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Effect of immediate versus late removal of catheter after Total Abdominal Hysterectomy

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ABSTRACT

Background: Total abdominal hysterectomy is commonly performed for benign gynecological diseases. Timing of urinary catheter removal after surgery remain controversial because early removal may cause urinary retention while late removal may increase risk of urinary tract infection. **Objective:** To compare frequency of recatherization and urinary tract infection in immediate versus late catheter removal after total abdominal hysterectomy. **Study Design:** Randomized controlled trial. **Duration and Place of Study:** This study was conducted from 11 December 2024 to 11 May 2025 at Department of Obstetrics and Gynaecology, Saidu Group of Teaching Hospital Swat. **Methodology:** Total 176 women undergoing total abdominal hysterectomy for benign conditions were included. Patients were divided into two groups by blocked randomization, 88 in immediate removal group and 88 in late removal group. Immediate removal was done within 24 hours and late removal after 24 hours of surgery. **Results:** Mean age in immediate group was 33.81 ± 8.18 years and in late group was 36.56 ± 8.69 years. Recatherization occurred in 10.2% patients in immediate group and 2.3% in late group (p = 0.057). Urinary tract infection was found in 10.2% in immediate group and 20.5% in late group (p = 0.060). Higher body mass index >25 kg/m^2 (p = 0.027), rural residence (p = 0.031) and low socioeconomic status (p = 0.048) showed significant association with urinary tract infection in late removal group. **Conclusion:** Immediate catheter removal show more recatherization while late removal show more urinary tract infection.

INTRODUCTION

Total abdominal hysterectomy is one of the most common major gynecologic surgical procedures performed for various benign and malignant disorders.[1] This involves the surgical removal of the uterus through an abdominal incision, along with the potential removal of the cervix, ovaries, and fallopian tubes depending upon the reason for surgery.[2] The most common indications include uterine fibroids, abnormal uterine bleeding, adenomyosis, endometriosis, pelvic inflammatory disease, and gynecologic malignancies, to name a few.[3] This surgical procedure is performed under general or regional anesthesia, requiring meticulous dissection of the urinary bladder from the lower uterine segment to avoid any possible damage to the urinary bladder. Due to the close relationship between the urinary bladder and the uterus, preoperative insertion of a urinary catheter is routine to decompress the urinary bladder, thus monitoring urine output during and after surgery.[4] Postoperative care following a total abdominal hysterectomy is of prime importance to avoid any possible complications such as hemorrhage, wound infection, urinary retention, urinary tract infection, etc., with catheterization being one of the most important factors in the postoperative period.[5]

The issue of immediate or delayed removal of the catheter after total abdominal hysterectomy remains a pertinent issue in clinical practice, with continued variations in practitioner protocols.[6] While immediate removal of the catheter in patients after hysterectomy may be defined as removal of the urinary catheter within 6 to 12 hours of surgery or on the day of surgery itself, delayed removal of the catheter in patients after hysterectomy may be defined as removal of the catheter 24 to 48 hours or longer after surgery.[7] The rationale behind immediate removal of the catheter in patients after hysterectomy includes the reduction of the risk of catheter-associated infections.[8]

Early catheter removal might increase the risk of urinary retention in patients. This might require the patient to be recatheterized.[9] This can be uncomfortable and anxiety-provoking. Conversely, prolonged catheterization increases the risk of catheter-associated urinary tract infection (CA-UTI), which can be caused by bacterial colonization and subsequent infection.[10] This can be presented with symptoms of fever, dysuria, and suprapubic discomfort. This can also cause prolonged stay

in the hospital, hence increased healthcare costs.[11] Early catheter removal has been shown by some studies to reduce the incidence of urinary tract infection without an increased incidence of recatheterization. [12]

However, there is a scarcity of data about the time interval for catheter removal in the postoperative period following total abdominal hysterectomy in the population of Swat. The practices in the region may be different compared to the practices in big hospitals, and the data collected internationally may not be applicable to our region. This study is needed to assess the rates of recatheterization and urinary tract infections in our population.

METHODOLOGY

This randomized controlled trial was carried out at the Department of Obstetrics and Gynaecology, Saidu Group of Teaching Hospital Swat, from 11 December 2024 to 11 May 2025. Approval was taken from the institutional ethical committee before starting the study, and the study was conducted according to hospital research guidelines. The total sample size was 176 patients, with 88 in each group. Sample size was calculated by taking 95% confidence level, alpha 5% (two-sided), and power 80%. The calculation was done by using frequency of recatherization 8.5% in immediate removal group as compared to 1% in late removal group after total abdominal hysterectomy.[13] Patients were allocated into two groups by blocked randomization, 88 patients in immediate removal group (Group A) and 88 patients in late removal group (Group B).

