JCTEI
JOURNAL OF CLINICAL TRIALS AND EXPERIMENTAL INVESTIGATIONS
Year: 2024 Volume: 3 Issue: 3

ORIGINAL ARTICLE

10.5281/zenodo.13821234

Perioperative findings and long-term impact of urinary bladder injuries secondary to cesarean delivery: A retrospective analysis of 67 cases

Adem Tuncekin[1,2] - Mehmet Yigit Yalcin[1,3]

1. Sanliurfa Education and Research Hospital, Department of Urology, Sanliurfa, Türkiye
2. Usak University, Faculty of Medicine, Department of Urology, Uşak, Türkiye
3. Sadıka Sabancı State Hospital, Department of Urology, Sakarya, Türkiye

Correspondence
Adem Tuncekin, Uşak Üniversitesi Tıp Fakültesi Ankara-İzmir Yolu 8. Km. 1 Eylül Kampüsü Yerleşkesi Uşak, Turkey.

e-mail
dr_adem65@hotmail.com

Received: 9 July 2024
Revised: 7 August 2024
Accepted: 28 August 2024
Published: 20 September 2024

Keywords
- Caesarean delivery
- Caesarean section
- Lowers urinary tract symptoms
- Urinary bladder injury
- Urinary bladder trauma

ORCID ID of the author(s):
AT: 0000-0001-9951-2556
MYY: 0000-0001-9943-7453

Abstract

Objective: The urinary bladder injury after cesarean delivery is rare but significant. Our study aimed to identify significant perioperative findings in bladder injuries secondary to cesarean delivery and assess their long-term impact on bladder functions.

Materials and methods: In this retrospective study, we reviewed 67 patients with bladder injuries from cesarean deliveries treated at our hospital between September 2018 and February 2023. The study included only cases involving surgical repair of these injuries related to cesarean delivery. Data were collected on patient demographics, medical and surgical history, injury details, treatment methods, and postoperative outcomes, including bladder function assessments and complications within a year after surgery.

Results: Between September 2018 and February 2023, 123.296 pregnant women were admitted to our hospital for birth; 46.786 (38%) cesarean deliveries occurred, and 67 (0.14%) patients suffered bladder injuries. Diagnosis was made intraoperatively in 58 (86.56%) patients and postoperatively in 9 (13.43%) patients. The mean age of the patients was 33.8±5.08 years and the mean number of cesarean sections the patients had undergone was 3.25±1.23. The mean bladder defect size was 4.46±2.91 cm, and they were most frequently observed in the bladder dome. Lower urinary tract symptoms were observed in 4 (5.97%) patients in the early period (postoperative 1st month) and in 12 (17.91%) patients in the late period (after 1st month), and the most common symptom was dysuria.

Conclusions: Bladder injury during cesarean delivery is a rare but serious condition. Immediate repair is crucial when the injury is visible. Any suspected injury in the postoperative period should prompt diagnostic procedures and subsequent treatment without delay. Regular follow-up appointments are essential for monitoring postoperative complications and bladder functions.

Cite as: Tuncekin A, Yalcin MY. Perioperative findings and long-term impact of urinary bladder injuries secondary to cesarean delivery: A retrospective analysis of 67 cases. J Clin Trials Exp Investig. 2024;3(3):53-59.

Introduction

The bladder is the most frequently injured genitourinary organ in abdominopelvic surgeries (1), and bladder injury during caesarean section (CS) is a rare but significant complication. The prevalence of CS is high and increasing in developed countries, and the procedure may cause serious morbid conditions (2). Studies on bladder injury after CS have shown that its incidence is approximately 0.20%, various risk factors, such as gestational age, previous CS history, and previous surgeries, have been identified and the complication rate is higher in emergency CS cases (3).

Bladder injuries are typically recognized and repaired during surgery; however, this is not always possible, and early diagnosis and intervention following cesarean section (CS) may be necessary (4). In cases where diagnosis is delayed, clinical conditions such as urinoma and abdominal distension may arise. To diagnose such injuries, particularly those involving the bladder, radiological imaging or cystoscopic examination can be utilized, with careful consideration of potential urogenital system injuries (5).

Various complications may also occur after bladder injury surgery. Acute period complications such as infection, hematuria, and urine extraction, and long-term consequences such as urogenital fistulas and overactive bladder are seen. In order to prevent these, two-stage bladder repair and postoperative care are required (6).

We aimed to evaluate the management of bladder injuries after cesarean section, perioperative findings and long-term impact of urinary bladder injuries secondary to cesarean delivery.

