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Difference Between Prevalence of Urinary Tract Infection Before and After DJ Stent Insertion in Pelvic Tumor Patients

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Abstract*--This research aimed to found out different prevalence of urinary tract infection in pelvic tumor patient before DJ Stent insertion and on the 1st, 2nd and 3rd months after DJ stent insertion. This is a prospective cohort study, between Mei to October 2017, a total of 42 women, diagnosed with pelvic tumor and hydronephrosis, never used DJ stent before, sterile urine culture with bacterial count of < 10^5 CFU before DJ stent insertion, and inserted DJ stent in either one or both side. All underwent urine culture and antibiotic sensitivity test before DJ stent insertion and after DJ stent insertion every consecutive month for three months. Mean age was (46,7±11,1), cervix cancer account 54,76% of all pelvic tumor, with 52,4% of DJ stent were placed on both side. Significant different in urinary tract infection was found in before and one month after DJ stent insertion (p = 0.00). Meanwhile, no significant different seen in urinary tract infection prevalence between 1st ,2nd and 3rd months after DJ stent insertion (p > 0.05). E.coli account (17(41%)) of all bacterial growth, with ciprofloxacin (14) as the most sensitive antibiotics among all bacteria. urinary tract infection is significant after DJ stent was inserted, while there was no significant difference in urinary tract infection prevalence between period of 1, 2 and 3 months after DJ stent insertion. E.coli is the most common bacterial growth and Ciprofloxacin is the most sensitive antibiotic.*

Key words*--antibiotic sensitivity, DJ stent,urinary tract infection, urine culture,*

I. INTRODUCTION

Double J stent or known as DJ Stent is soft hollow tube placed in the ureter during surgery to assure drainage of urine from the kidney through the bladder. Ureteral stent were indicated for ureteral obstruction caused by intrinsic or extrinsic matters, as ureteral marker when doing open surgery to prevent iatrogenic injury. Ureteral obstruction can be associated with pelvic tumor that are obstructing the ureter.

The most common tumor occurred in woman is cervical cancer, cervix cancer is the most common cause of cancer associated death in woman worldwide. It is estimated that 500.000 new case were found every year in developed countries.At Saiful Anwar General Hospital Malang, out of the whole cases of pelvic malignancies consulted to urology department with hydronephrosis complication and underwent DJ stent placement from year 2012 to 2017 reached up to 204 cases, whereas 163 them are mixed of cervix cancer, ovarial and endometrial cancer.

DJ Stent placement procedure, beside giving advantages, it can also give disadvantages such as pain, dysuria, fever, hematuria, excoriation of mucosa and ureteral peristaltic disturbances. All of them give negative effect on patients quality of life. Other complications include anxiety, sexual dysfunction, sleeping disorder. We

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also need to underline that bacterial colonization and fungus on the stent surface and urine it self colonization and fungus on the stent surface and the urine it self are the most commonly reported complications, especially by long term DJ Stent used.

DJ Stent use in Saiful Anwar General Hospital for ureteral obstruction account for 1106 patients within January 2012 to January 2017 and 204 of them were patients with malignancies. Until now infection rate due to DJ Stent placement is still unknown, so it is very important to know the number in order to prevent incidence and complication due to stent placement, remembering that urinary tract infection is the most common nosocomial infection.

Aim

This study aimed to find out urinary tract infection incidence due to DJ Stent placement after 1st, 2nd and 3rd month of placement.

II. MATERIAL AND METHODS

This study is a prospective analytic cohort study with the target population, all patients with tumors in the pelvic area undergoing DJ stent placement. This study is limited by tumors in the pelvic area undergoing DJ stent installation at Dr. Saiful Anwar Malang 8 months research period. Statistical calculations in this study use paired analytical methods. The sample size in this study was determined using consecutive sampling as many as 42 samples due to limited time, with the inclusion criteria including: female, tumors in the pelvic area with DJ stents placement in the right, left and both site at Dr. Saiful Anwar Malang within the 8-month study period, tumors in the pelvic area with complications of hydronephrosis, DJ stent has never been placed previously and the results of pre-stenting culture, the number of bacteria is less than 105 CFU.

