



Comparative Analysis of the Duration of Urethral Catheterization for Caesarean Delivery

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Authors' contributions

This work was carried out in collaboration between both authors. Author NS designed the study, wrote the protocol and performed the statistical analysis. Author OVK wrote the first draft of the manuscript. Both authors managed the analyses of the study. Author NS managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: To compare the effect of spontaneous voiding of urine to the different durations of the urethral catheter following elective caesarean section.

Study Design: Cross-sectional.

Place and Duration of Study: Department of Obstetrics and Gynaecology and department of microbiology, university of Port Harcourt Teaching Hospital, Port Harcourt between January and December 2014.

Methodology: We studied 160 booked parturient who had elective caesarean section. All the participants were randomly selected into three study groups and a control group. Each group consisted of 40 patients. The patients in control group voided spontaneously before and after surgery and did not have urethral catheterization. The study groups had urethral catheterization prior to surgery and were randomized into three groups of 40 patients depending on when their urethral catheters were removed postoperatively. All patients had mid-stream sample of urine collected a week prior to surgery and 72 hours after surgery for bacterial culture.

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Results: The overall incidence of urinary tract infection following caesarean section in this study was 26.9%. There was a significantly lower incidence of urinary tract infection (3.1%) for group B women (with immediate catheter removal after caesarean section) when compared to the next group with the least incidence of urinary tract infection post operatively (P= .02). Escherichia Coli was the commonest organism causing the urinary tract infection post operatively. The overall incidence of acute urinary retention was 13.8%. The need for catheterization after caesarean section (9.4%) was highest among women in group-A (spontaneous voiding before and after surgery).

Conclusion: Immediate postoperative removal of a urethral catheter after elective caesarean section was associated with a lower incidence of urinary tract infection. Spontaneous voiding without catheterization increases the risk of postoperative acute urinary retention and does not eliminate the risk of urinary tract infection following caesarean section.

Keywords: Urethral catheterization; caesarean section; urinary tract infection; bladder management; acute urinary retention.

1. INTRODUCTION

Urethral catheterization is commonly performed prior to Caesarean section for continuous bladder drainage. This practice, especially if prolonged, has been considered to predispose to urinary tract infection in these women. The optimal time to remove the urethral catheter after caesarean section is still controversial, as varying time of removal has been reported in the literature. Caesarean section is one of the commonly performed surgical procedures in obstetrics [1-5]. Its rate varies widely, across the globe, ranging from 0.4 to 41.9% [6]. In this environment, caesarean section rates of 22.2% - 26.2% have been reported [7-9]. The rationale for catheterization is to decompress the bladder so as to improve visualization of the lower uterine segment and make surgery less difficult, prevent injury to bladder and reduce post-operative urinary retention [10,11]. Post-operatively, the catheter avoids the need for the women to get out of bed to urinate or use a bedpan while she is still recovering from anaesthesia and postoperative pain. Much is still to be investigated about the effect of this long-standing empirical practice without much scientific evidence to determine optimal duration, advantages or disadvantages of use of urinary catheter. Generally indwelling catheters are, however, associated with urinary tract infection, maternal discomfort, delayed ambulation and higher cost [1,4,12-15]. Furthermore, some studies have suggested a significant reduction in the incidence of urinary tract infection post caesarean section in women who were not catheterized [15,16]. The literature is replete with information on the timing of removal of urethral catheter post caesarean section, and whether it has a significant effect on the risk of occurrence

of urinary tract infection. The incidence of urinary tract infection rises from about 6% in normal delivery to about 16-30% following caesarean section [17,18]. Caesarean section has been shown to increase the odds of developing urinary tract infection as does use of tolytics, severe pre-eclampsia/eclampsia and renal diseases. Most of these conditions are associated with bladder catheterization [19]. Yet another study demonstrated that immediate post-operative removal of urethral catheter or intermittent catheterization after elective caesarean section were associated with a lower risk of urinary infection [2] implying that the duration of the indwelling catheter may play a role in occurrence of urinary tract infection following Caesarean section. Other factors that affect the occurrence of urinary tract infection post caesarean section are the use of prophylactic antibiotics and type of anaesthesia [17].