Women aged 18 to 50 years, married, with any parity and undergoing Total Abdominal Hysterectomy for benign indications such as uterine fibroids, abnormal uterine bleeding, endometriosis or uterine prolapse were included in the study. Patients having history of neurogenic bladder, recurrent urinary tract infections, concomitant surgeries involving bladder or ureters or other pelvic organs, known allergy to catheter material or anesthesia, history of diabetes, history of end-stage renal disease and pregnancy on ultrasound were excluded from the study. Immediate removal of catheter was considered when catheter was removed in operating room within 24 hours after the procedure. Late removal of catheter was considered when catheter was removed after 24 hours of the procedure.

All patients underwent Total Abdominal Hysterectomy under standard departmental protocol. A single dose of antibiotic prophylaxis was given at time of surgery and continued postoperatively according to unit protocol. A 16F Foley's catheter with 10 cc balloon was inserted preoperatively. Fresh urine sample was taken from catheter for microscopy and culture at time of catheterization. Catheter remained in situ during surgery. According to assigned group, catheter was removed either immediately in operating room (Group A) or 24 hours after surgery (Group B). Patients were monitored postoperatively until discharge. During hospitalization, cases of catheter reinsertion and the development of urinary symptoms were noted. Recatherization of the patient was considered if the patient failed to spontaneously void urine following removal of the catheter. Urinary tract infection (UTI) was considered if there is a culture of $\geq 10^5$ colony-forming units/milliliter of urine and the patient manifested signs such as dysuria, urinary frequency, and urgency.

All collected data were entered and analyzed using SPSS version 26. Quantitative variables like age, BMI and parity were presented as mean ± standard deviation. Categorical variables including residential status, socioeconomic status, recatherization and UTI were presented as frequencies and percentages. Comparison between both groups for outcomes was done by chi-square test or Fisher's exact test. Stratification of outcomes was performed for age, BMI, residential status, socioeconomic status. Post-stratification chi-square test or Fisher's exact test was applied and $p \leq 0.05$ was considered significant.

RESULTS

The study was about the effect of immediate versus late removal of urinary catheter after Total Abdominal Hysterectomy, with both groups comprising 88 patients each (n=176 total). In terms of patient demographics, the mean age of patients in Group A (Immediate Removal) was 33.81 ± 8.18 years while in Group B (Late Removal) it were 36.56 ± 8.69 years. The mean parity was 4.38 ± 1.30 in Group A and 4.52 ± 1.29 in Group B, and mean BMI was recorded as 27.21 ± 2.75 kg/m^2 and 28.05 ± 3.11 kg/m^2 respectively. Majority of patients in Group A was from rural areas 48 (54.5%) while in Group B rural patients were also more, 55 (62.5%). Urban patients were 40 (45.5%) in Group A and 33 (37.5%) in Group B. Regarding socioeconomic status, low socioeconomic class were more common in both groups, that is 37 (42.0%) in Group A and 48 (54.5%) in Group B, followed by middle class 34 (38.6%) and 26 (29.5%), and high class 17 (19.3%) and 14 (15.9%) respectively (Table 1).

Table 1

Patient Demographics in Both Groups

Variables	Immediate Removal (Group A) n=88	Late Removal (Group B) n=88
	Mean ± SD	Mean ± SD
Age (years)	33.81 ± 8.18	36.56 ± 8.69
Parity	4.38 ± 1.30	4.52 ± 1.29
BMI (kg/m^2)	27.21 ± 2.75	28.05 ± 3.11
Residence	**n (%)**	**n (%)**
Rural	48 (54.5%)	55 (62.5%)
Urban	40 (45.5%)	33 (37.5%)
Socioeconomic Status		
Low	37 (42.0%)	48 (54.5%)
Middle	34 (38.6%)	26 (29.5%)
High	17 (19.3%)	14 (15.9%)

When comparison of outcomes was made between the two groups, recatherization was needed in 9 (10.2%) patients from Group A while only 2 (2.3%) from Group B require it, with p-value of 0.057 which were statistically not significant. For urinary tract infection, it was present in 9 (10.2%) patients of Group A and in 18 (20.5%) patients of Group B, with p-value 0.060 that also shows no statistically significant difference between both groups (Table 2).

