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Urinary bladder injury during cesarean delivery: Maternal outcome from a contemporary large case series

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ABSTRACT

Background: Urinary bladder injury is a rare complication during cesarean delivery. Little is known on maternal outcome following this injury.
Objective: To evaluate short and long-term maternal outcome following bladder injury during cesarean delivery.
Study design: A retrospective case series of all pregnancies complicated by full-thickness bladder injury during cesarean delivery in a single university affiliated tertiary medical center (August 2007–June 2016). Data on demographics, labor and surgery parameters, postpartum sequelae, and cystography were collected and reviewed by study personnel. Short-term maternal outcome included catheterization period, cystography results (if performed), any febrile illness and/or need for second operation prior to maternal discharge. Long term maternal outcome was obtained by searching our urology departmental and ambulatory database for follow up for all women. Univariate analysis was used to compare maternal outcome following first or repeat cesarean delivery.
Results: Of 17,326 cesarean deliveries performed during study period, 81 (0.47%) were complicated by bladder injury. Of them, 8 cases (9.9%) occurred during primary cesarean delivery (overall risk in primary cesarean 0.07%). Of the other 73 cases that followed repeated cesarean, adhesions were documented in 55 (75.3%) of them. Six cases (8.2%) had placenta accreta.
Bladder injury occurred at peritoneal entry in 55 (67.9%) cases, and involved the bladder dome in 49 (60.5%) of them. Injury was diagnosed during cesarean delivery in all but 3 women, in whom abdominal pain and bloating prompted evaluation on first to third postoperative day. All 3 underwent re-laparotomy with bladder closure without further adverse sequelae.
Cystography was performed in 35 patients on median postoperative day 8 (6–11 days). Eleven patients had abnormal findings as follows: 5 urinary leakage, 4 bladder wall irregularity and two urinary reflux. Two of the 11 patients (18%) required additional interventions: One patient required bilateral nephrostomy and re-laparotomy for bladder closure followed by additional surgery to repair consequent vesico-vaginal fistula. The second patient required left nephrostomy and ureteral re-implantation. Both women had combined ureteral and bladder injury. For the rest of the cohort, no febrile illness or other short- or long-term adverse events were reported.
There were no clinically significant differences in adverse maternal outcomes between women with repeat cesarean delivery compared to primary cesarean delivery.
Conclusion: Bladder injury is a rare complication of cesarean delivery. In our case series, unless there is combined ureteral and bladder injury, prognosis was favorable without any long-term sequelae.

Introduction

Iatrogenic bladder injury may occur with any procedure that involves the abdominal and/or pelvic cavity including gynecologic, general surgical or urologic surgeries [1]. Cesarean delivery (CD) is

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rarely complicated by bladder injury with reported incidence varying from 0.0016% to 0.94% [2,3].

Previous studies have identified risk factors for bladder injury during CD including: repeated cesarean, presence of adhesions, urgent cesarean and attempted vaginal birth after CD [4,5].

This information is helpful for practitioners performing CD. Not only it provides information regarding CD complications, it is also helpful for prediction and perhaps prevention of the next case. With rising CD rate we expect to encounter more complications including bladder injuries. However, the existing data about the short- and long-term maternal implications of such injury is scares. Such knowledge will improve the informed consent given to women prior to decision for cesarean let alone will better direct the obstetrician for the advised follow up after bladder injury during CD.

Limited number of studies addressed the outcome of bladder injury following CD. Some of the short-term complications that have been studied included prolonged operation time, urinary tract infection and prolonged indwelling catheterization [4]. So far, no long-term adverse outcome had been reported. Thus, in this study we aimed to present a contemporary case series of bladder injury during CDs, their management and the short-and long- term maternal outcome.

Materials and methods

A retrospective case series of all pregnancies complicated by bladder injury at or following CD in a single, tertiary, university affiliated medical center between August 2007 and June 2016. All women with diagnosis of bladder injury at the time of CD or in the early post-partum period prior to maternal discharge were included. Bladder injury was defined as any full thickness defect of the bladder that required surgical repair. We identified cases by searching the diagnosis of bladder injury and bladder repair in our comprehensive computerized labor and delivery databaseduring study period. Following that, all charts were manually reviewed carefully to confirm the diagnosis by study personnel. No exclusion criteria were made. The study was approved by our local institutional review board.