Exclusion criteria in this study include: Infections on the other site, urinary tract stones, diabetes mellitus, death, no routine control every month to check their urine and removal of DJ stents in less than 3 months. The tools and materials used in this study include 4 sterile urine containers for each patient and patient identity stickers. While the material needed is midstream urine.

The data collection in this study was to conduct laboratory tests on patients who met the inclusion criteria in the 8-month study period. The first thing to do is to give the patient informed consent about the patient's illness and the actions to be taken, starting from taking urine samples, the surgery that will be carried out and postoperative evaluation. Before the DJ stent is placed, a patient is selected and the patient who meets the criteria will be examined for urinalysis and urine culture.

The patient then underwent DJ stent placement in the operating room according to the standard operating procedures and carried out by experts who are competent scientifically, then followed by examination of urine culture within 1 month, 2 months and 3 months after of DJ stents placement. The urine samples obtained were then sent to Dr. RSUD's clinical pathology laboratory. Saiful Anwar to carry out the urinalysis and the microbial laboratory of RSUD Dr. Saiful Anwar for urine culture.

This research was conducted in ward II, Urology Clinic, Clinical Pathology and Microbiology Laboratory at dr. Saiful Anwar Malang General Hospital Laboratory. The data that has been collected will be tested

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for normality of data distribution and analyzed analytically using different tests and correlation tests with the help of SPSS to compare between variables and find relationships between variables.

III. RESULTS

Table 1. Sample Distribution Characteristic

Sampel Distribution	**N (42)**	**%**
Bacteria		
E. coli	17	41
Enterobacter fecalis	4	2
Staphylococcus coagulase Negatif	3	7,5
E.coli ESBL	3	7.5
Pseudomonas Aeruginosa	3	7.5
Acinetobacter Baumanii	2	7.5
Klebsiella Pneumoniae	1	5
Klebsiella Pneumoniae ESBL	1	2
Salmonella arizonae	1	2
Streptococcus non hemoliticus	1	2
Enterobacter cloacae	1	2
Serratia Liquifaciers	1	2
Enterobacter gorgoviae	1	2
STERIL	3	7.5
Tumor Type		
Cervix Tumor	23	54,76
Ovarial Tumor	17	40,48
Myoma Uterii	1	2,38
Teratoma	1	2,38
Age (Year)		
0-20	1	2,38
21-40	7	16,7
41-60	31	73,80
61-80	3	7,15
Stent Position		
Right	11	26,2
Left	9	21,4
Right and Left	22	52,4

Characteristic distribution obtained from 42 urine culture results from 1st ,2nd and 3rd month, five of the most grown bacteria from culture results were *E. coli* as much as 17 (41%) followed by *Enterobacter fecalis*, negative *Staphylococcus coagulase*, ESBL *E. coli*, *Pseudomonas Aeruginosa* with 3 (75%) respectively, whereas

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sterile urine were obtained from 3 samples. Of the total 42 patients, only 3 had sterile urine culture while 39 (92.85%) patients experienced bacterial growth. Age distribution was 10 years old as the youngest age while the oldest age was 69 years, with the highest age group being 41-60 years as many as 31 (73.80%).

The distribution of diagnoses of tumors in the pelvic area include, cervical tumors ranked as many as 23 people (54.76%), while ovarial tumors ranked second as many as 17 people (40.48%), while the remaining as many as 1 person each had diagnosis of myoma uterine and teratomas (2.38%). The highest number of DJ Stent placement on both sides are 22 people (52.4%) while the remaining 20 people are placed on one side whereas 11 people (26.2) had DJ Stent placement on the right side and the remaining 9 people (21, 4%) were on the left side.

