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# Evaluation of urethral catheterization versus non catheterization during cesarean delivery for urinary tract infection and intra-operative urinary bladder injury

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**Abstract**
**Objective:** To analyze the incidence of urinary tract infection and intra operative urinary bladder injury in women undergoing Cesarean section with or without indwelling urethral catheterization.
**Study design:** This prospective randomized controlled trial was conducted on 220 women who had undergone cesarean section, divided into two groups of 110 each. In group A, 110 participants underwent cesarean section without urethral catheterization and in group B another 110 participants underwent indwelling urethral catheterization on the operation table just prior to cesarean section with the catheter kept in-situ postoperatively for 24 hours. Urinary tract infection and intra-operative urinary bladder injury were the primary outcome measures while duration of hospital stay, early ambulation and postpartum haemorrhage were the secondary outcomes noted.
**Results:** With no intraoperative bladder injury in the study, a total of 7.27% and 18.18% women had evidence of urinary infection after 72 hours in group A and B respectively ($p< 0.001$). A significant difference was also observed for total duration of hospital stay (3.92 vs 4.59 days, $p<0.001$) and the time taken to first ambulate after surgery (9.80 vs 11.63 hours, $p<0.001$) in the two groups.
**Conclusion:** Urinary bladder catheterization at cesarean section increases the risk of urinary tract infection but not that of surgical injury.

**Keywords:** urethral catheterization, urinary tract infection, cesarean section

## Introduction
Cesarean section is the most common major surgical procedure in obstetrics. The rationale for preoperative urinary bladder catheterization practiced conventionally is to prevent urinary bladder injury, intra-operative difficulties and postoperative urinary retention as a distended organ is at higher risk of trauma [1]. Following birth of the baby, a full bladder may not allow effective uterine retraction thus predisposing to uterine atonicity and postpartum hemorrhage (PPH). For this reason, most obstetricians support a routine practice of keeping the catheter in for 24 hours after surgery. This practice has been shown to be associated with an increased risk of urinary tract infection, delayed postoperative ambulation time, longer hospital stay and eventually increased burden on the healthcare system [2, 3]. UTIs account for 40% of all nosocomial infections, and about 80% of these are associated with the use of urinary catheter[4]. Within 48 hours, up to 85% of indwelling catheters may be colonised with bacteria, which can lead to bacteriuria [5]. UTI may lead to local and systemic morbidity, as well as serious complications like septic shock, respiratory insufficiency, fluid balance disorders, chronic renal insufficiency and death. Risk of infection is about 5-10 percent with each day of indwelling catheterisation and 1-3 percent with each insertion in intermittent catheterization. The best way to prevent complications is to avoid catheterisation whenever possible [6]. Some studies have shown that cesarean section performed without using urethral catheter may lead to a lower rate of UTI, less voiding discomfort, early ambulation and shorter hospital stay [7-12].
The present study evaluates the rates of urinary tract infection and intra-operative urinary bladder injury in women undergoing cesarean delivery with or without urethral catheterization.

## Materials and Methods
This randomized control trial was conducted in the Department of Obstetrics and Gynaecology,

Pt. B.D. Sharma PGIMS, Rohtak on 220 women posted for primary or repeat cesarean birth for singleton pregnancy under general or spinal anaesthesia. Women who had prior urinary tract infection, those who had received any antibiotics prior to the cesarean section, those who were already catheterized or had obstructed or prolonged labour, premature rupture of membrane, two or more previous cesarean section or prior surgery on urinary tract were excluded from the study.

The participants were randomized into two groups of 110 each by computer generated number randomization. Women in group A were asked to evacuate their urinary bladder spontaneously just prior to shifting on the operation table while those in Group B underwent indwelling urethral catheterization on the operation table just prior to cesarean section and the catheter was kept in-situ postoperatively for 24 hours in them. Urine samples were taken for baseline complete examination and culture and sensitivity examination just prior to catheterization or cesarean section.

