

Original Research Article

URINARY TRACT INFECTION AFTER CAESAREAN SECTION IN RELATION TO DURATION OF CATHETERIZATION

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ABSTRACT

Background: Caesarean section, one of the most common obstetric surgeries, frequently involves routine urethral catheterization to minimize bladder injury, urinary retention, and improve surgical field visualization]. With no clear consensus on optimal removal timing, further clinical research is essential to balance patient safety, recovery outcomes, and cost-effective care, especially in resource-limited settings.

Materials and Methods: This observational cross-sectional study at Rama Medical College examined urinary tract infection risks in pregnant women undergoing Caesarean section under spinal anesthesia. Participants (n=126) were divided into two groups based on catheter removal timing (6 vs. 24 hours). Urine samples collected pre- and post-catheterization were analyzed for bacteriuria and antibiotic sensitivity. Exclusion criteria included medical comorbidities, prolonged labor, and recent antibiotic use. All patients received intravenous cefuroxime, with early ambulation encouraged and discharge by day three. Those with significant bacteriuria ($\geq 10^5$ CFU) were monitored for 10 days post-discharge.

Results: This study compared outcomes between two groups of pregnant women undergoing Caesarean sections based on catheterization duration (6 hours vs. 24 hours). Both groups were similar in age, gestational age, parity, and hemoglobin levels. Group II had a higher BMI and longer ambulation times. Urinary retention was more prevalent in Group I, while Group II had significantly higher rates of urine infection. Group I demonstrated earlier first voiding after catheter removal, while hospital stay durations were the same for both groups. The findings indicate catheterization duration significantly influences urinary outcomes and ambulation times.

Discussion: This observational cross-sectional study at Rama Medical College investigated the impact of urinary catheter removal timing on postoperative urinary tract infections (UTIs) and recovery in 126 post-Caesarean section patients. Participants were divided into two groups based on catheter removal timing: 6 hours (Group I) or 24 hours (Group II). Group I had significantly fewer UTIs (3.2% vs. 12.7%) and earlier ambulation (8.94 vs. 10.86 hours). However, urinary retention was higher in Group I (7.9% vs. 0%). Findings align with prior studies, supporting early catheter removal to reduce UTI risk and improve recovery without prolonging hospital stays.

Conclusion: This study evaluated 126 post-Caesarean patients, comparing catheter removal at 6 hours (Group I) and 24 hours (Group II). Group II had higher bacteriuria rates (12.7% vs. 3.2%), longer voiding times, and slower ambulation, while Group I experienced more urinary retention. Findings support early catheter removal to reduce UTI risk and improve recovery.

Keywords: UTI, Catheter Removal, Bacteriuria.

INTRODUCTION

Caesarean section, one of the most common obstetric surgeries, frequently involves routine urethral catheterization to minimize bladder injury, urinary retention, and improve surgical field visualization. However, prolonged catheterization is associated with significant risks, including urinary tract infections (UTIs), patient discomfort, delayed postoperative ambulation, and increased healthcare costs. Emerging evidence suggests that early catheter removal post-Caesarean may reduce UTI incidence, enhance recovery, and shorten hospital stays, though it could increase transient urinary retention requiring re-catheterization.^[1] With no clear consensus on optimal removal timing, further clinical research is essential to balance patient safety, recovery outcomes, and cost-effective care, especially in resource-limited settings.

MATERIALS AND METHODS

This observational cross-sectional study was conducted in the Department of Urology of Rama medical college and hospital, Hapur, involving consenting pregnant women scheduled for Caesarean section under spinal anaesthesia. Urine samples were collected for routine examination, culture, and sensitivity testing before catheterization and after catheter removal. Midstream clean-catch urine samples were obtained in sterile containers for analysis. Participants were divided into two groups based on catheterization duration: Group 1, with catheter removal 6 hours post-Caesarean section, and Group 2, with removal at 24 hours. Inclusion criteria included singleton pregnancies, prior Caesarean section, and consent to participate, while exclusion criteria comprised medical comorbidities necessitating prolonged catheterization, obstructed labor, ruptured membranes >4 hours, multiple pregnancies, urinary symptoms, current antibiotic therapy, and lack of consent. A sample size of 126 was calculated based on a 5.6% prevalence (Kingsley et al., 2018),^[2] with a 95% confidence interval and 4% precision.