Table 2. Urinalysis Results

Urinalysis	**N**	**%**
PH		
5.5	1	2,5
6	16	38
6.5	16	38
7	8	19
7.5	1	2,5
Molecular Weight		
1,005	5	11,9
1,010	10	23,9
1,015	12	28,5
1,020	8	19
1,025	6	14,4
1,030	1	2,3
Eritrocyte		
≤ 5	5	12
>5	37	88
Leukocyte		
≤ 5	5	12
>5	37	88

The urinalysis results showed that, patients with tumors in the pelvic region had urine pH at 6 and 6.5, each of which had 16 people (38%), while urine molecular weight of 1.015 was found in most people 12 (28, 5%). While the number of erythrocytes and leukocytes each consist of > 5 per high power field as many as 37 people (88%), where it is shows an abnormality in the urinalysis.

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Table 3a. Bacterial Growth and Antibiotic Sensitivity 1st Month

1st Month		
Bacteria	**Antibiotic Sensitivity**	**N**
E. coli	Ciprofloxacin, Gentamicin, Tmp-Sulfamethoxazole, Amikacin, Meropenem, Ampicilin, Nitrofurantoin, Fosfomycin, Tazobactam, Tigecycline	17
Klebsiella pneumoniae	Fosfomycin, Meropenem	1
Enterobacter fecalis	Gentamicin, Ciprofloxacin, Amoxcillin, Ampicillin, Amoxiclav, Tazobactam, Tigecycline,	4
Staphylococcus coagulase negatif	Tmp-Sulfamethoxazole, Ciprofloxacin, Erythromycin, Vancomycin	3
E.coli ESBL	Gentamicin, Fosfomycin, Amikacin, Meropenem	3
Pseudomonas aeruginosa	Piperacillin, Amikacin, Tazobactam	3
Acinetobacter baumanii	Amoxcillin, Amoxiclav, Ciprofloxacin	2
Klebsiella pneumoniae ESBL	Gentamicin, Ciprofloxacin, Tmp-Sulfamethoxazole	1
Salmonella arizonae	Fosfomycin, Meropenem, Nitrofurantoin	1
Streptococcus non hemoliticus	Amoxiclav, Ciprofloxacin, Nitrofurantoin	1
Enterobacter cloacae	Amikacin, Meropenem	1
Serratia liquifaciers	Gentamicin, Meropenem, Tmp-Sulfamethoxazole	1
Enterobacter gorgoviae	Fosfomycin, Amikacin, Meropenem	1
Steril		3

Table 3b. Bacterial Growth and Antibiotic Sensitivity 2nd Month

2nd Month		
Bacteria	**Antibiotic Sensitivity**	**N**
E. coli	Ciprofloxacin, Gentamicin, Tmp-Sulfamethoxazole, Amikacin, Meropenem, Ampicilin, Nitrofurantoin, Fosfomycin, Tazobactam, Tigecycline	17
Klebsiella pneumoniae	Fosfomycin, Meropenem	1
Enterobacter fecalis	Gentamicin, Ciprofloxacin, Amoxcillin, Ampicillin, Amoxiclav, Tazobactam, Tigecycline,	4
Staphylococcus coagulase negatif	Tmp-Sulfamethoxazole, Ciprofloxacin, Erythromycin, Vancomycin	3

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E.coli ESBL	Gentamicin, Fosfomycin, Amikacin, Meropenem	3
Pseudomonas aeruginosa	Piperacillin, Amikacin, Tazobactam	3
Acinetobacter baumanii	Amoxcillin, Amoxiclav, Ciprofloxacin	2
Klebsiella pneumoniae ESBL	Gentamicin, Ciprofloxacin, Tmp-Sulfamethoxazole	1
Salmonella arizonae	Fosfomycin, Meropenem, Nitrofurantoin	1
Streptococcus non hemoliticus	Amoxiclav, Ciprofloxacin, Nitrofurantoin	1
Enterobacter cloacae	Amikacin, Meropenem	1
Serratia liquifaciers	Gentamicin, Meropenem, Tmp-Sulfamethoxazole	1
Enterobacter gorgoviae	Fosfomycin, Amikacin, Meropenem	1
Steril		3

