage (16.1% vs. 3.6%, $p = 0.0052$). Uterine atonia was more frequent among parturient women who underwent cesarean section for non-progressive labor during the first stage compared to second stage (16.7% vs. 4.8%, $p = 0.0382$).
Conclusion: Uterine atony during first stage cesarean section and unintentional uterine incision extensions during second stage cesarean section were significantly more frequent when the operation was performed for non-progressive labor.

Introduction

Cesarean sections in the second stage of labor are associated with increased risk of maternal morbidity compared to those performed in the first stage of labor. Increased blood loss [1–3], extension tears to the uterine angles [1,4,5], bladder injury [1,4], intraoperative trauma to adjusted intra-abdominal tissues [3,6], uterine atony [4], wound infection [2,3], postoperative fever [1,3,7] and re-laparotomy [3] typically have been observed to be excessive in cesarean sections performed in the second stage of labor. This increased maternal morbidity is principally attributed to difficult and potentially traumatic disengagement of the deeply wedged fetal head during cesarean section in the second stage [8].

Studies reporting cesarean section associated morbidity in the second stage typically compare the morbidity of cesarean sections in the second stage to that of cesarean sections in the first stage of labor [1–4,6,7]. However, maternal morbidity might vary in accordance with indication for the operation across the stage of labor. For example, in crash emergency cesarean section performed for presumed fetal compromise during the second stage of labor, the need for expedited delivery of the fetus [9,10] may lead to potentially more traumatic efforts and intraoperative difficulties for disengagement of fetal head than when cesarean section is done for non-progressive labor (i.e. prolonged second stage). A comparison of cesarean section associated morbidity by stage of labor in accordance with indications for cesarean section (non-progressive labor or suspected fetal compromise) was not done previously. The objective of this study was to evaluate

* Corresponding author at: Department of Obstetrics and Gynecology, Edith Wolfson Medical Center, Holon, Israel. Tel.: +972 3 5028329; fax: +972 8 9366259.
E-mail address: drslurie@hotmail.com (S. Lurie).

http://dx.doi.org/10.1016/j.ejogrb.2014.08.025
0301-2115/

maternal morbidity in accordance with indications for cesarean section in the first and second stages of labor.

Materials and methods

This observational retrospective cohort study had two assessment stages. We first compared maternal morbidity in parturient women who underwent a primary cesarean section in the first stage of labor to that of women for whom the procedure was performed during the second stage of labor. Thereafter we compared maternal morbidity in accordance with various indications for the operation across the stages of labor. Cases were included if the cesarean section was performed during a 24-month period from 2010 to 2011 at Edith Wolfson Medical Center, a university tertiary health care facility. The study protocol was approved by the Edith Wolfson Institutional Review Board Committee (protocol number WOMC 0113-11). There were a total of 8885 deliveries between January 1, 2010 and December 31, 2011. Of those, 1992 (22.4%) were accomplished by a cesarean section.

Study eligibility included: primary cesarean section performed during active labor, singleton pregnancy, vertex presentation, gestational age between 37 + 0 and 40 + 6 weeks verified by ultrasound at 1st trimester, generally healthy, and unremarkable pregnancy. The criteria precluding inclusion were: elective cesarean section, cesarean section on demand during labor, state post previous cesarean section, multiple pregnancy, non-vertex presentation, gestational age of <35+6 weeks, any known maternal disease (for example lupus), and any known pregnancy complications (for example preeclampsia). Finally, 382 parturient women who underwent a primary cesarean section were enrolled in the study.

The selection of the underlying reason or indication for cesarean delivery was based on the primary indication for cesarean delivery as stated by the attending obstetrician. Each delivery was assigned to the primary indication noted for that pregnancy, regardless of other indications reported. All cesarean deliveries were allocated to one of three categories: non-progressive labor, non-reassuring fetal heart rate pattern, or hemorrhage. In our department, labor is managed by standard departmental protocols with direct supervision by a senior obstetrician. The category non-progressive labor included all types of obstructed, protracted or non-progressive labors. The diagnosis of failure to progress was made in accordance with the guidelines of the American College of Obstetricians and Gynecologists. There were no cases of failed attempts of instrumental deliveries in this group. Non-reassuring fetal heart rate pattern was defined as severe variable decelerations, late decelerations, prolonged decelerations (3–10 min), or baseline bradycardia of less than 100 beats per minute. Fetal blood sampling in order to confirm fetal distress in cases of non-reassuring fetal heart tracing during first stage of labor is exceedingly rarely performed in our department. The category hemorrhage included bleeding during labor when the leading reason for operation was the amount of bleeding without significant non-reassuring fetal heart rate pattern. The presumed cause for bleeding in those cases was abruption of placenta that did not lead to fetal compromise. Time of surgery was defined as morning (08 am to 04 pm), evening (4 pm to 11 pm) or night (11 pm to 08 am).

