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Original Research Article

An observational study on the effect of stent microbial culture status on double J stent associated lower urinary tract symptoms

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ABSTRACT

Background: The double-J ureteral stent had been widely applied during the endourologic surgery to relieve or prevent ureteral obstruction. Stent-related morbidities, such as lower urinary tract symptoms (LUTS), stent-related body pain and hematuria, are bothersome and might have a negative impact on quality of life (QoL) and sexual performance for both genders. The prevalence of LUTS after double DJ stenting is 50%-70%. The prevalence hence is significant and geographic variance might exist. This makes this issue an important health problem and indirectly serves as a scale for quality of healthcare delivery to the public. This study aimed to study the effect of stent microbial culture status on double j stent associated lower urinary tract symptoms performed at Narayana Hospitals, Nellore.
Methods: An observational study was conducted in the Department of Urology, Narayana Medical College & Hospitals, Nellore for 18 months from June 2021 to November 2022. A convenient sample of 45 were selected among the patients who underwent DJ stenting and presenting with LUTS to the outpatient department.
Results: The sensitivity of urine culture was 29.27%. The specificity and PPV are 100%. The NPV was 12.12% with diagnostic accuracy was 35.56%. The age and symptom score-IPSS were correlated and the r value was -0.03, QOL and Age were correlated with the r value was 0.004.
Conclusions: Urine culture was positive among 26.66% and stent culture in 84% of the stents. Urine culture is highly specific in identifying the stent culture status.

Keywords: DJ stent, IPSS score, QOL

INTRODUCTION

By definition, the double-J or pigtail stent is a tube placed within the ureteral lumen in a retrograde or antegrade fashion in order to maintain its patency. The double-J ureteral stent has been extensively utilized in endourologic surgery to alleviate or avert ureteral obstruction. Stent-associated morbidities, including lower urinary tract symptoms (LUTS), stent-related discomfort, and hematuria, are distressing and may adversely affect quality of life (QoL) and sexual function in both sexes. Stent discomfort can vary from one patient to another in an idiosyncratic manner, but is believed to affect over 80% of patients.

According to the study published by Lee et al, the prevalence of LUTS after double DJ stenting is 50%-70%.[1] The prevalence hence is significant and geographic variance might exist.[2] This makes this issue an important health problem and indirectly serves as a scale for quality of healthcare delivery to the public. The etiology of symptoms associated with stents remains ambiguous. The

pain and lower urinary tract symptoms (LUTS) resulting with stent insertion have been ascribed to spasms of the lower ureter and bladder, induced by local irritation from the stent.

Research indicates that pharmacotherapeutic drugs such as tamsulosin, along with other antimuscarinics and alpha blockers, enhance symptoms by inhibiting unnecessary bladder contractility or by an unidentified mechanism in the case of alpha blockers.[3] Patients who do not respond to this medication have few alternatives or must have stent removal, regardless of the consequences. The investigation into altering the architecture of the bladder end of the stent revealed no significant differences across the groups.

Need for the study

A complete understanding of the pathogenesis of stent-related symptoms is limited by the lack of systematic analysis of the same. The role of micro-organisms (pathogenic/opportunistic) are less investigated and reported. There is very limited data published regarding the DJ stent related complications and the role of stent culture and the organisms associated with it.

Hence the present study was taken up to study the effect of stent microbial culture status on double j stent associated lower urinary tract symptoms.

This research work aimed to study the effect of stent microbial culture status on double j stent associated lower urinary tract symptoms performed at Narayana Hospitals, Nellore. Also, to study the urine culture status on patients who underwent double j stenting and presenting with lower urinary tract symptoms performed at Narayana Hospitals, Nellore. Moreover, to assess correlation of the microbial culture of DJ stents to that of symptomatology, in patients having lower urinary tract symptoms after DJ stenting.