All the cesarean sections were carried out by consultant clinicians and injection cefotaxim 1gm 12 hourly was advised for 3 days postoperatively as per the departmental protocol. Vaginal painting with betadine solution was done prior to urethral catheterization in all cases. Pfannensteil incision was used for all except those undergoing a repeat section and having a previous vertical abdominal scar. Lower segment cesarean section was done by standard technique after incising the utero-vesical peritoneum and pushing the urinary bladder down. Uterus was closed in two layers and utero-vesical peritoneum was then left unsutured to reperitonise on its own. Any intra-operative urinary bladder injury that may occur was planned to be repaired and managed as per standard protocol. Complete urine examination and culture and sensitivity testing were repeated at 24 hours, 48 hours and 72 hours after surgery.

Urinary tract infection was defined as the presence of 100 bacteria per milliliter of urine with more than 10 leucocytes per high power field or more than 10 [5] colony forming units of pathogenic organisms per milliliter of urine on culture, with or without clinical features like dysuria, increased urinary frequency, and pyrexia. UTI and intra-operative urinary bladder injury were the primary outcome measures. The participants with preoperative evidence of UTI were excluded from the study.

### Statistical analysis

The data collected was tabulated and analysed by Chi-square and Student t-test by using SPSS software version 20.0 and a probability value of less than 0.05 was considered significant.

## Results

This randomized control trial was conducted in the Department of Obstetrics and Gynaecology, Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India, a tertiary care centre on 220 women who had undergone cesarean delivery with (group B) or without (group A) catheterisation. The following observations were made:

- In group A, 72 (65.45%) women who underwent emergency cesarean section did so for fetal distress while in group B, 94 (85.45%) women had cesarean section for the same indication.
- In group A, only one woman had urine microscopy positive prior to cesarean section, at 24 hours this and four other women were microscopy result positive. Three more women had urine microscopy positive at 48 hours in this group. In group B, one and 15 women (including the one already positive) had urine microscopy positive at 24 hours and 48 hours after cesarean section respectively. Five women other than these were reported urine microscopy positive at 72 hours after surgery.
- In group A, 2 women had growth on urine culture at 24 hours and 5 at 48 hours. In group B, 0, 18 and 4 women had positive cultures after 24, 48 and 72 hours after surgery.
- None of the women in the study had any intraoperative urinary bladder injury.
- In group A, 85(77.27%) women ambulated between 5-10 hours after cesarean section while in group B, 62(53.36%) women did so between 11-15 hours after the procedure.
- The mean duration of hospital stay in the study was 3.92±1.06 days in group A and 4.59±1.34 days in group B.
- Three women in group A had additional need for postoperative catheterisation, two had postpartum haemorrhage and one had urinary retention but these were statistically insignificant in comparison to group B.

## Discussion

Catheter associated urinary tract infection are the most common nosocomial infections and account for a major burden on the health care system. In the studies conducted previously by Senanayke *et al.* [10], Amat *et al.* [11] and Pandey *et al.* [12] as well as in the present study, women in the catheterized group had considerably higher incidence of positive urine cultures. During the process of catheterisation micro-organisms enter the urinary bladder either through contamination of the catheter tip by the flora of the distal urethra or by ascending along the catheter. Catheter by itself causes physical damage and inflammation to the urinary bladder epithelium, hence there are more chances of bacterial colonization by this synergistic effect [13-15]. Hence it can be inferred that women who undergo catheterisation have higher risk of urinary tract infections.

**Urine Culture and sensitivity test confirming urinary tract infection**

| | Time of conducting the test | Non-catheterised | Catheterised | p-value |
|---|---|---|---|---|
| Pandey *et al.* [12] (2015) | 24 hr | 4% | 29.3% | <0.05 S |
| Amat *et al.* [11] (2017) | 48 hr | 8% | 28% | <0.09 S |
| Senanayaka *et al.* [10] (2005) | - | 0% | 6% | <0.05 S |
| Present Study | 24 hr<br>48 hr<br>72 hr | 1.81%<br>6.36%<br>6.36% | 0%<br>16.36%<br>20% | <0.01 S |

### Intraoperative urinary bladder injury

It has been shown that urinary bladder is the most common organ injured during pelvic surgeries, its dome being the most common site and during cesarean section this happens most often at creation of urinary bladder flap [16, 17]. Repeat cesarean section is the most common risk factor mostly due to adhesions and the incidence is even higher during intrapartum emergency cesarean births.