Materials and methods

Patients and design

The retrospective study involved patients who experienced bladder injury secondary to cesarean delivery and underwent repair in our hospital from September 2018 to February 2023. Clinical data were extracted from patients' medical records at our hospital, encompassing various parameters such as patient age, comorbidities, surgical history, gestational age, number of pregnancies, abortion history, mode of delivery, indication for cesarean birth, diagnosis time and method of bladder injury, injury extent and localization, surgical intervention technique, and postoperative catheterization time. Additional data, including cystourethrogram and uroflowmetry findings after catheterization, complications, and hospital admissions within 12 months postoperatively, were recorded. The flow chart is given in **Figure 1**.

Inclusion criteria

Patients over the age of 18 who were diagnosed with intraoperative or postoperative bladder injury following a cesarean section and who underwent repair of the bladder injury were included in the study.

Exclusion criteria

Patients under the age of 18, those diagnosed with bladder injuries after non-cesarean gynecological or other surgeries, and those who did not undergo bladder injury repair were excluded from the study.

Ethical committee

This study was approved by the Harran University Clinical Research Ethics Committee on December 26, 2022, under approval number HRU/22.25.06.

Statistical analysis

Descriptive statistics, using mean, standard deviation (SD), number (n), and percentage (%), were employed for continuous variables during statistical analysis. The statistical package program SPSS (IBM SPSS for Windows, ver.26) was utilized for calculations and analysis.

Results

Between September 2018 and February 2023, our institution recorded a total of 123.296 birth admissions, with 76.510 (62%) being normal births and 46.786 (38%) being CS. Our institution is located in the province with the highest fertility rate in our country, and therefore it is one of the hospitals where births occur most frequently. Bladder injury was observed in 67 (0.14%) of the patients who underwent CS.

Preeclampsia was present in 2 (2.98%) cases, placental disorders in 2 (2.98%) cases, hypothyroidism in 1 (1.49%) case, diabetes mellitus in 1 (1.49%) case, oligohydramnios in 1 (1.49%) case and congestive heart failure in 1 (1.49%) case. Additionally, vaginal bleeding was observed in 4 (5.97%) patients and premature rupture of membranes was observed in 1(1.49%) patient. Indications for CS included pain in

Table 1: Demographic and peroperatif data of patients with bladder injuries and repair after CS

Variables	mean±SD, %
Age, years* (±SD)	33.8±5.08
Pregnancy status	
Pregnancy week * (±SD)	36.26±2.77
Gravida * (±SD)	5.79± 2.34
Parity * (±SD)	3.76±1.75
Abortion * (±SD)	1.07±1.24
Previous CS * (±SD)	3.25±1.23
CS urgent situation	
Urgent (%)**	86%
Elective (%)**	14%
Bladder defect size/cm * (±SD)	4.46±2.91
Defect localization	
Dome (%)**	46.26%
Posterior wall (%)**	40.29%
Base (%)**	8.95%
Dome + posterior wall (%)**	2.98%
Base + posterior wall (%)**	1.49%

*: data presented as mean±SD; **: data presented as a percentage (%), CS: Caesarean section

Table 2: The onset times and rates of early and late lower urinary tract symptoms after bladder injury repair

Symptoms	Early: 5.9%			Late: 17.4%		
	N	%	Onset times (days)	N	%	Onset times (months)
Dysuria	3	4.47	19.33±5.13**	6	8.95	5.16±3.86**
Urgency	-	-	-	2	1.49	15±4.24**
Urge incontinence	-	-	-	1	2.98	30*
Vesicovaginal fistula	-	-	-	1	1.49	18*
Cystorectocele	-	-	-	1	1.49	12*
Wound infection	1	1.49	21*	1	1.49	3*

N: number; %: percentage: *: data presented as N; **: data presented as mean±SD

the majority of cases (47, 70.14%), term pregnancy in 11 (16.41%) cases, bleeding in 7 (10.44%) cases, hematuria in 1 (1.49%) case, and cardiac arrest in 1 (1.49%) case. **Table 1** gives the patients' demographic data in detail.

Diagnosis was made intraoperatively in 58 (86.56%) patients and postoperatively in 9(13.43%). One intraoperatively diagnosed patient developed hematuria, so cystoscopy was performed, and all the remaining patients were diagnosed by observing bladder injury under direct vision. Abdominal swelling was observed in 7 (10.44%) of the patients diagnosed postoperatively, there was discharge from the drain in 1(1.49%) patient and wound discharge was observed in 1(1.49%) patient, leading to the diagnosis of bladder injury. The postoperatively diagnosed patients with abdominal swelling and wound discharge were evaluated in the emergency department and then underwent a full abdominal computed tomography scan (**Figure 2**). Bladder injury was detected by observing extravasation of contrast material from the bladder and by examining creatinine from the drain fluid in the patient who continued to drain, and finding it to be at a level compatible with urine.