METHODS

The present observational study was conducted in the Department of Urology, Narayana Medical College and Hospitals, Nellore from August 2022 to April 2024. A total of 45 patients who underwent DJ stenting and presenting with LUTS were included in the study. Ethical clearance was obtained from the Institutional Ethical Committee, Narayana Medical College, Nellore.

Inclusion criteria

Patients with age between 20-40 years, patients who underwent DJ stenting (unilateral or bilateral) after intracorporeal lithotripsy for ureteric calculi, patients undergoing ureteric stenting for the first time, patients with IPSS score 8 or above after DJ stenting, patients who were willing to give informed consent were included.

Exclusion criteria

History of severe lower urinary tract symptoms prior to DJ stenting, gross haematuria, associated bladder outlet obstruction, history of tuberculosis/diabetes mellitus/medications for chronic ailment, urine microbial culture positive at the time of DJ stenting, cystoscopy revealing urinary bladder abnormality, residual stone in postoperative X-ray KUB, lower coil of DJ stent crossing the midline, suspected stent migration, and patients who were not willing to give informed consent were excluded.

	Not at All	Less Than 1 Time in 5	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always
1. Over the past month, how often have you had a sensation of not emptying your bladder completely after you finished urinating?	❑0	❑1	❑2	❑3	❑4	❑5
2. Over the past month, how often have you had to urinate again less than 2 hours after you finished urinating?	❑0	❑1	❑2	❑3	❑4	❑5
3. Over the past month, how often have you found you stopped and started again several times when you urinated?	❑0	❑1	❑2	❑3	❑4	❑5
4. Over the past month, how often have you found it difficult to postpone urination?	❑0	❑1	❑2	❑3	❑4	❑5
5. Over the past month, how often have you had a weak urinary stream?	❑0	❑1	❑2	❑3	❑4	❑5
6. Over the past month, how often have you had to push or strain to begin urination?	❑0	❑1	❑2	❑3	❑4	❑5
7. Over the past month, how many times did you most typically get up to urinate from the time you went to bed at night until the time you got up in the morning?						
❑0 none ❑1 1 time ❑2 2 times ❑3 3 times ❑4 4 times ❑5 5 or more times						
AUA symptom score = sum of questions 1 to 7.						
From Barry MJ et al. *J Urol.* 1992;148:1549–1557.[14]						

Figure 1: The IPSS questionnaire.

Procedure

The patients who satisfied the inclusion criteria were enrolled after written informed consent. All the 45 patients were selected by convenient sampling method. The data was collected prospectively by direct observation in specially designed proforma containing the all the detailed investigations that the patient underwent pre- operatively. The following investigations were done after enrolling the patient into the study: complete urine examination, urine routine and microscopy, urine culture and sensitivity, renal function tests (blood urea, serum creatitine), X-ray KUB, USG abdomen and pelvis, routine preoperative baseline investigation.

All the patients were subjected to stent removal observing maximum sterile precautions. The procedure was noted and any difficulty in removal of stent was recorded. The stent was received in a sterile culture tube and the distal end (vesical end) was cut with sterile scissors and sent for culture. The stent was processed in the microbiology department. It was initially cultured in Brain Heart Infusion broth (BHI) as soon as it is received in the department. Then isolates are cultured in McConkeyagar and Blood Agar. Sensitivity for antibiotics was done subsequently. The following scores were used to assess the patient during the study:

AUA symptom score

The American Urological Association (AUA) has developed the following questionnaire to help men determine how bothersome their urinary symptoms are and to check how effective their treatment is. It is also known as International Prostate Symptom Score (IPSS). Grading of IPSS with score and grading of severity were-7 as mild, 8-19 as moderate and 20-35 as severe.

Quality of life questionnaire-IPSS

The IPSS-QoL is a single question: "If you were to spend the rest of your life with your urinary condition just the way it is now, how would you feel about that?" with scores of 0 (delighted), 1 (pleased), 2 (mostly satisfied), 3 (mixed about equally satisfied and dissatisfied), 5 (mostly dissatisfied), and 6 (terrible).