Buchholz *et al.* reported a 0.35% incidence rate of accidental cystotomy at cesarean sections and concluded that the most common predisposing factor for this complication was previous CS consequent upon dense urinary bladder adhesions over the lower uterine segment [18]. However, there was no bladder entry in the present study and can thus be concluded that carrying out

cesarean delivery without indwelling catheter in emergency as well as elective settings even in women with previous cesarean delivery may be considered safe and should not warrant mandatory preoperative bladder catheterization.

### Ambulation after surgery

Catheterisation may cause discomfort in some women on movement and especially while sitting as the bulb of the catheter sits on the urinary bladder neck. Moreover the urine urge felt by distention of urinary bladder is absent in catheterized women. These factors may cause prolongation of time to ambulation post-surgery. Most of the studies in the past have reported significantly quicker ambulation after surgery if continuous urinary bladder drainage was not used [8, 9, 11, 12]. However, Acharya *et al*. found no significant difference in the time period [7].

**Time to ambulate post-surgery (hours)**

| Study | Non-catheterised | Catheterised | p-value |
|---|---|---|---|
| Amat *et al.* [11] (2017) | 8.2 ± 2.1 | 14.1 ± 2.9 | <0.001 S |
| Pandey *et al.* [12] (2015) | 7.42 ± 1.38 | 27.17 ± 1.73 | <0.001 S |
| Acharya *et al.* [7] (2008) | 14.32 ± 4.12 | 15.45 ± 4.54 | <0.112 NS |
| Ghoreishi *et al.* [8] (2003) | 6.8 ± 2.9 | 12.9 ± 3.4 | <0.05 S |
| Nasr *et al.* [9] (2009) | 7.7 ± 3.42 | 13.4 ± 9.9 | <0.001 S |
| Present Study | 9.80 ± 2.88 | 11.63 ± 1.98 | <0.001 S |

**Duration of Hospital Stay**

| | Non-catheterised | Catheterised | p-value |
|---|---|---|---|
| Amat *et al.* [11] (2017) | 2.9 ± 1.4 days | 3.7 ± 1.1 days | <0.04 S |
| Pandey *et al.* [12] (2015) | 3.99 ± 1.28 days | 5.2 ± 2.43 days | <0.001 S |
| Acharya *et al.* [7] (2008) | 2.9 ± 0.35 days | 3.06 ± 0.34 days | <000.3 NS |
| Ghoreishi *et al.* [8] (2003) | 46.5 ± 11.7 hours | 64.0 ± 10.7 hours | <0.05 S |
| Nasr *et al.* [9] (2009) | 21.8 ± 5.9 hours | 45.22 ± 16.1 hours | <0.001 S |
| Present Study | 3.92 ± 1.06 days | 4.59 ± 1.34 days | <0.001 S |

As is evident from the table below, the mean hospital stay has been shown to be significantly greater in catheterized groups than in non-catheterized groups comprising matched populations thus pointing towards a contributory role of catheterisation in prolonged hospital stays and hence indirectly adversely affecting health costs. The reasons could vary from delayed ambulation to more infectious morbidity. Avoidance of catheterisation can thus impact the hospital stay and costs of cesarean surgeries.

### Conclusion

Women undergoing routine catheterisation prior to cesarean section have higher risk of urinary tract infection and non catheterisation of patients prior to or during cesarean section does not predispose to increased risk of urinary bladder injury during the procedure. It can also be concluded that the duration of catheterisation is directly related to the incidence of urinary tract infection especially after 24 hours of continuous bladder drainage. However, given the unequal distribution of previous cesarean section cases among the two groups of the study, further larger studies enrolling women with repeat cesarean deliveries are required to shed more light on this important issue.

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