

Study of Resistance Profile of Internal Microflora Derived From DJ Stents Used In Urology Department, Rims, Ranchi

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Abstract

INTRODUCTION:-

Today's era of medical advancement, acknowledges quenching benefits from immense number of medical devices and among them, urinary catheter -stents proved its frontrunner.

DJ stents bypasses upper genitourinary obstruction due to calculus, mass, fibrosis or stricture thus maintaining patent & effortless urinary flow. It hence, prevents from creating any external surgical diversion.

It's length, 5-12" (12-30cm) with luminal diameter, 0.06-0.2" (1.5-6mm) and having multiple openings over its surface (overcomes obstruction & dilates ureter 2-3 times), made of materials like polyurethane (UROLOGY, RIMS), silicone, c-flex, urosoft, metal mesh, drug eluting stents etc.

It is inserted retrogradely with help of cystoscope and placed between bladder and kidney through ureter under mild sedation, LA or GA.

AIM AND OBJECTIVES :-

To study resistance profile of isolated colonizing microorganisms obtained from DJ stent culture & antibiotic sensitivity.

MATERIAL AND METHODS :-

82 DJ stents brought from Urology Department were cross sectionally studied from Feb 2019-Sep 2019 (7 months) in Microbiology Department, RIMS. Data entry and analysis has been done in MS EXCEL.

DJ stents were made sterile externally and both ends cut and dropped in BHI broth, incubated overnight. Resulting, turbid broth suspension is inoculated on BA, MA and NA followed by over night incubation to identify isolates by observing growth pattern, colony morphology, motility and biochemical properties. Pure isolated colonies obtained by subcultures are swabbed over MHA after preparing lawn culture. MHA plates swabbed with isolates are dried and impregnated with 14 antibiotic disks, 6 in each plate.

In Vitro AST, were performed by Kirby Bauer Disc Diffusion method and interpreted by CLSI Guidelines, 2019.

RESULTS :- 95.12% of all 82 stents showed colonization, rest 4.87% were sterile. *Pseudomonas aeruginosa*, 44.87%, *Enterococcus spp*, 17.94%, *Klebsiella spp*, 15.38%, *S.aureus*, 11.53%, *E.coli*, 3.84% were common isolates.

29.48% isolates were panresistant (*Pseudomonas*- 43.47%), 25.64% isolates showed sensitive to single drug and 7.69% sensitive to both drugs. Hence, 62.82% stent isolates were MDR.

74.28% of all *Pseudomonas* isolates were MDR and 28.57% were panresistant. *Acinetobacter spp.* and *Enterococcus spp* were 100% MDR.

CONCLUSION :-

13 *Pseudomonas* were sensitive to only 1 drug and 84.61% responded to Amikacin. In my study, I found where higher antibiotics like 3rd gen cephalosporin, betalactams and imipenems expressed resistance, simple antibiotics like amikacin and chloramphenicol showed promising response. Thus, empirical use of higher antibiotics should be prohibited and use of simple antibiotic should be encouraged.

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I. Introduction

In today's era of medical advancement, quenching benefits from immense number of medical devices, urinary catheters and stents are proved frontrunners¹.

Double J Stent (Polyurethane DJ-stent used in RIMS) used for bypassing genitourinary tract obstruction in form of calculus, stricture, fibrosis and renal mass. It proves instrumental in case of

Hydronephrosis (U/L or B/L) , Vesicovaginal fistulas , Acute Renal Failure or Chronic Renal Failure² .It promotes patent and continuous drainage of upper urinary tract to bladder and hence prevents from creating any external diversion³. Hence , its implication in modern urology seems to be of keen importance , helping patients to restore their uninhibited and effortless urinary flow⁴.

In our setup , maximum incidence of DJ stenting is done after performing interventions like ESWL ,PCNL and OPEN SURGERY under spinal or general anaesthesia.In case of upper obstructive uropathy , stent is retrogradely inserted through cystoscope under mild sedation or local anaesthesia⁵. DJ stent association with biofilm formation explains most of long term post stenting complications⁶ like UTI,abdominal discomfort ,hematuria and pyuria.

Length of DJ stent may vary from 5-12 inches (12-30 cm) and its luminal diameter vary from 0.06 -0.2 inches (1.5-6 mm).One or both end of stent may be coiled (called pigtail stent) which prevents from moving out from original location⁷.

II. Aim And Objectives :-

- 1) To find different, resident colonizing microorganisms in internal lumen of DJ Stent.
- 2) To study resistance profile of colonizing microorganisms obtained from DJ Stent Culture and Antibiotic Sensitivity.