Sample size

Sample size was calculated using the formula Z2pq/d2. The prevalence of LUTS after double DJ stenting is 50%-70%. Taking the lowest prevalence as prevalence of LUTS i.e., 50%, with 95% confidence interval, 80% power of the study, with 15% anticipated error, sample size was calculated.[1]

$N= Z^2pq/d^2$

Where, Z=1.96, P=50%, Q = 100-P=50, d = [absolute precision] = 15.

N = [1.96x1.96x50x50]/152

=42.68

= Rounded off to 45.

Data entry and analysis

The data was entered in Microsoft Excel 2010 version. Data was analyzed using Microsoft Excel 2010 and Epi Info 7.2.0. Descriptive and inferential statistical analysis were used in the present study. Results on continuous measurements were presented on Mean±SD [Min-Max] and results on categorical measurements were presented in Number [%]. Significance was assessed at 5% level of significance. Pearsons correlation was used to compare inter group variation for continuous variables. A p value of <0.05 was considered as statistically significant.

RESULTS

Among the study population, majority of them, belonged to the age group of 26-30 years (44.44%), followed by 31-35 years and 36-40 years (20% each). 15.5% was contributed by 20-25 years. Majority of them were males (68.88%). DJ stenting was done on the right side (46.66%), followed by left side (40%). 13.33% underwent stenting on both the sides. Dysuria was seen in 62.22%, changes in the frequency were seen in around one fourth of population. Around 13.33% had symptoms related to urgency.

IPSS score

Among the study population, based on IPSS score, 28.88% were having moderate severity and 71.11% were having severe symptoms. Among the study population, based on IPSS score quality of life was graded as mostly unsatisfied in 62.22%, followed by terrible in 17.77% and unhappy in 15.55% (Figure 2 and 3).

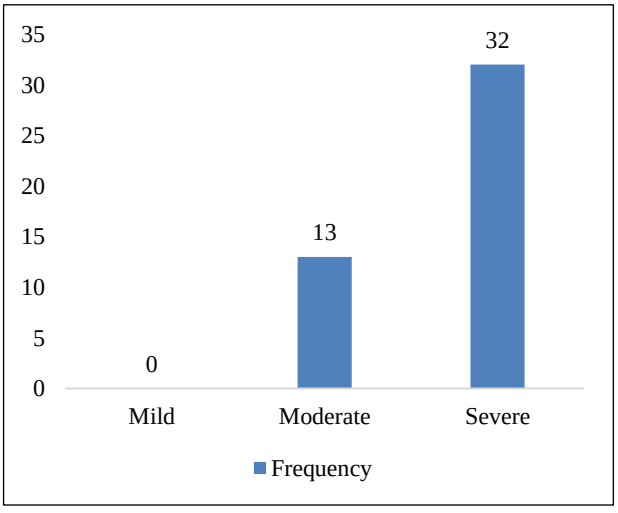

Figure 2: The IPSS score.

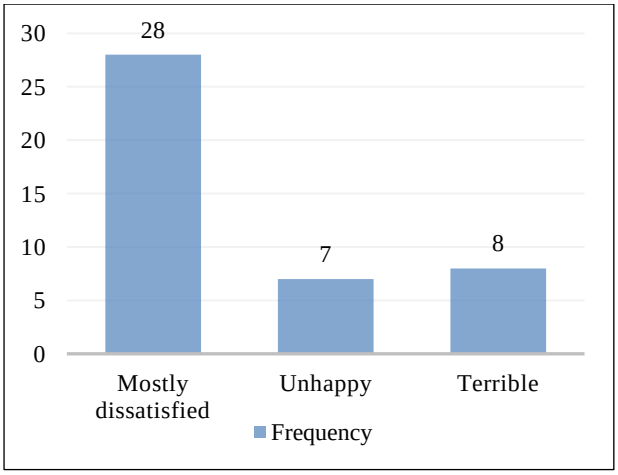

Figure 3: The QOL IPSS grading.