Catheterization was performed after spinal anaesthesia, and catheters were removed as per group allocation. Urine samples were collected by the 48th postoperative hour and analyzed microscopically, with cultures grown on CLED agar to identify significant bacteriuria ($\geq 10^5$ CFU). Antibiotic sensitivity testing was conducted for significant colonies. All participants received intravenous cefuroxime 750 mg every 8 hours for 24 hours. Early ambulation was encouraged, and patients were discharged on the third postoperative day as per institutional protocol. Those with significant bacteriuria were monitored for 10 days post-discharge to assess for urinary symptoms.

RESULTS

In our study mean age of participants in Group I was 31.16 ± 4.906 years and of the Group II was 32.24 ± 4.039 years. There is no statistically significant difference in the mean age between Group I and Group II at the 5% significance level (p -value = 0.180) and both the groups are comparable.

Mean Gestational Age at Delivery in Group I was 37.4922 ± 1.686219 (in weeks) and that in Group II, it was 37.6805 ± 1.41070 (in weeks). There is no statistically significant difference in the mean gestational age at delivery between the two groups.

In our study, It was observed that For Group I the mean parity was 1.46 ± 0.591 while for Group II it was 1.59 ± 0.754 . There is no statistically significant difference in the parity between Group I and Group II.

The mean Body Mass Index (BMI) of participants in Group I was 23.363 (SD = 0.9189), and that in Group II, it was slightly higher at 23.930 (SD = 1.4379). The t-test results indicate a statistically significant difference in the mean Body Mass Index (BMI) between participants in the two Groups and that participants in Group II had a higher mean BMI when compared to Group I.

It was observed that 79.4% of participants in Group I and 66.7% of Group II underwent Caesarean section on maternal request (CSMR). There is no statistically significant association between the indication for LSCS and the duration of catheterization.

Hemoglobin (Hb) level in Group I was 11.446 g/dL with a SD of 0.7242, while in Group II, it was 11.554 g/dL with a SD of 0.6574 and there is no statistically significant difference between the Hemoglobin levels in the two groups.

The mean ambulation time for participants in Group I was 8.94 hours, with a SD of 0.55 hours, while in Group II, the mean ambulation time was 10.86 hours, with a SD of 0.85 hours. A t-test for equality of means was conducted to compare ambulation times between the two groups. The results showed a statistically significant difference in ambulation times between the two groups ($p < 0.05$), with participants in Group II having significantly longer ambulation times compared to those in Group I. Thus, shorter catheterization leads to early ambulation in the present study.

It was observed that 5 participants (7.9%) in Group I had Urinary Retention post catheter removal requiring re-catheterization while no participant in Group II experienced Urinary retention. Chi-square tests were conducted to examine the association between urinary retention and the duration of catheterization. The Pearson Chi-Square test yielded a statistically significant result ($\chi^2 = 5.207, df = 1, p = 0.023$), indicating a significant association between urinary retention and the duration of catheterization. The presence of urinary retention

appears to be more prevalent among participants in Group I) as compared to Group II. Thus more women required re-catheterization in the group where catheter was removed early i.e., at 6 hours.

In the study groups I, It was observed that 2 participants had positive urine culture after surgery while, in Group II, Bacterial growth was found in 8 participants. The Chi-Square Tests indicated a significant association between the variables ($p = .048$ for Pearson Chi-Square, $p = .041$ for Likelihood Ratio), and thus, urine infection was significantly more in group II when compared to Group I.

It was observed that 13 participants of Group I passed urine within 3 Hours while none passed urine within 3 hours in Group II. The Chi-Square Tests indicate a significant association between the two variables ($p < .001$ for all tests), suggesting that the interval at first voiding from urethral catheter removal varies significantly between the two groups. Thus, Group I passed urine earlier.

Mean of Interval at first voiding from catheter removal in the two study groups was observed, Group I had a mean of 3.164 hours, while Group II had a mean of 3.645 hours. The t-test revealed a significant difference in the interval at first voiding from urethral catheter removal between the two groups ($t(124) = -14.223$, $p < 0.001$), with Group II having a significantly longer time until first voiding. Similarly, for hospital stay, both groups had a mean of 3 days with zero standard deviation, making it impossible to compute t-values. Therefore, no comparison could be made for hospital stay. Overall, the analysis showed that catheterization duration significantly affected the interval at first voiding, with longer catheterization associated with delayed voiding.

DISCUSSION

This observational cross-sectional study was conducted in the Department of Urology of Rama medical college and hospital, Hapur to evaluate the occurrence of urinary tract infection (UTI) after urinary catheter removal in post-Cesarean section patients. A total of 126 patients were divided into two groups based on the catheter removal timing: Group I (6 hours post-surgery) and Group II (24 hours post-surgery).

