

Significance of Indwelling Time for Bacterial Colonization of Double J Stents

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ABSTRACT

Objectives: To determine the significance of indwelling time for bacterial colonization of DJ stents by measuring the frequency of bacterial colonization in such stents after endoscopic Urological surgery. **Place And Duration:** Study was done from September 2014 to November 2015 (15 months) in Department of Urology and Kidney Transplantation, Allied Hospital, Faisalabad. **Methodology:** 68 patient were included in the study who undergone Percutaneous nephrolithotomy (PCNL) and Ureterorenoscopy (URS) for renal and ureteric stones respectively with DJ stenting. Sterile nature of urine was assured in pre-operative circumstances and patients with active urinary tract infection were excluded from the study. Urinary cultures were performed at 2-4 weeks, 5th week and more than 6th week of indwelling time and lower end of DJ stent cultures were also performed after removal. **Results:** 68 patients were included in the study with mean age 48.5 years (20-77 years age limits). Among 68, 38 were male patients and 30 were female. Percutaneous nephrolithotomy (n = 5) and ureterorenoscopy (n =63) were the procedures after which DJ stenting was performed. Out of 68, 36 patients undergone right sided stenting and 32 patients undergone left side ureteric stenting. Urine culture was positive in 1 (1.47%) case and DJ stent cultures were positive for bacterial colonization in 4 (5.8%) cases. We do not found any statistical association between stent culture analysis and variables like gender, age of patient, or laterality. However we find statistical significance between stent indwelling time and colonization as evident by the results that the rate of colonization was 2.7% when indwelling time was less than 4 weeks, 4% colonization when indwelling time was 5 weeks as compared to 28.5% colonization when indwelling time was more than 6 weeks. **Conclusion:** These results showed that colonization rates increases when indwelling time increases especially when indwelling time exceeds 6 weeks. This study also refers to the fact that DJ stents can be kept safely for maximum duration of 6 weeks and indwelling time greater than 6 weeks will be associated with complication of urinary tract infection. Moreover this study also showed that one may find an infected colonized stents even if urine culture is negative for any growth.

Key words: Double J stent, Colonization, Percutaneous nephrolithotomy, Ureterorenoscopy, Culture.

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INTRODUCTION

World is changing so as the treatment modalities are also changing especially in Urology where upper urinary tract surgery for stone disease (Renal and ureteric stones) is almost being shifted to endoscopic/minimally invasive surgery from open surgery. Endo-urology is advancing and a great variety of indwelling instruments like DJ stents have been designed to make endoscopic surgery more safe and patient friendly. These stents are generally considered to be safe, but development of biofilm around these stents and infectious complications are commonly encountered, as evident by figure that out of nosocomial infections in Urology, 80 % are secondary to indwelling

catheters and stents¹, so are causing damages of great importance to the patients². To avoid this grave complication in DJ stents, triclosan-eluting stents are being used to combat this situation and complication³. In this study, we determined the rates of bacterial colonization of such stents with respect to different indwelling times and association of bacteriuria with colonization. Variables like gender, age, and indwelling time were observed and their possible association was determined.

METHODOLOGY

Study design: Prospective study

Setting: Department of Urology and Kidney Transplantation, Allied Hospital, Faisalabad.

Duration: This study was done between September 2014 to November 2015 (15 months).

Sample Size: 68 patients were enrolled in the study

Sampling technique: Non probability consecutive sampling

Inclusion Criteria: Patients included in this study were those who have been admitted with renal and ureteric stones for endoscopic management. Such patients undergone PCNL or URS followed by DJ stenting.

Exclusion Criteria: Patients with established urinary tract infection, metabolic diseases, immune compromised status and patients with Grade 4 and Grade 5 ESRD were excluded from the study.

Procedure: Midstream urine cultures of all the patients undergoing DJ stent insertion were done before surgery and sterile nature of urine before surgery was confirmed. We administered all patients one dose of prophylactic antibiotics (1 g I.V. ceftriaxone) just before surgery and all the patients were given routine post-operative antibiotic coverage for 3 days in post-operative period. DJ stents of Boston make (Percuflex Plus stent) of 4.8 F were placed after surgeries and were kept indwelling for 4 - 6 weeks. Urine cultures were done at 2-4 weeks, 5 weeks and more than 6 weeks while all stents were removed by endoscopic means in operation theater under sterile conditions. The lower 3 cm tips of the removed stents were taken for culture purpose and transported to the lab under sterile conditions. Growth greater than 1000 colony-forming units/ml was considered significant as such stents were labeled with positive colonization. Bacterial type was identification was done by 'Petri dish'.

Statistical Tool: Characters of obtained data were observed in terms of laterality, gender, age, and indwelling time. We applied statistical test of Student t and Chi-square tests for statistical analysis. The level for statistical significance was based on $p=0.01$, and results were considered statistically significant when $p < 0.01$.