An important reason for the use of bladder catheterization for caesarean section is to prevent acute urinary obstruction during the postoperative period due to postoperative pain or its treatment with analgesia. It has been demonstrated that the risk of acute urinary tract retention is higher in women who had caesarean section than those who had vaginal delivery and those who were on narcotic analgesics post surgery [19,20]. The need for intermittent catheterization to relieve acute obstruction is also higher for those who had Caesarean section than those with vaginal delivery. Among those who had caesarean delivery, intermittent catheterization was associated more with acute urinary retention and need for re-catheterization than those on indwelling catheter [21]. Ultimately, the presence, and duration of the urinary

catheter, a foreign body in the urinary tract, along with the factors risk factors stated above would determine the occurrence of urinary tract infection and or acute urinary obstruction in women who had caesarean section. Our department practices a 12 - 24 hour duration for the urinary catheter post operatively and this is empirical. The aim of this is to compare incidence of urinary tract infection and acute urinary obstruction in women who had caesarean section with spontaneous voiding (no urinary catheter) to others with immediate catheter removal after caesarean section, 6-hour and 24-hour removal of urethral catheter after caesarean section on the. The outcome of this study will help direct the current practice in the department on the duration of urinary catheter after elective caesarean section. This is particularly important in our department where there is a high incidence of urinary tract infection of over 17.7% complicating caesarean deliveries. This study therefore is to determine the incidence of complications of urethral catheterization with respect to the duration of use.

2. PATIENTS AND METHODS

This is a study of 160 booked patients undergoing an elective caesarean section at the University of Port Harcourt Teaching Hospital between January 1st and December 31st, 2014. The Obstetric unit records an average of 150 deliveries per month. Caesarean delivery accounts for about 50% of all deliveries (including the booked and unbooked patients) and elective caesarean section make up 20% of all caesarean deliveries per month. This gives an average of 180 cases within the study period. All the participants for this study were fully counseled about the study and reserved the right to withdraw for any reason.

All participants who met the inclusion criteria were randomly divided into four equal groups, a control and three study groups. The participants were asked to pick from a basket containing 160 sealed envelopes with papers marked A to D, which determined the groups. Controls were patients who voided spontaneously prior to surgery and were not catheterized. The study population comprised of those that were catheterized preoperatively with size 16F Foley urethral catheter under sterile condition on the operating table and the catheters removed at various periods post operatively. Hence, the patients were divided into 4 groups of 40 patients as follow:

Group A – This includes patients who voided spontaneously (no catheter).

Group B – Patients who had indwelling urethral catheter removed immediately after surgery.

Group C – Patients who had indwelling urethral catheter removed 6 hours after surgery.

Group D – Patients who had indwelling urethral catheter removed 24 hours after surgery.

All the patients received spinal anaesthesia as well as prophylactic antibiotics treatment according to the departmental protocol. They also had their mid-stream samples of urine collected a week prior to admission and 72 hours after surgery which were sent for bacterial culture. Patients with pre-operative positive urine culture were excluded from the study and given antibiotic treatment according to sensitivity.

2.1 Outcome Measures

The outcome measures include significant bacteriuria (defined as more than 10^5 bacteria of the same colony per ml of urine [18] in a sample of mid-stream urine collected 72 hours post operatively for bacterial culture); post-partum urinary retention (defined as the inability to void associated with a painful, usually palpable or percussible bladder and relieved by catheterization [19]).

The demographic characteristics of the patients were recorded and the patients matched for age and parity. The data from the study were analyzed using SPSS version-19 Software. Test of significance using the students' T-test and X^2 – test with the level of significance set at $P < 0.05$ was carried out.

2.2 Inclusion Criteria

The inclusion criteria is

- Women with valid indications for elective caesarean section.

2.3 Exclusion Criteria

The exclusion criteria for the study women with:

- Severe pre-eclampsia/eclampsia
- Diabetes mellitus in pregnancy
- Renal disease
- Significant bacteria growth on pre-operative urine culture.

- Patients with immune suppressive disease.
- Patients who had tocolysis prior to surgery.
- Patients on antibiotics prior to the surgery.

3. RESULTS

There were no significant differences between the groups regarding demographic characteristics such as maternal age and gestational age. The incidence of urinary tract infection in this study was 26.9%. The incidence of urinary tract infection was highest among women who had their urethral catheter removed after 24 hours (55%) when compared with those who had their catheter removed after 6 hours (22.5%), immediately after surgery (12.5%) and those who used no catheter (17.5%) There were statistically significant differences between the group with catheter removed by 24 hours and others in the incidences of urinary tract infection (P=0.02) see Table 2.