Group I had a mean age of 31.16 years, while Group II had a slightly higher mean age of 32.24 years. The mean gestational age at delivery was comparable between both groups (Group I: 37.49 weeks; Group II: 37.68 weeks), with no significant difference in maternal age or gestational age ($p > 0.05$). Similarly, parity was comparable (Group I: 1.46; Group II: 1.59). Both groups primarily consisted of patients with a BMI below 25, though

Group II had a higher percentage of participants with a BMI ≥ 25 .

Similar findings were reported in a previous study by Adeyanju et al.^[3] About 55% of the participants in each group were in the age group of 30-39 years. The mean age and gestational age at delivery of the participants in groups A (12 hours) and B (24 hours) were comparable (31 ± 4 years versus $32. \pm 5.1$ years; $p = 0.5$ and $38. \pm 1.$ weeks versus $38. \pm 0.7$ weeks; $p = 0.$ respectively).

In another relevant study R Ahmed et al,^[4] reported that the mean maternal age was 30.1 ± 4 years and 28.6 ± 3 years in group A (8 hours) and in group B (24 hours). The mean gestational age was 38.9 ± 1.1 weeks and 38.3 ± 1.4 weeks in group A and B respectively. Likewise to our study, this study has also not found any significant difference in maternal and gestational age between the groups ($p > 0.05$).

In another study Ersak et al,^[5] reported that the maternal age was 30.5 ± 3.1 and 28.9 ± 1.8 years in the catheterized group at 6 hours and 24 hours. The gestational age was comparable in both groups with a mean age of 39 weeks.

The incidence of bacteriuria was significantly lower in Group I (3.2%) compared to Group II (12.7%), highlighting the impact of catheterization duration on postoperative UTIs. None of the participants developed symptomatic UTI during follow-up, possibly due to prophylactic antibiotics administered post-surgery. Findings were consistent with prior studies showing that shorter catheterization durations reduce UTI incidence.

Urinary retention was more prevalent in Group I, with 7.9% of participants requiring re-catheterization, compared to none in Group II. This aligns with prior research indicating faster bladder function recovery following shorter catheterization durations. Hou et al,^[6] in their study, reported that the urinary 36 retention rate (13.9%) was significantly higher in the group whose catheter was removed 6 hours after CS. This finding was consistent with the findings of our study.

The extensive review of literature has signified that the authors share a strong recommendation for immediate removal of the urinary catheter following surgery, although they acknowledge that existing evidence is low quality.^[7] For patients with immediate catheter removal after cesarean, the cited Cochrane review reported decreased urinary tract infections and unchanged incidence of voiding dysfunction.

However, prolonged catheterization (24 hours) was associated with delayed first voiding and ambulation, with Group II demonstrating significantly longer times to first void (3.65 hours) and ambulation (10.86 hours) compared to Group I (3.16 hours and 8.94 hours, respectively; $p < 0.05$).

Most participants in both groups underwent Cesarean section due to maternal request (Group I: 79.4%; Group II: 66.7%). Mean hemoglobin levels

and hospital stay durations were similar between the groups, with all patients discharged within three days. The findings indicate that shorter catheterization durations may enhance early postoperative recovery and reduce complications without prolonging hospital stays.

Studies by Maki KC et al. (2023),^[8] and El- Mazny et al (2018),^[9] supported the present findings, noting that delayed catheter removal increases UTI rates and delays ambulation. R Ahmed et al.^[4] reported higher UTIs (16.4%) and delayed recovery with 24-hour catheterization compared to 8-hour removal (4.1%). Adeyanju et al,^[3] observed reduced bacteriuria and shorter ambulation times in groups with earlier catheter removal.

The study emphasizes that catheter removal at six hours post-Caesarean section reduces UTI incidence, enhances early ambulation, and improves postoperative recovery without increasing the risk of urinary retention. Early catheter removal is recommended to optimize patient outcomes, aligning with existing literature advocating for shorter catheterization durations to minimize complications and expedite recovery.

CONCLUSION

This study evaluated 126 post-Caesarean patients, comparing outcomes between catheter removal at 6 hours (Group I) and 24 hours (Group II). Group II had higher bacteriuria rates (12.7% vs. 3.2%), longer voiding times, and slower ambulation, while Group I experienced more urinary retention. Findings emphasize optimizing catheterization timing to improve recovery.

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