Urology consultation was requested for 47 (70.14%) of the patients, and repairs were performed by the urologist. In the remaining 20 (29.86%) patients, repair

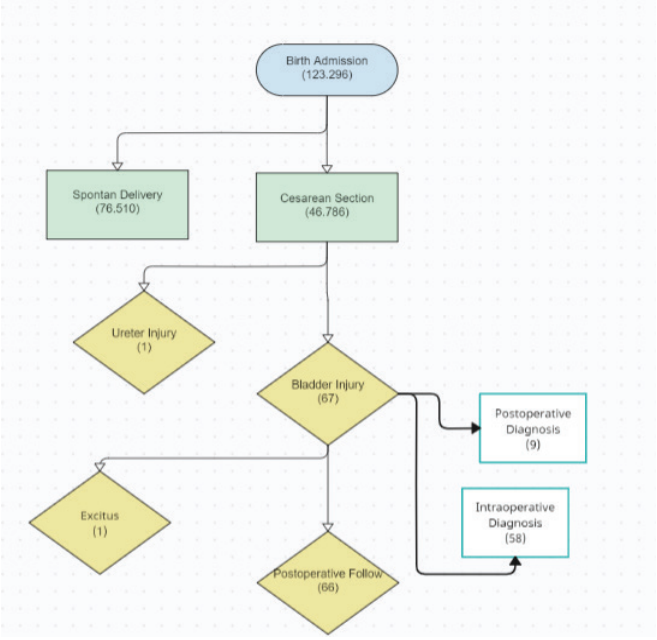

Figure 1: Flow chart

was performed by a gynecologist and obstetrician. In the surgical treatment, repair was performed in 51(76.11%) patients by suturing the bladder mucosa with 3/0 Vicyrl and the detrusor with 2/0 Vicyrl in a double layer, one by one. In the remaining 16(23.89%) patients, the bladder mucosa and detrusor were sutured in one layer with 2/0 Vicyrl to make the repair. As an additional intraoperative intervention, 1 (1.49%) patient underwent uterine rupture repair, 1 (1.49%) underwent colon perforation repair, 10 (14.92%) underwent hysterectomy due to placental disorders and 6 (8.95%) due to bleeding, and 3 (4.47%) patients underwent double J ureteral stent placement in bilateral ureters.

One of the patients was pronounced dead on the first postoperative day as a result of uterine rupture and bleeding. The mean Foley catheter follow-up period

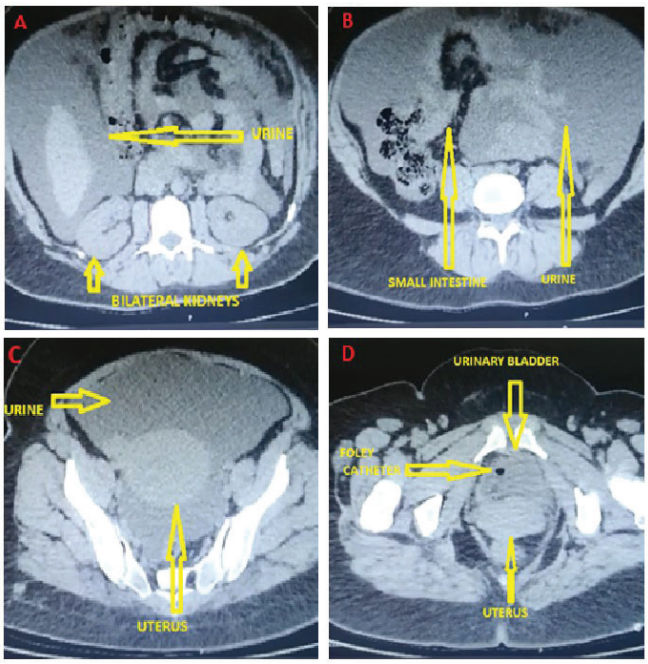

Figure 2: Top-down cross-sectional images of our patient, who was diagnosed with bladder injury after cesarean section, on computed tomography taken after abdominal swelling; **A:** The appearance of urine extravasation around the kidneys, **B:** Appearance of widespread urinary extravasation in the abdomen, **C:** the appearance of urinary extravasation around the uterus, **D:** Image of traumatized bladder and Foley catheter.