In our department a senior obstetrician is always present during surgery. We use a Pfannenstiel incision for the skin, the subcutaneous tissue is incised in the midline and transversely, after sharp opening of the peritoneum, the bladder is carefully pushed downward off the lower uterine segment, and the uterus is incised transversely in the lower uterine segment. After fetal and placental delivery, the uterus is exteriorized, the uterine incision is closed in two layers with continuous suture of polyglactin no. 1 (Vicryl), visceral and parietal peritoneums are left open, the muscles are not approximated, the rectus sheath is closed with a continuous non-locking suture of polyglactin no. 1 (Vicryl) and the skin is closed with staples.

Postoperatively, the patients were followed daily at our maternity ward using a standard postoperative care practice that included intravenous prophylactic antibiotics administered after delivery of the infant, removal of the urinary catheter on the first postoperative day, encouragement of early ambulation (12 h after the operation), allowance of resumption of drinking 18 h after the operation if bowel sounds are present, and staples removal on the fifth postoperative day. Complete blood count was done 24–36 h after the operation.

The primary outcome measures included maternal intra-operative and postoperative morbidity and immediate neonatal outcome (cord pH and Apgar score). Intraoperative parameters included skin incision to fetal delivery interval, duration of operation, intraoperative difficulties for disengagement of fetal head, extension of uterine incision (lower segment tears), intraoperative trauma of other abdominal organs, atonic uterus, and excessive bleeding (as judged by need for intraoperative blood transfusion). Postoperative parameters included blood loss (as judged by hemoglobin decrease), febrile morbidity (defined as temperature of $\geq$37.8 °C on two occasions), thromboembolic morbidity (defined as diagnosis of deep vein thrombosis), abdominal scar morbidity (defined as scar dehiscence or scar infection), re-laparotomy and duration of hospitalization. Neonatal outcome parameters included Apgar score, cord pH and intra-operative fetal injury (including skin lacerations).

Statistical analysis: Analysis of data was carried out using SPSS 21.0 statistical analysis software (IBM Inc., USA). For continuous variables, descriptive statistics were calculated and reported as mean ± standard deviation (SD) and were compared by stage of labor in which cesarean section was performed (first vs. second) within each indication using the *t*-test for independent samples. In addition, these variables were compared by indication for cesarean section using the one-way analysis of variance (ANOVA) and post hoc pairwise testing was performed using Bonferroni's test. Nominal variables were compared by stage of labor during which cesarean section was performed using the chi-square (χ^2) test or Fisher's exact as necessary. All tests were two-sided and considered significant at $p < 0.05$.

Results

Of the 382 enrolled parturient women who underwent a primary cesarean section, 306 (80.1%) were performed during the first stage of labor and 76 (19.9%) during the second stage. Table 1 summarizes parturient women characteristics by stage of labor.

Cervical dilation as a factor contributing to the decision to operate, time interval from skin incision to delivery, operation length, newborn birth weight, cord pH and postoperative hemoglobin differed significantly across indications for cesarean section during the first stage of labor, ($p < 0.05$). In post hoc testing, cervical dilation as a factor contributing to the decision to operate was significantly greater in parturient women operated for non-progressive labor (5.3 ± 2.4 cm) than either for non-reassuring fetal heart rate pattern (4.3 ± 2.2 cm) or bleeding (2.1 ± 1.6 cm) ($p < 0.0001$). Head station at decision to operate in the first stage of labor was significantly ($p = 0.006$) lower in parturient women operated for non-progressive labor (−2.9 ± 1.4 cm) than for non-reassuring fetal heart rate pattern (−3.9 ± 1.4 cm). In post hoc testing, time interval from skin incision to delivery was significantly ($p = 0.009$) shorter in parturient women operated for non-reassuring fetal heart rate pattern (4.1 ± 2.3 min) than either of the other two indications, and did not differ between bleeding (4.3 ± 2.0 min) and non-progressive labor (5.1 ± 3.4 min). In post hoc testing, operation length was significantly ($p = 0.005$) shorter in parturient women