

## **Bladder Injury during Cesarean Section: A Case Control Study for 10 Years**

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**Objective:** To determine the incidence, risk factors and management of bladder injury during Caesarean section.

**Design:** Retrospective study.

**Setting:** Abha Maternity Hospital, Asir, Saudi Arabia.

**Method:** The medical records of all the patients who had bladder injury during Cesarean section in 10 years period (2000-2010) were reviewed. Two cases were chosen for every case of bladder injury as control. Personal characteristic, obstetric, surgical details, mechanism of injury, anatomic location, diagnosis, management and outcome were assessed for both (case and control) groups.

**Result:** Twenty-four cases of bladder injury were indentified among 10,765 Cesarean sections done during the study period, an incidence of 0.22%. Bladder injury occurred frequently with prior surgery including Cesarean section (62.5% versus 43.7%,  $p=0.022$ ), presence of adhesions (95.8% versus 45.8%,  $p<0.0001$ ), emergency Cesarean (87.5% versus 37.5%,  $p<0.0001$ ) and placenta previa and or accreta (41.6% versus 2.1%,  $p<0.0001$ ).

**Conclusion:** A prior Cesarean section, presence of abdominal and or bladder adhesions, emergency Cesarean and placenta previa and or accreta, all are significant risk factors for bladder injury during Cesarean section. Bladder injury should be a part of discussion with the patients requesting Cesarean section.

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Bladder injury during Cesarean section could be associated with significant morbidity. It could lead to prolonged operative time, urinary tract infection and formation of vesicouterine or vesicovaginal fistula<sup>1-3</sup>.

Most complications occurred during emergency Cesarean delivery; station before surgery, labor before surgery, low gestational age ( $\leq 32$  weeks), rupture of chorionic membranes before surgery, prior Cesarean delivery and skill of operator were associated with an increased risk complications<sup>4</sup>.

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Bladder injury during Cesarean section is uncommon but has significant morbidities. The incidence is about 0.104% - 0.28%<sup>5,6</sup>. Phipps et al, found that women with a bladder injury were more likely to have had a prior Cesarean delivery compared with the control group (67% versus 32%)<sup>5</sup>. Prior pelvic surgery and presence of adhesions are risk factors for bladder injury<sup>5</sup>.

To the best of my knowledge there is only one study regarding the bladder injury with Cesarean section in Saudi Arabia, but it was performed in different regions<sup>7</sup>.

The aim of the study was to determine the rate, risk factors and management of bladder injury during Caesarean section.

## **METHOD**

Patients who had bladder injury during Cesarean section from 1 January 2000 to 31 December 2010 were included in this retrospective study. Any patient with ureteric injury alone and those who have injuries during other gynecological procedures were not included. Two cases of Cesarean sections without bladder injury for each case of bladder injury were used as control group.

In the hospital all high risk Cesareans would be done by a consultant obstetrician, other Cesareans will be supervised by obstetrics specialist.

The data were analyzed using SPSS 16.0 (2007); the sample was divided into two groups those with bladder injury and those without as the control group. Chi-square test was used for data analysis. Multivariate analysis using logistic regression was carried out with bladder injury as the final outcome. The odds ratio (OR) and 95% confidence interval (CI) were calculated using logistic regression. A p-value of <0.05 was considered statistically significant.

## **RESULT**

Twenty-four cases of bladder injury were identified during Cesarean section in the study period; 10,765 Cesarean sections were performed during the study period. The Cesarean section rate had increased from about 15% in 2000 to 24.2% during 2010. The incidence of bladder injury in this study was 0.22%.

The personal and clinical characteristics of the women who had a bladder injury (case group) and those of the controls (no bladder injury) are shown in Table 1. Both groups were almost the same regarding their age, parity, gestational age at Cesarean section, type of pregnancy (multiple versus singleton), presence of labor or not, fetal position at delivery and those who had uterine scar dehiscence or rupture.