for the remaining 66 patients was 13.93±3.95 days. Before removing the Foley catheter, it was decided to remove the catheter by performing cystograms in 27 (40.90%) patients and by retrograde bladder filling in the remaining 39 (59.10%) patients, as the bladder contour was regular in ultrasonography. The mean postoperative follow-up period of the patients was observed to be 9.20±6.95 months. When evaluated in the early period (first month) and late period (after the first month), lower urinary tract symptoms were observed in a total of 16 (23.88%) patients, including dysuria in 9 (13.43%) patients, urgency in 2 (2.98%) patients, urge incontinence in 1 (1.49%) patient, vesicovaginal fistula in 1 (1.49%) patient, wound infection in 2 (2.98%) patients, and cysto-rectocele in 1 (1.49%) patient. Data on the lower urinary tract results are given in detail in **Table 2**.

The culture antibiogram results of patients diagnosed with urinary tract infection revealed E. coli, Klebsiella, and Pseudomonas in order of frequency. Subsequently, the patients were treated with appropriate antibiotics based on these results. Anticholinergics were started in patients with storage symptoms, cystorectocele repair was performed in patients with cystocele and rectocele, and vesicovaginal fistula repair was performed in patients with vesicovaginal fistula. Appropriate antibiotics and daily wound care were administered to the patient who developed a wound infection. One of the two patients who underwent hysterectomy as an additional intervention was accepted as dead on the 21st day despite abdominal abscess drainage.

Discussion

The incidence of bladder injury after cesarean delivery ranges from 0.0016% to 0.9600% (7), and this rate can increase in cases of recurrent cesarean sections and adhesions from previous surgeries (8). Our hospital, located in the province with the highest crude birth rate in the country, approximately 29 per 1,000 population (9), had a bladder injury rate of 0.14% in our study. Despite the high number of births at our institution, the complication rate observed was consistent with the literature (10). In contrast, Majhi et al. reported bladder injury rates as high as 20% with an increasing number of repeat cesarean sections (11).

Bladder injuries can usually be diagnosed intraoperatively. Deterioration of bladder wall integrity or injury due to urinary extravasation may be detected. In suspect cases, direct cystoscopy or staining of the bladder with methylene blue may aid diagnosis. Despite this, bladder injuries may be overlooked, and there may be delays in diagnosis. This situation can cause various complications, such as hematuria, uroascites, infection, and urogenital fistulas (12). In our study, the majority of patients diagnosed late presented with abdominal distention, and the mean presentation time was 5.20±2.39 days.

When a bladder injury is diagnosed, immediate repair should be performed, and debridement should be performed when necessary during repair. In the presence of a defect in the trigone, possible ureteral injuries should be taken into consideration (13). In case of injury after CS, repair is usually performed with open surgery. Despite this, in cases of injury following laparoscopic or robotic intervention, repair can be continued with the same method (14,15). In our study, open repair was performed in all cases. The bladder can be closed continuously or individually with double or single layer absorbable sutures. In a meta-analysis, the suture size was 2/0–4/0, and the chosen suture type was often polyglactin (16). In the majority of our cases, the bladder was closed in double layers with polyglactin and sutured one by one.

Various complications, such as postoperative infection, urogenital fistulas, and hydronephrosis, may occur in repaired patients. The success rate of surgical repair in bladder injury is over 90% according to literature (17). When the long-term results of our study were evaluated, similar complications and surgical success rates were observed, the most common being urinary tract infection.

The limitation of our study is that it is retrospective; the recorded data were examined rather than the patients being questioned in the evaluation of long-term results, and non-bladder urogenital injuries were excluded from the scope. In addition, the surgeons performing the repair were different people and represented two different branches, that is, urology and gynecology/obstetrics. Despite these differences, although similar complications were observed, it is recommended from a medicolegal perspective to seek urology consultation for bladder repair.

Despite the limitations of our study, we observed that most cases of post-cesarean bladder injury can be diagnosed intraoperatively. We believe that double-layer bladder repair is effective and safe. To prevent complications, the Foley catheter should be monitored for an adequate period. Additionally, we believe that anticholinergics may be useful in preventing lower urinary tract symptoms, especially in patients with reduced bladder capacity.

Conclusions

Urinary bladder injury during CS delivery is rare; however, if not diagnosed early, it can lead to significant morbidity and even death. Therefore, immediate repair is crucial when the injury is visible. Any suspected injury in the postoperative period should prompt diagnostic procedures and subsequent treatment without delay. Regular follow-up appointments are essential for monitoring postoperative complications and bladder functions. Our study highlights this issue, emphasizing the need for prospective studies with larger populations and longer follow-up periods to obtain more definitive results.