Escherichia coli was the commonest organism (43.2%) isolated in the patients with positive urine culture results. Other organisms isolated were Klebsiella species (29.4%), Proteus (11.3%) and Staphylococcus species (16.1%) as in Fig. 1. All patients with urinary tract infection were treated with antibiotics according to their culture and sensitivity pattern.

The overall incidence of acute urinary retention in this study was 13.8%. Of the 40 women who voided spontaneously before surgery, 15(37.5%) had a need for catheterization. Of the other 25 that voided spontaneously, 10(25%) used the toilet while 15 (37.5%) used a bedpan. This was statistically significant when compared with the 7(17.5%) requiring re-catheterization in the group that had immediate removal of urinary catheter after surgery ($X^2=25.81$, P=. 00) as seen Table 3. None of the women in the 6-hour and 24-hour catheter removal groups needed re-catheterization.

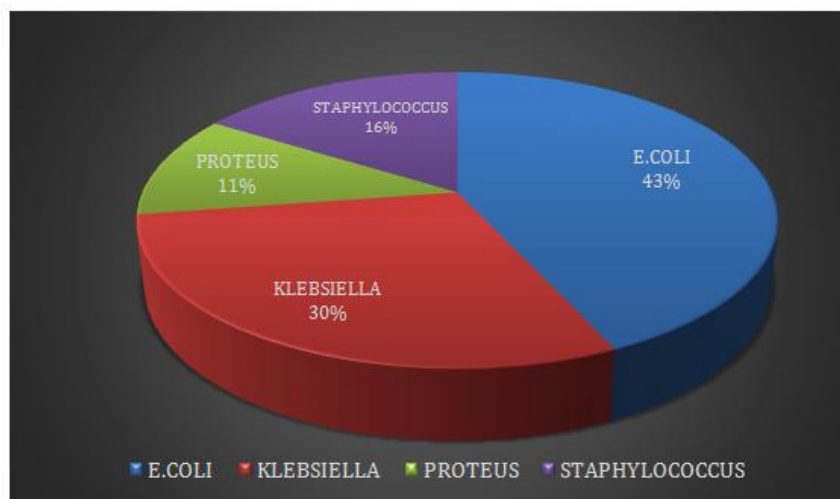


Fig. 1. Prevalence of organisms isolated in patients with positive urine culture

Table 1. Demographic characteristic of the women in the groups

Characteristics	Group A (40)	Group B (40)	Group C (40)	Group D (40)	X ²	P-value
Maternal age (Mean+SD)	28.75(3.96)	29.01(3.67)	28.98(3.19)	29.68(3.38)	0.475	.679
Gestational age (Mean+SD)	37.88(0.52)	37.97(0.58)	38.18(0.81)	38.10(0.47)	1.662	.167

Table 2. Incidence of urinary tract infection among the groups

Culture result	Group A (40)	Group B (40)	Group C (40)	Group D (40)	X ²	P-value
Negative	33(82.5%)	35(87.5%)	31(77.5%)	18(45%)		
Positive	7(17.5%)	5(12.5%)	9(22.5%)	22(55%)	9.56	.02

Table 3. Incidence of acute urinary retention

Need for re-catheterization	Group A (40)	Group B (40)	Group C (40)	Group D (40)	X ²	P-value
Yes	15(37.5%)	7(17.5%)	Nil	Nil	25.81	.00
No	25(62.5)	33(82.5%)	40(100%)	40(100%)		

4. DISCUSSION

Bladder care during and after caesarean section is a serious concern for the patient as well as the surgeon who makes conscious effort to avert any accident to the urinary apparatus. Catastrophic surgical outcomes could occur while operating on a field view disrupted by filling bladder. The empirical practice of urinary catheterization prior to caesarean section is a routine procedure in many countries as it is widely believed that its placement can improve exposure of the lower uterine segment at the time of surgery, reduce the possibility of injury to the urinary system during surgery and avoid post-operative urinary retention [22,23,24]. Several studies have investigated the effects of removing the catheter at various times and compared with an indwelling catheterization [2,10,11]. The results suggest that immediate post-operative removal of the urethral catheter is associated with a lower risk of urinary tract infection compared with indwelling catheter. This is consistent with the findings of this study. However, the resolve to retain or remove the catheter has occupied a crucial discuss in contemporary obstetric practice.

