

Urinary Catheter Removal And Postoperative Outcomes In Caesarean Section: Insights Into Infection And Pain Risks

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ABSTRACT:

Introduction:After caesarean section (C-section) urinary catheterization is a routine practice to manage urinary retention, but its duration may affect patient outcomes, including the risk of urinary tract infection (UTI) and pain levels. This cross-sectional study included 100 patients: 50 patients who underwent catheter removal 6 hours and 50 patients who underwent catheter removal 24 hours.

Objectives: This study aimed to evaluate the association between the duration of urinary catheter removal (6 hours and 24 hours) and the incidence of UTI and pain levels after C-section.

Methods: A comparative analysis was performed in patients undergoing C-section, stratified by the duration of catheter removal (6 hours and 24 hours). The examination to find out whether a patient has a UTI is through urine culture and the pain variable was measured using the Visual Analog Scale (VAS) questionnaire.

Results: The findings did not reveal a significant association between the duration of catheter removal (6 hours and 24 hours) and the incidence of UTI ($P=0.643$). However, a significant association was observed between catheter removal and pain levels ($P=0.000$).

Conclusions: Shorter duration of urinary catheter removal after caesarean section was not associated with increased risk of UTI but was significantly associated with pain.

1. Introduction

Caesarean section (C-section) is one of the most commonly performed surgical procedures worldwide, accounting for a significant proportion of all deliveries. Indwelling urinary catheters are routinely employed during and after C-section to manage urinary retention and facilitate postoperative care.¹ However, prolonged catheterization has been implicated in a range of adverse outcomes, including urinary tract infections (UTIs) and discomfort or pain. Urinary tract infections are among the most common nosocomial infections encountered in obstetric and gynecological settings,² with catheter-associated urinary tract infections (CAUTIs) accounting for a substantial proportion of these cases. CAUTIs can lead to increased morbidity, prolonged hospital stays, and greater healthcare costs, thereby placing a significant burden on both patients and healthcare systems.³ Furthermore, the pain

and discomfort associated with catheter use can hinder postoperative recovery and negatively impact patient satisfaction and overall quality of care. Despite the clinical importance of these issues, the relationship between the duration of urinary catheter use and the occurrence of UTIs and pain following C-section remains insufficiently explored in the literature.⁴ Understanding the optimal duration of urinary catheter removal is critical to minimizing the risks of infection and pain while ensuring effective postoperative management.⁵

Catheter removal pain experienced by patients after C-section is an aspect that needs to be considered because it can affect the patient's quality of life,⁶ worsen postoperative pain and increase the length of stay in the hospital. Although most still use catheters >24 hours, but in the use of catheters <24 hours it is possible to have the same risk of UTI and Pain. Therefore, this study aims to determine the relationship between the duration of use of urinary catheters after C-section with UTI and pain.⁷

2. Methods

The research design used is an analytical observational study using a cross-sectional design involve 100 pregnant women who underwent C-section surgery. The subjects collected consisted of 50 patients who underwent catheter removal 6 hours after C-section surgery and 50 patients who underwent catheter removal 24 hours after C-section that aims to describe or explain a condition in a community (exploratory study) and then explain the condition through the collection or measurement of correlation variables that occur in the research object simultaneously or at the same time. The examination to find out whether a patient has a UTI is through urine culture and the pain variable was measured using the Visual Analog Scale (VAS) questionnaire combined with the Numeric Rating Scale (NRS). This research was conducted at the Sitti Khadijah 1 Mother and Child Hospital (RSIA) from September 2023 to May 2024. Before this research was conducted, the researcher requested ethical eligibility from the Human Biomedical Research Ethics Commission, Faculty of Medicine, Universitas Hasanuddin, Makassar with number 586 / UN4.6.4.5.3L1 PP36 / 2023 on August 25, 2023.

3. Results

A comparison of the characteristics of the research subjects is presented in Table 1. Table 1. shows that the respondents in this study were mostly low-risk, multigravida, educated > 9 years, normal BMI and unemployed. Age, education, BMI and parity have the same characteristics between the 24-hour catheter use group and the 6-hour catheter use group. While the history of C-section and history of catheter use are the same for the duration of 24-hour catheter use.

Table 1. Characteristics of Research Subjects

Characteristics	24 Hours	6 Hours	P-value
	(n= 50)	(n= 50)	
	n (%)	n (%)	
Age			
Low risk	30 (60.0)	39 (78.0)	0.052
High risk	20 (40.0)	11 (22.0)	
Parity			
Primigravida	13 (26.0)	16 (32.0)	0.509
Multigravida	37 (74.0)	34 (68.0)	
Education			
≤ 9 years	12 (24.0)	10 (20.0)	0.629
> 9 years	38 (76.0)	40 (80.0)	
Occupation			
Working	17 (34.0)	9 (18.0)	0.068
Not working	33 (66.0)	41 (82.0)	

*Chi-square test, p-value < 0.05 = significant

In this study Table 2. shows variables related to the duration of after C-section catheter removal. The results of statistical tests of respondents who have normal BMI, history of C-section and history of catheter use are related to the duration of catheter removal. The OR value shows that a history of BMI is 2,891 times more risky than a history of C-section and a history of catheters to experience pain and UTI.