Table 2

Comparison of Outcomes between the Two Groups n=176

Outcomes	Group A (Immediate Removal) n=88 n (%)	Group B (Late Removal) n=88 n (%)	P value
Recatherization			
Yes	9 (10.2%)	2 (2.3%)	
No	79 (89.8%)	86 (97.7%)	0.057*
Total	88 (100%)	88 (100%)	
Urinary Tract Infection			
Yes	9 (10.2%)	18 (20.5%)	
No	79 (89.8%)	70 (79.5%)	0.060**
Total	88 (100%)	88 (100%)	

*Fischer Exact Test **Chi-Square Test

In assessment of association between demographic variables with recatherization, among patients with age ≤30 years, recatherization was seen in 4 (12.1%) patients of Group A and 0 (0.0%) in Group B with p-value 0.126, while in patients with age >30 years, recatherization occurred in 5 (9.1%) and 2 (3.2%) in Groups A and B respectively with p-value 0.249. For BMI ≤25 kg/m^2, recatherization was reported in 3 (12.5%) in Group A and 0 (0.0%) in Group B (p=0.262), and for BMI >25 kg/m^2, it was 6 (9.4%) and 2 (2.8%) in Groups A and B respectively (p=0.147). Among rural residents, recatherization occurred in 5 (10.4%) of Group A and 1 (1.8%) of Group B (p=0.095), while in urban residents it was 4 (10.0%) and 1 (3.0%) in Groups A and B (p=0.369). In low socioeconomic patients, recatherization was seen in 3 (8.1%) in Group A and 1 (2.1%) in Group B (p=0.313), in middle class 4 (11.8%) and 1 (3.8%) respectively (p=0.377), and in high class 2 (11.8%) and 0 (0.0%) respectively (p=0.488). Regarding UTI association, in age ≤30 years, UTI was present in 4 (12.1%) in Group A and 4 (16.0%) in Group B (p=0.715), while in age >30 years it were 5 (9.1%) and 14 (22.2%) in Groups A and B (p=0.053). For BMI ≤25, UTI was found in 3 (12.5%) and 1 (6.3%) in Groups A and B (p=0.638), and for BMI >25 it were 6 (9.4%) and 17 (23.6%) respectively which shows significant association (p=0.027). Rural residents had UTI in 5 (10.4%) from Group A and 15 (27.3%) from Group B (p=0.031), while urban residents showed 4 (10.0%) and 3 (9.1%) UTI cases in Groups A and B respectively (p=1.000). Among low socioeconomic patients, UTI was recorded in 3 (8.1%) and 13 (27.1%) in Groups A and B (p=0.048), in middle class it were 4 (11.8%) and 5 (19.2%) (p=0.482), and in high class it were 2 (11.8%) and 0 (0.0%) respectively (p=0.488) (Table 3).

Table 3

Association of Demographic Variables with Recatherization and Urinary Tract Infection in Both Groups

Demographic Variables	Group		Recatherization		P-value	UTI		P-value
			Yes n (%)	No n (%)		Yes n (%)	No n (%)	
Age (years)	≤30	A	4 (12.1%)	29 (87.9%)	0.126*	4 (12.1%)	29 (87.9%)	0.715*
		B	0 (0.0%)	25 (100.0%)		4 (16.0%)	21 (84.0%)	
	>30	A	5 (9.1%)	50 (90.9%)	0.249*	5 (9.1%)	50 (90.9%)	0.053**
		B	2 (3.2%)	61 (96.8%)		14 (22.2%)	49 (77.8%)	
BMI (kg/m^2)	≤25	A	3 (12.5%)	21 (87.5%)	0.262*	3 (12.5%)	21 (87.5%)	0.638*
		B	0 (0.0%)	16 (100.0%)		1 (6.3%)	15 (93.8%)	
	>25	A	6 (9.4%)	58 (90.6%)	0.147*	6 (9.4%)	58 (90.6%)	0.027**
		B	2 (2.8%)	70 (97.2%)		17 (23.6%)	55 (76.4%)	
Residence	Rural	A	5 (10.4%)	43 (89.6%)	0.095*	5 (10.4%)	43 (89.6%)	0.031**
		B	1 (1.8%)	54 (98.2%)		15 (27.3%)	40 (72.7%)	
	Urban	A	4 (10.0%)	36 (90.0%)	0.369*	4 (10.0%)	36 (90.0%)	1.000*
		B	1 (3.0%)	32 (97.0%)		3 (9.1%)	30 (90.9%)	
Socioeconomic Status	Low	A	3 (8.1%)	34 (91.9%)	0.313*	3 (8.1%)	34 (91.9%)	0.048*
		B	1 (2.1%)	47 (97.9%)		13 (27.1%)	35 (72.9%)	
	Middle	A	4 (11.8%)	30 (88.2%)	0.377*	4 (11.8%)	30 (88.2%)	0.482*
		B	1 (3.8%)	25 (96.2%)		5 (19.2%)	21 (80.8%)	
	High	A	2 (11.8%)	15 (88.2%)	0.488*	2 (11.8%)	15 (88.2%)	0.488*
		B	0 (0.0%)	14 (100.0%)		0 (0.0%)	14 (100.0%)	