**Table 1: Personal and Clinical Characteristics of Cases and Controls**

<b>Characteristics</b>	<b>Cases Group (n=24)</b>	<b>Control Group (n=48)</b>	<b>p-value</b>
<b>Number (%)</b>			
<b><u>Age</u></b>			
<25 years	1 (4.2%)	8 (16.7%)	0.39
26-35 years	16 (66.7%)	27 (56.3%)	
>35 years	7 (29.2%)	13 (27.1%)	
<b><u>Parity</u></b>			
Multi	18 (75%)	41 (85.4%)	0.28
Grand Multi	6 (25%)	7 (4.6%)	
<b><u>Gestational Age</u></b>			
<32 weeks	3 (12.5%)	0 (0%)	0.49
33-37 weeks	6 (25%)	16 (33.3%)	
>37 weeks	15 (62.5%)	32 (6.7%)	
Multiple Pregnancy	1 (4.2%)	1 (2.1%)	0.61
Previous Abdominal or Pelvic Surgery	24 (100%)	23 (47.9%)	<0.0001
<b><u>Cesarean Type</u></b>			
Elective	3 (12.5%)	30 (62.5%)	<0.0001
Emergency	21 (87.5%)	18 (37.5%)	
<b><u>Number of Previous Cesarean</u></b>			
I	2 (8.3%)	25 (52.1%)	0.022
II	7 (29.2%)	2 (4.2%)	
III	11 (45.8%)	12 (25%)	
IV	4 (16.7%)	9 (18.7%)	
Midline Skin Incision	5 (20.8%)	1 (2.1%)	0.013
<b><u>Adhesions</u></b>			
No	1 (4.2%)	26 (54.2%)	<0.0001
Mild-moderate	5 (20.8%)	16 (33.3%)	
Severe	18 (75%)	6 (12.5%)	
Bladder Adherent to Uterus	23 (95.8%)	17 (35.4%)	<0.0001
Bladder Flap Done	11 (45.8%)	34 (70.8%)	0.026
<b><u>Type of Placenta</u></b>			
Normal	14 (58.3%)	47 (97.9%)	<0.0001
Previa	2 (8.3%)	1 (2.1%)	
Accreta	8 (33.3%)	0 (0%)	
<b><u>Estimated Blood Loss</u></b>			
<700 ml	7 (29.2%)	39 (81.2%)	<0.0001
700-1000 ml	6 (25%)	9 (18.7%)	
>1000 ml	11 (45.8%)	0 (0%)	
Presence of labor	17 (70.8%)	16 (33.3%)	0.22
<b><u>Fetal Position</u></b>			
Vertex	23 (95.8%)	37 (77.1%)	0.35
Breech	1 (4.2%)	11 (22.9%)	
<b><u>Birth Weight</u></b>			
<2500 grams	10 (41.7%)	0 (0%)	0.001
2500-3500 grams	11 (45.8%)	40 (83.3%)	
>3500 grams	3 (12.5%)	8 (16.7%)	
Uterine Rupture	1 (4.2%)	0 (0%)	0.33
Uterine Scar Dehiscence	2 (8.3%)	1 (2.1%)	0.22

Women who had prior Cesarean (3 or more) were prone to bladder injury (62.5% versus 43.7%,  $P=0.022$ ). Women who had emergency Cesarean sections were prone to bladder injury (87.5% versus 37.5%,  $P<0.0001$ ). Women who had intra abdominal adhesions were prone to bladder injury (95.8% versus 45.8%,  $P<0.0001$ ). The bladder was more adherent to the lower uterine segment in the case group (95.8% versus 35.4%,  $P<0.0001$ ).

Women who had placenta previa and/or accreta were prone to bladder injury (41.6% versus 2.1%,  $P<0.0001$ ). Patients with bladder injury tend to have more blood loss (>1000 ml) during Cesarean section (45.8% versus 0%,  $P<0.0001$ ).

Table 2 shows the timing and location of bladder injury. All the cases were identified during the Cesarean section except two cases, which were identified in the recovery room due to frank hematuria in the urinary catheter bag; the two cases were taken to operating room and a urologist was involved in the bladder repair.

**Table 2: Timing and Location of Bladder Injury and the Number of Previous Cesarean Sections**

	Number of Previous Cesarean Section				P value
	I	II	III	≥IV	
<b><u>Time of Bladder Injury</u></b>					
During Cesarean	2	6	10	4	0.72
Postoperative	0	1	1	0	
<b><u>Timing of Injury during Cesarean Section</u></b>					
Entry to Peritoneal Cavity	2	5	3	1	0.16
Bladder Flap	0	0	2	0	
Uterine Incision and Delivery	0	1	5	3	
<b><u>Location of Bladder Injury</u></b>					
Anterior	1	4	1	1	0.63
Posterior	0	0	6	2	
Dome	1	3	4	1	

Eleven (45.8%) cases of bladder injury occurred during entry to peritoneal cavity, 2 (8.3%) cases occurred during bladder flap creation and 9 (37.5%) cases occurred during uterine incision and/or delivery. The bladder injured at anterior bladder wall in 7 (29.2%), 8 (33.3%) at the posterior bladder wall and 9 (37.5%) at the dome of the bladder.