The overall incidence of urinary tract infection following caesarean delivery in this study was 26.9%. It was higher in women who had their urethral catheter removed after 24 hours. This could be explained by increased formation of biofilms [25-27] around the indwelling urethral catheter following prolonged placement as reported in similar studies. The true incidence of 26.9% is higher than the value in the Departmental annual report of 17.7% that prompted the study. It is possible that several women who developed urinary tract infection may have been missed, as the diagnosis was only made based on symptoms pointing towards UTI as opposed to searching for urinary tract infection in all patients participating in the study.

The present study demonstrated that *Escherichia Coli* was the commonest organism isolated from positive urine cultures following bladder catheterization; this is similar to an earlier report on urinary tract infection following caesarean

section [28]. In some other study, *Klebsiella* was the predominant organism in post caesarean section urinary tract infection [11]. The difference may be as a result of technique of urine collection or the difference in the population personal hygiene disposition. The proximity of the urethra to the vagina and rectum allows faecal flora (with Coliforms such as uropathogenic *Escherichia Coli*) to colonize the periurethral area of women [27]. This relationship increases the prevalence of *Escherichia Coli* causing urinary tract infection and may have played a role in the high prevalence of *Escherichia Coli* in this study. It also accounted for 80% of urinary tract infection in pregnancy in another study [28]. The relatively short urethra of women in comparison with men facilitated movement of bacteria into the bladder and explains the 50-times greater urinary tract infection rate in women than in men [27].

One major rational for catheterizing the urinary bladder is to avoid post-operative urinary retention. The overall incidence of non-obstructive acute urinary retention in this study (13.9%) was low. This finding is in agreement with other studies [4,15]. Factors consistent with low rate of post-operative urinary retention include adequate analgesia, early ambulation and possibly the avoidance of blunt dissection of the bladder during surgery preventing disturbance of the bladder innervations [15]. However about 37.5% of the 40 patients in group A, had a need for catheterization after surgery. This high proportion of acute retention is similar to the study in Thailand, which reported a high retention rate of 39.2% amongst women without catheterization prior to caesarean delivery [11]. The study concluded that continued post-operative drainage with an indwelling catheter was a method of preventing retention of urine. This was also confirmed in our study as seen in the 6 hours and 24 hours catheter removal groups in our study. Urinary output after caesarean delivery depends on the amount of fluid input, the haemodynamic state of the patient and the effect of spinal anaesthesia. Spinal anaesthesia alone is not considered to cause a significant increase in urinary retention [29]. However, spinal anaesthesia may be associated

with increased acute urine retention noticed in the group with spontaneous voiding and immediate removal of catheter in this study.

There are several limitations to this study. Different surgeons were involved in these surgeries including catheterization of the patients and different analgesic medications administered post operatively. The study also did not have sufficient sample size and lacked the power to analyze the effects of spontaneous voiding of urine or otherwise on intra-operative and post-operative complications and long-term bladder safety. We recommend that larger randomized controlled trials be carried out before generalization of the findings of this study.

5. CONCLUSION

Given the rising incidence of caesarean section, the direct and indirect benefits of avoiding catheterization are likely to be substantial. Immediate removal of urethral catheter after caesarean delivery in haemodynamically stable patients has been shown from this study to lower the incidence of urinary tract infection. Spontaneous voiding, without catheterization, has been shown to increase the risk of acute urinary retention, which causes much discomfort and dissatisfaction to the women. Comparatively, a 6-hour duration of catheter placement has been found to be significantly desirable in terms of incidence of urinary tract infections and acute urinary retention when compared with the routine 24 hours catheter placement practiced in most institutions. However, larger randomized controlled trials are required before generalization of the study becomes possible.

CONSENT

Both authors declare that each patient gave written consent, at the time of recruitment into the study, after explaining the reason and the requirements for the study and were allowed to opt out of the study at any time if they so desired.

ETHICAL APPROVAL

Ethical approval was given for the study by the ethical committee of the University of Port Harcourt Ethical Committee.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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