Table 2. Relationship between Risk Factors and Duration of Catheter Use after Caesarean Section

Risk Factors	Duration of Catheter Use After Caesarean Section		P-value	OR
	24 hours	6 hours		
	n (%)	n (%)		
BMI				
Normal	34 (68.0)	43 (86.0)	0.032	2.891
Overweight	16 (32.0)	7 (14.0)		
SC history				
There's a history	25 (50.0)	14 (28.0)	0.024	2.571
No history	25 (50.0)	36 (72.0)		

History of Catheter use

There's a history	25 (50.0)	14 (28.0)	0.024	2.571
No history	25 (50.0)	36 (72.0)		

Chi-square test, p-value < 0.05 = significant

Table 3. Relationship between Duration of Post Caesarean Catheter Use with UTI

Variable	Catheter Removal				P Value
	24 Hours	%	6 Hours	%	
Pain Category					
Mild Pain	44	88.0	22	44.0	0.000*
Moderate Pain	6	12.0	28	56.0	
UTI					
No	46	92.0	46	92.0	0.643**
Yes	4	8.0	4	8.0	

Description: *Chi-square test, **Fisher exact test, p-value < 0.05 = significant.

Table 3. Show the finding did not reveal a significant association between the duration of catheter removal 6 hours and 24 hours and the incidence of UTI. That patients tend to feel mild and moderate pain catheter removal. The pain variable shows a relationship with the duration of catheter removal after C-section.

4. Discussion

The results of the study showed that only a few respondents experienced UTI. The prevalence of postpartum UTI is estimated at 2-4% of all. Although postpartum UTI is usually mild, it is associated with pain. The criteria often used to indicate the presence of bacteriuria is the presence of bacteria $\geq 10^5$ CFU/mL, this criterion is seen from the presence of >100 colonies of bacteria in the culture media.^{2,8} The results of the study also did not find many UTIs because the duration of catheter use was not for days. But only 6-24 hours. The length of time the catheter is in place contributes to urinary tract infections.⁹ Urinary tract infection (UTI) is an inflammatory condition caused by microorganisms, especially bacteria, that infect the urinary tract. UTI often occurs in patients undergoing urinary catheterization, with prevalence varying depending on the duration of catheter placement and procedural cleanliness.¹⁰ Urinary catheterization can disrupt the normal defense mechanisms of the urinary tract, such as constant urine flow and mucosal function. Microorganisms can enter through the exterior (extra luminal) or internal (intraluminal) catheter.¹¹ Escherichia coli is the most common pathogen found, followed by Klebsiella pneumoniae, Proteus mirabilis, and Enterococcus spp. Duration of catheterization is a major risk factor the longer the catheter is in place, the higher the risk of bacterial colonization.¹²

Spread within 6 hours begins from the Initial Colonization stage, namely In the first 6 hours, microorganisms begin to adhere to the surface of the catheter and urinary tract with the help of adhesions, such as pili and fimbriae, found in bacteria such as *E. coli*.¹³ Fimbriae P in *E. coli* allows germs to attach to glycoprotein receptors in the urinary tract epithelium, initiating colonization. This adhesion is accelerated if there are micro-injuries due to trauma during catheter installation.¹³ Initial Immune Response, namely the local immune system, such as IgA secretion and epithelial cell activity, attempts to fight colonization.¹⁴ However, catheter placement often weakens these defense mechanisms. Spread within 24 Hours begins with Biofilm Formation: After 24 hours, adherent microorganisms begin to form a biofilm on the surface of the catheter. Biofilm is a polysaccharide matrix layer that protects bacteria from phagocytosis and antibiotics.¹⁵

The combination of these two outcomes is rarely explored together. This study provides new insights into the possible relationship between catheter removal time and patient pain experience,¹⁶ which may impact patient quality of life and satisfaction. This study may provide stronger evidence to determine the optimal timing of catheter removal after C-section, which has often been based on clinical habits or individual preferences rather than strong evidence-based research.¹⁷ By identifying the optimal duration of catheter removal, this study has the potential to reduce the risk of UTI, a common but preventable complication.¹⁸ The results of this study may help improve efficiency in post C-section patient management, reduce hospital stays, or antibiotic use for UTIs.¹⁹ This study focused on women undergoing C-section, which is a population with unique physiologic conditions (eg, hormonal changes, relative immunosuppression) and therefore provides specific and relevant data compared to other general studies.²⁰ If the results are significant, this study opens the door to larger, prospective follow-up studies to evaluate additional factors, such as catheter type, antimicrobial agents, or catheter removal protocols.²¹

5. Conclusion

This study showed no relationship between the duration of urinary catheter removal 6 and 24 hours after C-section with the incidence of UTI, but there was a significant relationship between the level of patient pain. The duration of catheter use under 24 hours tends not to increase the risk of UTI. Therefore, management of the duration of catheter installation is an important aspect in preventing postoperative complications.

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