III. Materials And Methods :-

The DJ stents used in study were brought from Department of Urology , RIMS ,after their removal from patients and further processed in Department of Microbiology ,RIMS . This was a cross sectional study in which 82 DJ stents were processed in a time span of about 7 months ,started from Feb 2019 - Sept 2019. 49 stents were derived from male and 33 from female patients. Data entry has been done in M.S EXCEL and Analysis by M.S EXCEL.

DJ stents transported in Hi Dispo TM Bag followed by gentle washing and external surface swabbing with 70% ethanol. Normal saline filled in 5 ml syringe is pushed through needle inserted in internal lumen of one end of stent where other end of stent is dipped in a glass tube containing BHI broth.The saline flushed through internal lumen of stent , carrying micro flora adhering internal surface of stent into BHI broth. Further both end of stent is cut and dropped in BHI broth tube followed by vortexing for 30 seconds. Hence , the cell suspension obtained in BHI broth is incubated overnight and then inoculated on Blood Agar , Mac Conkey Agar and Nutrient Agar which is further incubated overnight to obtain growth. Pure colonies from growth were identified on basis of colony morphology , growth pattern , motility and biochemical testing⁸ .

Once identification of internal micro flora of stent is complete , In Vitro Antibiotic Susceptibility Testing were performed by Kirby Bauer Disc Diffusion method and interpretation done according to CLSI 2019 guidelines⁹.14 Antibiotic Disk were used with 6 disk in each MHA plate , once the plate is swabbed with lawn culture .

IV. Results And Discussion :-

95.12% DJ stents showed colonization where mere 4.87% were sterile. Colonization also depends on composition of stent.In a study it was found that stent made of Polyurethane showed 100% colonization followed by 62.6% with silicone , 56% with Urosoft and 55.5% with C flex¹⁰ . Since , polyurethane stent were used and studied , colonization % correlates with study made by Hasan et al. In his study , 67.9% of stents were colonized (he used different type of catheter) and *Pseudomonas aeruginosa* were the most common isolates.

Similarly in my study , *Pseudomonas aeruginosa* predominates as isolates with max 44.87% followed by *Enterococcus* species (17.94%) , *Klebsiella* species (15.38%) , *Staphylococcus aureus* (11.53%) , *Escherichia coli* (3.84%) , *Proteus* and *Acinetobacter* (2.56% each) and CONS (1.28%) .

Resistance profile revealed , 23 stent isolates among 78 (29.48%) to be Pan Resistant (resistant to all 14 antibiotics used in study) whereas 25.64% stent isolates showed resistance to all drugs except one and 7.69% stent isolates showed resistance to all drugs except 2. Hence , totaling all , 62.82% of all stent isolates were some how multi drug resistant (MDR) .

Pseudomonas , apart from predominant isolate in my study , it also accounted for maximum 43.47% of all Pan resistant isolate followed by *Enterococcus* spp. which shares 39.13%.

Among all 35 *Pseudomonas aeruginosa* isolates , 74.28% were MDR and 28.57% was Pan Resistant . *Acinetobacter* spp. and *Enterococcus* spp. were 100% MDR .

The isolates which topped among pan resistance were *Acinetobacter* (100%) followed by *Enterococcus* (64.28%) and *Pseudomonas aeruginosa* (28.57%).

2 VRSA strains of *Staphylococcus aureus* and 9 VRE strain of *Enterococcus* spp. were isolated among 78 isolate.

V. Conclusion

There are 13 *Pseudomonas aeruginosa* isolates which is sensitive to only one drug among 14 used for AST (37.14% of all *Pseudomonas aeruginosa* isolates). Out of all 13 isolates , 11 isolates (84.61%) responded to Amikacin , 1 responded each to Ciprofloxacin and Linezolid (7.69%). Similarly , 1 *Klebsiella* spp. showed sensitive to only one drug ie, Chloramphenicol.

This infers that , where all higher antibiotics like 3rd Gen Cephalosporins , Betalactams , Imipenems expressed resistance , simple drugs like Amikacin was consistently sensitive among all MDR Strains of *Pseudomonas* (87.5%).

We can interperate this fact to promote use of simple antibiotic like Amikacin and Chloramphenicol against *Pseudomonas* and other Gram negative bacteria in prefferance of using higher antibiotic like Pipracillin Tazobactam and Imipinems as imperial drugs in Urology Department.

VI. Limitations

If external surface of DJ stent is not made sterile properly we could not assure that the microflora obtained from DJ stent is resident of internal luminal biofilm coating.The cell suspension obtained from DJ stent, when innoculated on culture media ; seldom produce pure colony so subcultures has to be done several times for obtaining pure colony before performing AST.