RESULTS

Study was done for period of 15 months. 68 patients (38 males and 30 females) who fulfilled the inclusion and exclusion criteria were part of the study. Age limits were 20-77 years with mean age 48.5 years. None of the patient was lost in follow-

up. Percutaneous nephrolithotomy ($n = 5$) and ureterorenoscopy ($n = 63$) were the procedures after which DJ stenting was performed. The time length for PCNL was 97 minutes on average while for URS average time span for surgery was 43 minutes. The right and left sided ureteric stenting proportion was 36 (52.94%) and 32 (47.1%), respectively. Mean indwelling time for DJ stents was 33.5 days. In study, colonization was detected in 2 males and 2 females (Figure-1). There was no statistical association for stent colonization and age ($p > 0.01$) as shown by statistical result showing median age for sterile stents group as 43.7 and for that of non-sterile as 45.9. The difference for gender was also statistically insignificant. Mean indwelling times showed statistical significance for colonized and non-colonized stents (Table 1). The detected microorganisms were Escherichia coli in three cases and Pseudomonas in one case. In our study, the rate of colonization was 2.7% when indwelling time was less than 4 weeks, 4%, when indwelling time was 5 weeks and 28.5% when indwelling time was more than 6 weeks respectively (Table 2). No significant association found in our study for type of bacteria and indwelling time.

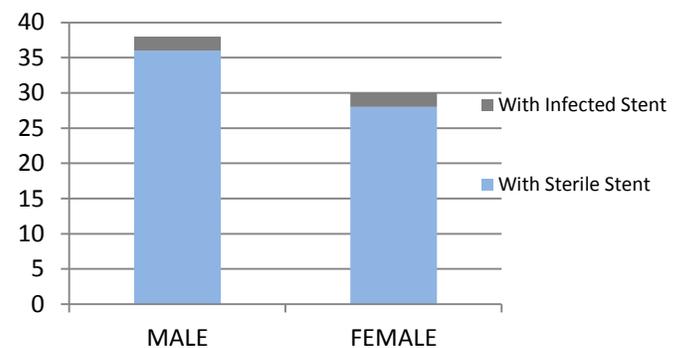


Figure 1: Gender distribution for sterile and infected stents

Table 1: Case distribution according to complications

	Indwelling Time (Days)
Sterile, N (%)	21
Non-Sterile, N (%)	46
<i>p</i>	<0.01

Table 2: DJ stent colonization rate for different indwelling times

Indwelling time (week)	Patient (N)	Colonization rates of stents (%)
Less than 4 weeks	36	1 (2.7%)
5 weeks	25	1 (4%)
6 weeks	7	2 (28.5%)

DISCUSSION

Urology is one of the fields in the world in which surgery has been mostly replaced from open to minimally invasive surgery especially endoscopic surgery for upper urinary tract stone disease. Endoscopic surgery is becoming least invasive with passage of time and DJ stent has become an important part of the urological surgery. It has got many advantages as where it provides good urinary drainage during healing process of ureteric mucosa, it also is generally safe and least invasive as is associated with minimal tissue reaction⁴. But being non self to patient, they act as cause of many complications like pain, frequency⁵, hematuria, dysuria, and some complications like stent encrustation arise due to long indwelling time⁶. It has been found that longer the duration is, more is the complication rate⁷. Ureteric stents are made of different types of materials and furthermore covering and coating is provided over the stents to avoid complications⁸. Cause of infective complications in such indwelling stents is formation of biofilm around such stents. Biofilm management is always difficult because it consists of rapidly growing and slow growing bacteria⁹ and it has ability to get attached to various surfaces including surrounding mucosal surfaces, walls of catheters and stents¹⁰. During manipulation, this biofilm gets dis-integrated and inhabitant micro-organisms are released into the urine and can lead conditions characterized from uncomplicated UTI up to urosepsis¹¹. Systemic antibiotic therapy has role to treat circulating bacteria, but it is usually non protective against the biofilm formation as well as antibiotics have poor penetration in to the biofilm, so have no or limited role in eliminating such organisms¹². Considering this complication, research work has been done previously to find out any possible predictor for this stent colonization. Urine was once considered to be a good predictor but results have shown its controversial role as

predictor. The relationship between association of urine and stent cultures is not still clear and opinion varies. Lojanapiwat work results indicate colonization in about two to three of the patients¹³. But on other hand Klis et al. gave opinion as that urine cultures cannot predict correctly the catheter/stent cultures and significant difference lies between the two¹⁴. Another study showing sensitivity of urine cultures to stent colonization as a poor predictor, showing only 31% in a study by Lifshitz et al¹⁵. Our study interprets the same that urine culture is not a good and reliable indicator for detecting stent colonization; therefore, a negative culture does not means that stent is non-colonized. Bacterial colonization of stents depend upon various factors and many such factors and level of their significance of role in development of such infective complication has been investigated. Some studies have been done to check for association of development of bacteriuria and bacterial colonization of the DJ stent with diabetes mellitus, ESRD and gender¹⁶. There are some other specific factors associated with development of urinary tract infection by particular organisms whose distribution varies¹⁷. Studies are also done to look out the appropriate safe indwelling time of ureteric stents. In past, some studies were done to look for possible complications if ureteric stents are removed early in post-operative period after different types of open and endoscopic surgeries.

CONCLUSION AND RECOMMENDATION

Authors conclude that indwelling time has got significant association for development of DJ Stent bacterial colonization. However, further studies are required to determine the indwelling duration of DJ stents after different urological approaches so that unwanted long indwelling time period for stents can be reduced. Authors strongly recommend that patients with DJ stents who are at risk for development of bacteremia, should be administered with broad-spectrum antibiotics, especially if indwelling time of more than 4 weeks is desired, and that the stents should be removed as soon as permissible.

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