Table 3c. Bacterial Growth and Antibiotic Sensitivity 3rd Month

3rd Month		
Bacteria	**Antibiotic Sensitivity**	**N**
E. coli	Ciprofloxacin, Gentamicin, Tmp-Sulfamethoxazole, Amikacin, Meropenem, Ampicilin, Nitrofurantoin, Fosfomycin, Tazobactam, Tigecycline	17
Klebsiella pneumoniae	Fosfomycin, Meropenem	1
Enterobacter fecalis	Gentamicin, Ciprofloxacin, Amoxcillin, Ampicillin, Amoxiclav, Tazobactam, Tigecycline,	4
Staphylococcus coagulase negatif	Tmp-Sulfamethoxazole, Ciprofloxacin, Erythromycin, Vancomycin	3
E.coli ESBL	Gentamicin, Fosfomycin, Amikacin, Meropenem	3
Pseudomonas aeruginosa	Piperacillin, Amikacin, Tazobactam	3
Acinetobacter baumanii	Amoxcillin, Amoxiclav, Ciprofloxacin	2
Klebsiella pneumoniae ESBL	Gentamicin, Ciprofloxacin, Tmp-Sulfamethoxazole	1
Salmonella arizonae	Fosfomycin, Meropenem, Nitrofurantoin	1
Streptococcus non hemoliticus	Amoxiclav, Ciprofloxacin, Nitrofurantoin	1
Enterobacter cloacae	Amikacin, Meropenem	1
Serratia liquifaciers	Gentamicin, Meropenem, Tmp-Sulfamethoxazole	1
Enterobacter gorgoviae	Fosfomycin, Amikacin, Meropenem	1
Steril		3

Antibiotics that are sensitive to bacteria that grow from urine culture of patients with tumors in the pelvic area with DJ Stent placement including Ciprofloxacin, Gentamicin, Tmp-Sulfamethoxazole, Amikacin,

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Meropenem, Ampicilin, Nitrofurantoin, Fosfomycin, Tazobactam and Tigecycline, these antibiotics are sensitive to *E.coli*, which is the largest bacteria growth in this study (17) 41% at months 1,2 and 3 in patients with tumors in the pelvic area attached to DJ Stent. This can be seen in tables 3a, 3b and 3c

Table 4. Antibiotic sensitivity against bacterial growth due to DJ Stent Placement

	ANTIBIOTIC																
BACTERIA	CIPRO	GENTA	TMX	AMIK ACIN	MERO PENE M	AMPIC ILIN	NITROF URANT OIN	FOSFO MYCIN	TAZOB ACTA M	TIGE CICLI NE	AMPIC ILIN	AMO XILIN	AMOXIC LAV	ERITRO MICIN	VANCOM ICIN	NITRO FURAN TOIN	PIPERA CILIN
E. Coli	9	8	5	6	3	1	1	5	1	1							
Enterobacter fecalis	1	1				1			1	1	1	1					
Staphylococcus coagulase Negatif	1		1											1	1		1
E.coli ESBL	1			1	1			2									
Pseudomonas Aeruginosa				2					2	1							1
Acinetobacter Baumanii	1											2	2				
Klebsiella Pneumoniae					1			1									
Klebsiella Pneumoniae ESBL	1	1	1				1										
Salmonella arizonae				1				1									
Streptococcus non hemoliticus													1				
Enterobacter cloacae				1	1												
Serratia Liquifaciers		1		1								1					
Enterobacter gorgoviae						1	1	1									
	14	11	7	12	6	3	3	10	4	3	1	4	3	1	1		2

Based on antibiotics sensitivity to bacterial growth due to stent placement, most of them are still sensitive to ciprofloxacin (14), amikacin (12) and gentamicin (11) respectively, occupying the top three sensitive antibiotics against bacterial growth**.**

Based on the results of the repeated ANOVA test, it was found that before the installation of DJ Stent was compared with the time of 1, 2 and 3 months, the significance of $p = 0.000$ ($p < 0.05$) was obtained in the first month growth compared to before the installation of DJ Stent. Whereas if months 1, 2 and 3 are compared to each other, there is no significant condition found. Where is $p > 0.00$ ($p < 0.05$ = significant)

Multivariate test showed that the incidence of infection before the DJ Stent was installed and after the installation of DJ Stent was obtained a significance $p = 0.000$ ($p < 0.05$ = significant) which showed the incidence of urinary tract infection after stent installation was statistically significant.