VII. Recommendations

As mentioned in a study by Hasan et al regarding 100% colonization with polyurethane DJ stent corroborating similarly in my study too. Hence , good quality stent like Drug Eluting Stent , Bioabsorbable Stent , C- flex and Urosoft stent should be promoted in use¹¹.

Any stents used should ideally possess optimal flow characteristics , well patient tolerance , biocompatibility , radioopacity , visibility on USG¹² with ease of insertion and removal along resistance to infection , corrosion and encrustations for maintaining long term patency and infection free period¹³.

Since, DJ stent internal microflora proves nidus for bacterial infection and colonization of DJ stent is an inevitable phenomenon , patients are to be monitored for stent related complications¹⁴ like irritative voiding symptoms , incontinence,hematuria ,pyuria encrustations , migration , malposition ,biofilm formation, vesico ureteric reflux, discomfort¹⁵, hyperplastic urothelial reactions¹⁶ , forgotten stent¹⁷ etc and prophylactic simple antibiotic like amikacin , chloramphenicol, ciprofloxacin , amoxycillin , sulfadoxime pyrimethamine may be used to achieve handsome gain. This is a small initiative to achieve bigger goal of impeding rapid pace of emerging MDR in present scenario^{18,19}.

CONFLICT OF INTEREST :-

No conflict of interest from any other researchers or any other institutional bodies. No funding recieved from any other source.

ISOLATES NAME(78)	ISOLATES%	PAN RESISTANT(1)	SENSITIVE TO ONE DRUG(2)	SENSITIVE TO TWO DRUGS(3)	MDR (1+2+3)
<i>P.aeruginosa</i>	35/78 (44.87%)	10/35 (28.57%)	13/35 (37.14%)	3/35 (8.57%)	26/35 (74.28%)
<i>Enterococcus</i> spp.	14/78 (17.94%)	9/14 (64.28%)	4/14 (28.57%)	1/14 (7.14)	14/14 (100%)
<i>Klebsiella</i> spp.	12/78 (15.38%)	0/12 (0%)	1/12 (8.33%)	0/12 (0%)	1/12 (8.33%)
<i>S.aureus</i>	9/78 (11.53%)	2/9 (22.22%)	2/9 (22.22%)	2/9 (22.22%)	6/9 (66.66%)
<i>E.coli</i>	3/78 (3.84%)	0/3 (0%)	0/3 (0%)	0/3 (0%)	0/3 (0%)
<i>Acinetobacter</i> spp.	2/78 (2.56%)	2/2 (100%)	0/2 (0%)	0/2 (0%)	2/2 (100%)
<i>Proteus</i> spp.	2/78 (2.56 %)	0/2 (0%)	0/2 (0%)	0/2 (0%)	0/2 (0%)
CONS	1/78 (1.28%)	0/1 (0%)	0/1 (0%)	0/1 (0%)	0/1 (0%)

ISOLATES (78)	ISOLATES %	PANRESISTANT ISOLATES /TOTAL PANRESISTANT (1)	ISOLATE SENSITIVE TO 1 DRUG/TOTAL ISOLATE SENSITIVE TO 1 DRUG (2)	ISOLATE SENSITIVE TO 2 DRUGS/TOTAL ISOLATE SENSITIVE TO 2 DRUGS (3)	1+2+3/ TOTAL 1+2+3
<i>P.aeruginosa</i>	35/78 (44.87%)	10/23 (43.47%)	13/20 (65%)	3/6 (50%)	26/49 (53.06%) OR 26/78 (33.33%)
<i>Enterococcus</i> spp.	14/78 (17.94%)	9/23 (39.13%)	4/20 (20%)	1/6 (16.66%)	14/49 (28.57%) OR 14/78 (17.94%)
<i>Klebsiella</i> spp.	12/78 (15.38%)	0/23 (0%)	1/20 (5%)	0/6 (0%)	1/49 (2.04%)OR 1/78 (1.28%)
<i>S.aureus</i>	9/78 (11.53%)	2/23 (8.69%)	2/20 (10%)	2/6 (33.33%)	6/49 (12.24%) OR 6/78 (7.69%)
<i>E.coli</i>	3/78 (3.84%)	0/23 (0%)	0/20 (0%)	0/6 (0 %)	0/49 (0%)OR 0/78 (0%)

Acinetobacter spp.	2/78 (2.56%)	2/23 (8.69%)	0/20 (0%)	0/6 (0%)	2/49 (4.08%)OR 2/78 (2.56%)
Proteus spp.	2/78 (2.56 %)	0/23 (0%)	0/20 (0%)	0/6 (0%)	0/49 (0%)OR 0/78 (0%)
CONS	1/78(1.28%)	0/23 (0%)	0/20 (0%)	0/6 (0%)	0/49 OR 0/78 (0%)

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