*Fischer's Exact Test **Chi-Square Test

DISCUSSION

The mean age of patients in Group A was 33.81 ± 8.18 years and in Group B was 36.56 ± 8.69 years. Both groups was comparable in terms of age, parity and BMI, which suggest that demographic variables was evenly distributed and not likely to cause bias in results. Recatherization was needed in 9 (10.2%) patients of Group A and only 2 (2.3%) of Group B, with p-value 0.057 which was statistically not significant. The higher rate of recatherization in immediate removal group can be explained by the fact that when catheter is removed too early after surgery, the detrusor muscle of bladder may not yet recovered from the effect of anesthesia and surgical trauma. This leads to urinary retention and need of recatherization. The bladder normally required some time to regain its normal contractile function after pelvic surgery, and early removal does not allow this recovery to complete properly. Urinary tract infection was found in 9 (10.2%) patients of Group A and 18 (20.5%) of Group B, with p-value 0.060 that was also not statistically significant. The high occurrence of urinary tract infections, which was evident in the late removal group, can scientifically be explained by the prolonged period that the catheter remained inside the urinary bladder. The urinary catheter can be regarded as a foreign object, and the longer period for which the catheter remains inside the bladder increases the chance for bacteria to ascend the catheter and enter the bladder through a biofilm. This is a well-

recognized factor within a hospital setup, where catheter-associated urinary tract infections are mainly caused by prolonged catheterization.

Recatherization was required in 9 (10.2%) patients of immediate removal group and 2 (2.3%) of late removal group (p=0.057). This finding was comparable to Joshi *et al.* [13] who also reported higher recatherization rate in immediate removal group that is 8.5% versus 0% in delayed removal group (p=0.077) after abdominal hysterectomy, and both studies showed statistically non-significant results. Similarly Hasabe *et al.* [14] reported urinary retention and recatherization in 8.57% in immediate removal group, which is also close to present study finding of 10.2%. The scientific reason for higher recatherization in immediate removal group is that early catheter removal does not allow adequate recovery of detrusor muscle from the effect of anesthesia and surgical manipulation, resulting in temporary urinary retention. However Gupta *et al.* [15] reported opposite trend where recatherization was 10% in early removal group and 0% in late removal group after vaginal hysterectomy, which is similar in direction to present study but with different surgical route that may explain some variation in results.

Urinary tract infection was found in 9 (10.2%) patients of immediate removal group and 18 (20.5%) of late removal group (p=0.060), which was statistically non-significant but showed clear trend that late catheter removal carries more risk of UTI. This was strongly supported by Joshi *et al.* [13] who reported positive urine culture in 8.5% of immediate removal versus 22.8% of late removal group (p=0.222) after abdominal hysterectomy, showing same pattern and comparable magnitude. Thakur *et al.* [16] also reported UTI in 4% of short-term catheterization group versus 22% in long-term group (p=0.017) after vaginal prolapse surgery, which was statistically significant and support the same direction of present findings. Gupta *et al.* [15] similarly found UTI in 20% of early removal versus 52% of late removal group (p=0.0008), confirming that prolonged catheterization significantly increase the risk of UTI. The meta-analysis by Sahadevan *et al.* [17] further consolidate this finding by reporting 30% reduction in UTI incidence with early catheter removal compared to removal after 48-72 hours (RR 0.70, 95% CI 0.60-0.81). The biological explanation for higher UTI in late removal group is that urinary catheter act as a foreign body and its prolonged presence in bladder facilitate bacterial colonization *via* biofilm formation on catheter surface, which allow ascending infection into bladder. Castillo-Pino *et al.* [18] also observed higher UTI rates with delayed removal, 17.4% at 48 hours and 13% at 72 hours, compared to 7.4% at 24 hours, though the difference was not statistically significant (p=0.512), which is in agreement with present study where p-value was also non-significant. Sandberg *et al.*[19] reported UTI in 4.1% of immediate removal versus 9.9% in delayed removal group (p=0.215) after laparoscopic hysterectomy, again showing same trend as present study with non-significant p-value, and the difference in UTI rates between studies may be due to different surgical approaches and catheterization protocols used. Ouladsahebmadarek *et al.* [20] reported symptomatic UTI in 3% of early removal versus 9% in delayed removal group (p=0.074) after abdominal hysterectomy and laparotomy, which also shows non-significant but clinically meaningful difference similar to present study results.

The present study had some limitations that should be acknowledged. It was a single center study which limit the generalizability of findings to other settings and populations. The sample size of 88 patients in each group was relatively small which may have affect the statistical power to detect significant differences between groups. The follow up period was short and long term urinary outcomes after catheter removal was not assessed in present study. Urine culture was not performed in all patients routinely which may have underestimate the true incidence of urinary tract infection in both groups.

CONCLUSION

Based on the present study, it was found that prompt removal of urinary catheters after Total Abdominal Hysterectomy resulted in a higher rate of recatheterization, whereas delayed removal resulted in an increased risk of urinary tract infection, although not statistically significant. The present study also found that demographic factors such as body mass index, living in rural areas, and socioeconomic status are more strongly related to urinary tract infection in the delayed removal group.

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