IV. DISCUSSION

Urinary tract infections can develop in a short time as a complication of instrumentation in the urinary tract that was previously sterile or as an advanced complication of the main disease process. In most patients with ureteric obstruction, stenting is carried out using prophylactic antibiotics, single doses. In patients who have had a previous urinary tract infection, the installation of a stent if possible should be postponed until the urine is sterile when urine culture and testing for antibiotic sensitivity. The presence of foreign objects can cause colonization of the urinary tract and the stent itself. Eradication of the infection may be needed to remove or replace a stent.

Ureter stents are used in the urology field to allow drainage of the upper urinary tract, especially after managing urinary tract stones. Stents are generally the site of infection and encrustation, especially in patients who have a tendency to form stones. The layer formed in its surface can attract bacteria and form biofilms that can cause infection or encrustation.[14,15,16] In a study conducted by Reid and Denstedt et al. 1992 it is said that up to 90% of sedentary stents were attached by bacteria, of which 27% of cases would result in positive urine culture.

In this study we found that out of 43 patients only 3 patients had sterile urine culture until the 3rd month while 39 (92.85%) of them experienced bacterial growth. When compared to research by Reid, in this study the numbers are higher, this may occur because of the underlying disease which is malignant tumor that can cause

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decrease in the immune system so that it is very easy to get infection. The definition of a high risk of developing urinary tract infections after stenting and management of patients who developed urinary tract infections with symptoms after permanent placement of the stent has been described. Analysis of the colonization rate in the settled stent showed 104 of 250 patients had positive urine culture overgrown with bacteria after stent release.

In this study the most bacteria that can be isolated are *Escherichia coli*, which is 17 people (41%) as well as research conducted by (Elijah et al., 2004) where 62 patients with stents had sterile urine culture results. The microorganisms that were isolated were 32 *Escherichia coli* (31%), followed by *Staphylococcus* spp. as many as 26 (25%), *Pseudomonas* spp. 22 (21%), *Enterococcus* spp. 16 (15%), and *C. albicans*, 14 (14%). This happens because *Escherichia coli* is a normal flora in the human gastrointestinal tract, but if it is in other channels the bacteria will turn into pathogenic bacteria, as well as the urinary tract which usually occurs due to an ascending infection.

The amount of colonization increases with the duration of stent installation. There is a strong correlation between colonization with the time the stent is in the urinary tract, it is said as much as four to nine times the stent left for 1 month will experience colonization by microorganisms (p 0.01) .17 In this study similar to the previous research conducted by Rafal , the same thing was found in the first month to the third month only 3 urine samples were not overgrown with bacteria, while the other 39 (92.85%) were overgrown with bacteria. All patients with bacteriuria before the installation of stents that have been previously treated also experience bacterial growth and stent colonization, but organisms that grow can differ from organisms that previously caused infection. The attachment of bacteria to the urinary catheter and other prosthesis devices is a risk factor for urinary tract infections. In this study the same thing was found on antibiotic sensitivity, where ciprofloxacin and gentamicin antibiotics are antibiotics that are still sensitive to all bacteria that grow. This is because the two drugs are very effective in killing gram-negative germs, and most of the bacteria that grow in the urinary tract are germs with gram negative.

V. CONCLUSION

In this study it can be concluded that the incidence of urinary tract infections in patient with tumor in the pelvic area who underwent DJ stent placement observed between months 1, 2, and 3 does not have a significant difference, whereas after the stent installation obtained significant differences with p = 0,000 in bacterial growth compared to before DJ Stent placement. A total of 39 (92.85%) patients experienced bacterial growth in this study with E. coli bacteria as the most bacteria causing urinary tract infections.

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