Culture and sensitivity

Among the study population, urine culture was positive among 26.66%. Among the patients with urine culture positive status, organisms isolated were *E. coli* in 50%, *Klebsiella*, *Pseudomonas* in 16.66%, *Proteus* and *Enterococcus* in 8.33% each. Stent culture was positive among 84.31%. Among the patients with stent culture positive status, organisms isolated were *E. coli* in 53.48%, *Klebsiella* in 16.27%, *Pseudomonas* in 11.62%, *Proteus* in 4.65% and *Enterococcus* in 9.33%. *Staphylococcus aureus* and *Acinetobacter* contributed to 2.32% each. The sensitivity of urine culture was 29.27%. The specificity and positive predictive value are 100%. The negative predictive value was 12.12% with diagnostic accuracy was 35.56%. Organisms isolated according to symptomatology (Table 1 and 2).

Table 1: The symptomotology and organisms isolated in stent culture.

Organism isolated	Dysuria	Frequency	Urgency	Grand total
Acinetobacter	1	0	0	1
E. coli	15	2	4	21
Enterococcus	2	1	1	4
Klebsiella	4	2	1	7
Proteus	1	1	0	2
Pseudomonas	1	4	0	5
No growth seen	3	1	0	4
S. aureus	1	0	0	1
Grand Total	28	11	6	45

Table 2: The symptomotology and organisms isolated in urine culture.

Organism isolated	Dysuria	Frequency	Urgency	Grand total
E. coli	4	2	0	6
Enterococcus	1	0	0	1
Klebsiella	1	0	1	2
No growth seen	19	9	5	33
Proteus	1	0	0	1
Pseudomonas	2	0	0	2
Grand total	28	11	6	45

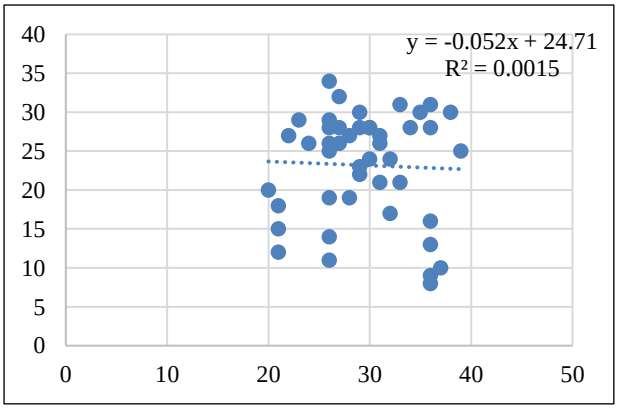

Figure 4: The scatter plot between age and IPSS score.

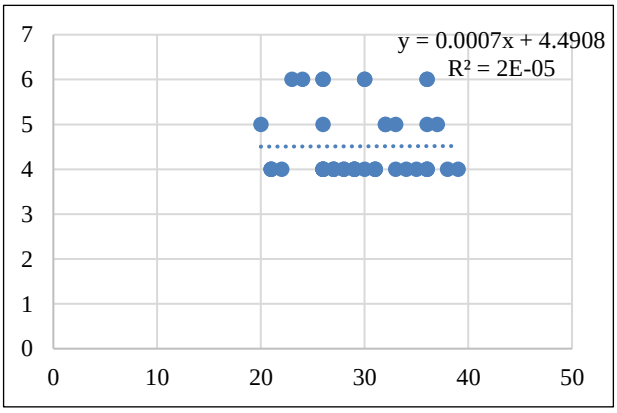

Figure 5: The scatter plot between age and QOL score.