Conflict of interest: The authors report no conflict of interest.

Funding source: No funding was required.

Ethical approval: The study was approved by the local ethics committee (26.12.2022/22.25.06).

Informed consent: Written informed consent was obtained from all individual participants and/or their gaurdians.

Acknowledgments: None

Peer-review: Externally. Evaluated by independent reviewers working in at least two different institutions appointed by the field editor.

Data availability: The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Contributions

Research concept and design: AT, MYY

Data analysis and interpretation: AT, MYY

Collection and/or assembly of data: AT, MYY

Writing the article: AT, MYY

Critical revision of the article: AT, MYY

Final approval of the article: AT, MYY

References

1. Chang WC, Hsu WC, Sheu BC, Huang SC, Torng PL, Chang DY. Minimizing bladder injury in laparoscopically assisted vaginal hysterectomy among women with previous cesarean sections. Surg Endosc. 2008;22(1):171-6.
2. Safrai M, Stern S, Gofrit ON, Hidas G, Kabiri D. Urinary tract injuries during cesarean delivery: long-term outcome and management. J Matern Fetal Neonatal Med. 2022;35(18):3547-54.
3. Phipps MG, Watabe B, Clemons JL, Weitzen S, Myers DL. Risk factors for bladder injury during cesarean delivery. Obstet Gynecol. 2005;105(1):156-60.
4. Radu VD, Pristavu AI, Vinturache A, Onofrei P, Socolov DG, Carauleanu A, et al. Risk Factors for Urological Complications Associated with Caesarean Section-A Case-Control Study. Medicina (Kaunas). 2022;58(1):123.
5. Manidip P, Soma B. Cesarean bladder injury - obstetrician's nightmare. J Family Med Prim Care. 2020;9(9):4526-9.
6. Glaser LM, Milad MP. Bowel and Bladder Injury Repair and Follow-up After Gynecologic Surgery. Obstet Gynecol. 2019;133(2):313-22.
7. Gungorduk K, Asicioglu O, Celikkol O, Sudolmus S, Ark C. Iatrogenic bladder injuries during caesarean delivery: a case control study. J Obstet Gynaecol. 2010;30(7):667-70.
8. Salman L, Aharony S, Shmueli A, Wiznitzer A, Chen R, Gabbay-Benziv R. Urinary bladder injury during cesarean delivery: Maternal outcome from a contemporary large case series. Eur J Obstet Gynecol Reprod Biol. 2017;213:26-30.
9. TÜİK, Türkiye İstatistik Kurumu, Doğum İstatistikleri 2021. Mayıs 2022. https://data.tuik.gov.tr/Bulten/Index?p=Dogum-Istatistikleri-2021-45547.
10. Khalil AS, Flora S, Hagglund K, Aslam M. Increased bladder injury rate during emergency and repeat cesarean section. J Turk Ger Gynecol Assoc. 2023;24(2):97-100.

11. Majhi J, Mishra BN, Majhi MM. Prevalence and Risk Associated With Bladder Injuries During Caesarean Section in a Secondary Care Hospital. Cureus. 2024;16(4):e59249.

12. Bodner-Adler B, Hanzal E, Pablik E, Koelbl H, Bodner K. Management of vesicovaginal fistulas (VVFs) in women following benign gynaecologic surgery: A systematic review and meta-analysis. PLoS One. 2017;12(2):e0171554.

13. Armenakas NA, Pareek G, Fracchia JA. Iatrogenic bladder perforations: longterm followup of 65 patients. J Am Coll Surg. 2004;198(1):78-82.

14. Aydin C, Mercimek MN. Laparoscopic management of bladder injury during total laparoscopic hysterectomy. Int J Clin Pract. 2020;74(6):e13507.

15. Gellhaus PT, Bhandari A, Monn MF, Gardner TA, Kanagarajah P, Reilly CE, et al. Robotic management of genitourinary injuries from obstetric and gynaecological operations: a multi-institutional report of outcomes. BJU Int. 2015;115(3):430-6.

16. Jensen AS, Heinemeier IIK, Schroll JB, Rudnicki M. Iatrogenic bladder injury following gynecologic and obstetric surgery: A systematic review and meta-analysis. Acta Obstet Gynecol Scand. 2023;102(12):1608-1617.

17. Cordon BH, Fracchia JA, Armenakas NA. Iatrogenic nonendoscopic bladder injuries over 24 years: 127 cases at a single institution. Urology. 2014;84(1):222-6.