As by departmental policy, a senior obstetrician attends all cesarean deliveries. All women are given prophylactic antibiotics 30 min prior to elective cesarean delivery or at the earliest time prior to emergency cesarean. In all cases with suspected bladder injury at or following CD, a senior urologist is consulted at time of diagnosis, and repair of the bladder is performed immediately using 2 or 3 layers of 2.0- Vicryl suture (polyglactin 910). After surgical repair, all women are left with in situ Foley catheterization for at least 5–7 days. Intravenous antibiotics (Cefuroxime, Ofloxacin or Cefamizin) are given to all until removal of the Foley catheter. Vital signs are checked routinely three times a day and febrile illness, defined as two temperature measurements $\geq 38^{\circ}$, taken at least 6 h apart, from 24 h after surgery is treated with broad spectrum antibiotics. Follow up cystography is performed prior to maternal discharge according to the attending urologist discretion. Continued ambulatory follow up is advised per case by the ambulatory urologist service. In cases were ambulatory follow up is advised, women are scheduled for appointment prior to discharge to ensure their arrival.

Data were retrieved from the comprehensive computerized perinatal database of the obstetric division as well as from the urologist hospital and ambulatory database and was cross tabulated using an individualized identification number per patient. Collected data included maternal demographics and obstetric parameters, details regarding the CD, bladder injury location and repair technique. Short-term maternal outcome included catheterization period, cystography results (if performed), any febrile illness and/or need for second operation prior to maternal discharge. Long term maternal outcome was obtained by searching our urology departmental and ambulatory database for follow up for all women from the time of the index pregnancy till time of the study. It included the need for repeated urinary tract imaging or any surgical intervention.

For this study, we meticulously reviewed all women charts. First, we describe the bladder injury characteristics and maternal short-and long-term outcome. Second, we compared injury characteristics and outcomes between women at their first CD and following repeat CD.

Data analysis was performed with the SPSS v21.0 package (Chicago, IL). Continuous variables were compared using Student's *t*-test and Mann-Whitney *U* test. The chi-square and Fisher's exact tests were used for categorical variables, as appropriate. Differences were considered significant when p-value was less than 0.05.

Results

Overall, during study period there were 75,682 deliveries, of them, 17,326 were cesarean deliveries (22.89%). Full thickness bladder injury during CD was diagnosed in 81 women (0.47%). During study period, 7029 (40.6%) patients had repeat CD with bladder wall injury diagnosed in 73 patients (1.03%) of them. In the remaining 10,297 primary CD, bladder wall injury was diagnosed in only 8 (0.07%) cases. Most women with bladder injury had a previous CD (n = 73, 90.1%) and in most of them adhesions were documented (n = 55, 75.3%). Of all patients, 49 patients (60.5%) had a scheduled CD and 32 (39.5%) had an urgent CD.

Of the 8 cases with primary CD, one (12.5%) had a scheduled CD due to placenta previa and 7 (87.5%) had an urgent CD. Four of them were in active labor and two were in the second stage of labor. Indications for urgent CD included: breech presentation at labor (3 cases), non-reassuring fetal heart rate (2 cases), one case of placenta previa with suspected placental abruption at 33 weeks gestation and one case of twin delivery at labor. Adhesions were reported in 5 cases of them (62.5%).

For the entire cohort, indications for scheduled CD were: single or multiple previous cesarean deliveries (n = 41, 83.7%), breech presentation (n = 4, 8.1%), and placenta previa (n = 4, 8.1%). Indications for urgent CD included: Arrest of descent, arrest of dilatation, failed induction, chorioamionitis, placental abruption, breech presentation in labor and non-reassuring fetal heart monitoring. In 4 of these cases the cervix was fully dilated at time of surgery.

Bladder injury occurred at peritoneal entry in 55 (67.9%) of cases, and involved the bladder dome in 49 (60.5%) of them.

In 78/81 (96.3%) cases the diagnosis of bladder injury was made during CD after the delivery of the fetus. All were treated with Foley catheterization for median 7 (range 5–10) days post-partum. In the other 3 patients (3.7%), suspicion for bladder injury was made 1–3 days post-operatively in the maternity ward due to abdominal pain abdominal bloating and free fluid demonstrated on abdominal ultrasound. Two of these 3 patients, had an abnormal rising creatinine level: One patient was diagnosed with bladder injury using cystography on post-operative day 2 and the other was highly suspected for having bladder injury on post-operative day 3 due to abnormal creatinine levels and free fluid on abdominal ultrasound, therefore the decision for re-laparotomy without any urinary tract imaging was made. The third patient suffered from macro-hematuria on post-operative day 1 and was diagnosed with bladder injury using cystoscopy. All 3 patients had a re-laparotomy and bladder repair. After repair, these patients were left with Foley catheterization for up to 10 days and cystography, performed prior to catheter removal was normal.