Co-relations

Among the study population, age and symptom score – IPSS were corelated and the r value was -0.03, with corresponding p value of 0.87. QOL and age were correlated with the r value was 0.004 with corresponding p value of 0.9 (Figure 4 and 5).

DISCUSSION

Age

In the present study, among the study population, majority of them, belonged to the age group of 26-30 years (44.44%), followed by 31-35 years and 36-40 years (20% each). 15.5% was contributed by 20-25 years. The findings of the present study can be compared with the following studies:

In the study done by Li et al, the median age was 48 years ranging between 4 years and 72 years.[4] Pal et al reported the mean age was 52 years and Choi et al reported the mean age was 66.66 years.[5,6] The median age was 43.1 years ranging between 21 years and 73 years in the study done by Ozgur et al.[7]

Gender

In the present study, among the study population, majority of them were males (68.88%), followed by females (31.11%). The findings of the present study can be compared with the following studies:

In the study done by Li et al, female preponderance was observed.[4] Females contributed to 61.77%. Pal et al reported male preponderance (60%).[5] Female preponderance was reported by Choi et al.[6] Ozgur et al reported near equal distribution with respect to gender.[7]

Side involved

In the present study, among the study population, majority of them underwent DJ stenting on the right side (46.66%), followed by left side (40%).13.33% underwent stenting on both the sides.

The findings of the present study can be compared with the following studies:

Choi et al reported that 42% of the DJ stunting was on left side, followed by 28.12% on the right side. 29.68% had bilateral stenting done.[7]

Symptoms reported

In the present study, among the study population, dysuria was seen in 62.22%, changes in the frequency were seen in around one fourth of population. Around 13.33% had symptoms related to urgency. The findings of the present study can be compared with the following studies:

In the study done by Chen et al, 83.33% had reported symptoms related to increased frequency and urgency.[8] In an another study done by Cheung et al, reported the symptoms of dysuria.[9] Denstedt et al reported that half of the cases reported increased frequency, dysuria and urgency.[10] Srivastava et al reported that 61.53% of them had increased frequency and urgency related symptoms.[11] 69.23% had reported dysuria.

IPSS score

In the present study, among the study population, based on IPSS score, 28.88% were having moderate severity and 71.11% were having severe symptoms.

Quality of life

In the present study, among the study population, based on IPSS score quality of life was graded as mostly unsatisfied in 62.22%, followed by terrible in 17.77% and unhappy in 15.55%.

Urine culture and organisms isolated

In the present study, among the study population, urine culture was positive among 26.66%. Among the patients with urine culture positive status, organisms isolated were *E. coli* in 50%, *Klebsiella*, *Pseudomonas* in 16.66%, *Proteus* and *Enterococcus* in 8.33% each.

The findings of the present study can be compared with the following studies:

Li et al reported urine culture positivity rate of 35.29%, whereas Pal et al reported 15%.[4,5] Both the authors along with Klis et al, reported that *E. coli* was the most common organism isolated from urine culture.[12]

Stent culture and organisms isolated

In the present study, among the study population, stent culture was positive among 84.31%. Among the patients with stent culture positive status, organisms isolated were *E. coli* in 53.48%, *Klebsiella* in 16.27%, *Pseudomonas* in 11.62%, *Proteus* in 4.65% and *Enterococcus* in 9.33%. *Staphylococcus aureus* and *Acinetobacter* contributed to 2.32% each.

The findings of the present study can be compared with the following studies:

Li et al reported stent culture positivity rate of 61.77%, where as Pal et al reported 53%.[4,5] Sahan et al, reported lowest percentage of (18%) stent culture positivity.[13] *E. coli* was the most common organism obtained from stent cultures.

The limitations of the study include small sample size and results are specific to the given study population and study place.

CONCLUSION

The study concluded that, urine culture was positive among 26.66% and stent culture was positive in 84% of the stents sent for culture. *E. coli* was the most common micro-organism cultured from both the specimens. Urine culture is highly specific in identifying the stent culture status.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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