Table 3 shows multivariate logistic regression model investigating the risk factors for bladder injury. Previous abdominal/pelvic surgery, including previous Cesarean section, was associated with 5-fold increase in the risk of bladder injury.

**Table 3: Regression Analysis of Bladder Injury Risk Factors**

Factor	OR	95% CI
Abdominal Adhesions	6.31	3.60 - 9.21
Bladder Adherent to Uterus	5.73	4.32 - 8.40
Cesarean Type	4.73	3.83 - 8.70
Number of Previous Cesarean Sections	2.48	1.81 - 3.04
Previous Abdominal or Pelvic Surgery	5.16	1.04 - 6.92
Type of Placenta	5.33	3.44 - 9.40

Abdominal adhesions and bladder adhesions to the uterus were associated with 6-fold and 5-fold of bladder injury respectively. Emergency Cesarean section has 4-fold increase in the risk of bladder injury. Placenta previa and accreta were associated with 5-fold increase of bladder injury.

## **DISCUSSION**

The bladder injury during Cesarean section varies from 0.0016% to 0.94%<sup>8,9</sup>. In this study, an incidence of 0.22% was found. The incidence does not appear to have changed in the last half of the century. Another study from Saudi Arabia found that the incidence of bladder injury is 0.44%<sup>7</sup>.

Risk factors for bladder injury during Cesarean section were investigated before. Prior Caesarean delivery accounted for 67% of the bladder injuries, while in the controls the rate of prior Caesarean delivery was 32%<sup>5</sup>.

In a recent study, prior Caesarean delivery have accounted for 72.4%. In the control group, the incidence of prior Caesarean delivery was 34.2%, 5-fold increase in the risk of bladder injury with prior Cesarean section<sup>10</sup>.

In this study, women with a bladder injury tend to have prior Cesarean (3 or more) compared with those without bladder injury (62.5% versus 30.7%;  $p=0.022$ ), 5-fold increase in the risk of bladder injury.

Intra-abdominal adhesions and adhesions between bladder and the uterus will increase the risk of bladder injury; 6-fold increase in the risk of bladder injury with abdominal adhesions and 5-fold increase in the risk with bladder adhesions to the uterus, both consistent with other studies<sup>5,6,10</sup>.

In this study, emergency Cesarean section is a significant risk factor for bladder injury compared to elective Cesarean section; this finding is similar to previous studies<sup>4,5,10</sup>. Other studies found that elective Cesarean was a risk factor for bladder injury<sup>11</sup>.

In this study, placenta previa and or accrete are risk factors for bladder injury. A study found that 3 out of 5 patients with placenta percreta have bladder injury even with proper preoperative imaging evaluation<sup>12</sup>.

Non-recognized bladder injury during CS could lead to vesicovaginal fistula, vesical calculi and urinary ascites. Visual inspection is the most reliable method of assessing bladder integrity and is often the only diagnostic mode available. Intra-operative findings, which suggest bladder perforation include extravasation of urine, visible laceration, the appearance of Foley catheter, sudden increase in bleeding from the wound and the presence of bloody urine in the bag. The intravesical instillation of methylene blue or indigo carmine through the Foley catheter is helpful selective intra-operative adjunct, but it should be deferred until careful inspection is completed because the colored dye can obscure the surgical field. Most bladder perforations can be repaired using vesicorrhaphy performed intravesically with two-layer closure using absorbable suture material. Permanent non-absorbable sutures should never be used because of their propensity to produce calculi, granulomas and recurrent urinary tract infections.

In this study, 22 cases of 24 were recognized during surgery, a urologist was consulted for the bladder repair and postoperative management; all recovered without any long term complications. The other two cases were recognized in the recovery room due to frank hematuria; both cases were repaired immediately by a urologist.

## CONCLUSION

**Prior Cesarean section, presence of abdominal and or bladder adhesions, emergency Cesarean and placenta previa and or accreta are significant risk factors for bladder injury during Cesarean section. Bladder injury should be part of discussion with patients requesting Cesarean section.**

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