

# FEASIBILITY AND OUTCOMES OF DOUBLE J STENTING: AN AUDIT IN A HOSPITAL WITHOUT RESIDENT UROLOGIST IN MALAYSIA

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## Abstract

**Introduction:** Ureteric obstruction commonly presents as a urological emergency requiring urgent intervention with urinary diversion. Double J stenting (DJS) is the preferred option to relieve ureteric tract obstruction in our centre.

**Objective:** Our study aims to determine the feasibility and outcomes of DJS by general surgeons and medical officers in a hospital without a resident urologist and to identify the possible predictive factors for successful DJS.

**Methods:** This is a clinical audit of all patients scheduled for DJS in Hospital Bintulu, Sarawak, from January 2017 to March 2020. A total of 57 patients were included. Socio-demographic data and factors predicting success rate, i.e., level of ureteric obstruction and its causes (intrinsic or extrinsic), diagnosis, size and nature of stone(s), degree of hydronephrosis and pre-operative renal profile, were collected. Success rate and post-operative outcomes for all successful cases were evaluated. Bivariate statistical analyses were used to investigate the association of predictive factors with the success rate of DJS.

**Results:** Double J stenting was successful in 63.2% (36 cases) of our total samples of 57 cases. Out of 36 successful cases, 82.1% of the cases were able to return to baseline renal profile within 14 days and 83.3% did not develop fever within 3 days post-operative. The post-operative mean length of stay was 3.16 days and post-operative day 1 mean pain score was 0.72. Causes of obstruction by intrinsic factors, urolithiasis, pre-operative normal serum creatinine (<106 µmol/L) were associated with successful DJS.

**Conclusion:** Double J stenting is feasible and safe to be done in a hospital without a resident urologist with available facilities despite the limitations.

**Keywords:** Double J Stenting, Feasible, Outcomes, Hospital Without Resident Urologists

## Introduction

Ureteric obstruction commonly presents as urological emergency requiring urgent intervention with urinary diversion (1, 2). Ureteric obstruction caused by nephrolithiasis, tumor, or retroperitoneal fibrosis can be uncomplicated, or complicated by urinary tract infection, renal insufficiency or renal failure (3). A patient with complicated obstruction will require immediate decompression of the urinary tract with either percutaneous nephrostomy (PCN) or double J stenting (DJS), an indwelling ureteric catheter (4-6). Percutaneous nephrostomy and DJS are both effective in relieving obstruction and infection due to ureteric calculi. Neither

modality shows superiority in promoting a more rapid recovery after drainage, as concluded in two randomized trials (7, 8). However, DJS is the preferred option in our Centre because it is less invasive and has lower risk of bleeding compared to PCN. Percutaneous nephrostomy has higher risk of tube blockage, leakage and dislodgement, requiring additional tube changes compared to DJS. Patients with percutaneous nephrostomy also have higher risk of developing complications related to mobility and personal hygiene.

In Malaysia, there are only 118 urology consultants and most of them practice in the private sector (9). With an increasing number of cases of nephrolithiasis, the burden is

significantly on the limited number of urology consultants in the government sector. There are often delays in reaching specialized care where tertiary urology centres are scarce; the nearest can be hours to days away (10). In line with the Global Surgery 2030 vision, district hospitals with availability of surgical and anaesthetic services should aim to provide DJS services. This could significantly improve the availability of the said services and reduce the workload on tertiary urology Centres.

### **Success rate and complications of double J stenting**

In tertiary urology centres, the success rate of DJS was 81% to 94% for intrinsic obstruction and 48% to 73% for extrinsic obstruction (1, 11). Intrinsic obstruction is defined as obstruction caused by stone disease and ureteropelvic obstruction (1). Side effects and complications of DJS include patient discomfort and storage bladder symptoms (12), bacteriuria with or without clinical urinary tract infection (13), urosepsis (13), haematuria (12), flank and loin pain on the same side as the DJS (12, 14, 15), upward or downward migration (13, 14), fragmentation (16) and calcification (14).

In most studies (1, 11), DJS was performed by experienced urology consultants. However, data on the outcome and factors associated with successful DJS placement performed by general surgeons or medical officers who were credentialed and privileged in hospitals without a resident urologist in Malaysia is limited.

Identifying negative predictive factors could significantly reduce the numbers of unnecessary procedures carried out in hospitals without a resident urologist, as well as expedite the decision to transfer the patient to a tertiary urology centre.

### **Objectives of the study**

This study generally aims to determine the feasibility and outcomes of DJS by general surgeons and medical officers in a hospital without a resident urologist in Sarawak. Specifically, we aimed to determine the success rate of all DJS cases and post-operative outcomes of all successful DJS. Besides that, we wanted to perform an exploratory analysis to survey the association of several factors such as aetiology (intrinsic or extrinsic), diagnosis, size of stones, degree of hydronephrosis, pre-operative renal profile, etc., with successful DJS.

## **Materials and Methods**

### **Study design**

This is a clinical audit of all patients scheduled for DJS in Hospital Bintulu – a secondary specialty hospital without a resident urologist in Sarawak from January 2017 to March 2020.

### **Data collection**

Data was collected via accessing the Hospital Information System (HIS) – an electronic patient record. First, socio-demographic data (age, gender, ethnicity), American Society of Anesthesiologists (ASA) physical status of patients and indications of DJS were obtained by going through the medical records. ASA is a classification used to assess and communicate a patient's pre-anesthesia medical co-morbidities. The success rate of all DJS was identified and all successful DJS cases were further evaluated for post-operative outcomes. Lastly, in order to identify the associated predicting factors, the following parameters were assessed: radio-opacity of stones (by reading X-rays of the kidney, ureter & bladder (KUB)), level of ureteric obstruction, diagnosis, size of stones, degree of hydronephrosis (as per Society of Fetal Urology (17)) and pre-operative renal profile.

### **Post-operative outcomes measures**

Four parameters that were assessed postoperatively include, returning of renal profile to baseline, post-operative fever within 3 days, post-operative length of hospital stay and post-operative pain score. This information was obtained through the HIS system. For returning of the renal profile to baseline postoperatively, the baseline renal profile was obtained from the previous admissions records or primary care medical records upon admission. Another renal profile was repeated on Day 14 post DJS upon follow-up, and comparison was made. For post-operative fever, all patients who had a temperature more than 38 °C within 3 days post DJS, were taken into account. Post-operative length of hospital stay was obtained by calculating the date of DJS to date of discharge. Post-operative pain score was assessed on post-DJS Day 1, using Ministry of Health (MOH) pain scales. The scale has numbers and the pain score is recorded as numbers, from 0 to 10. 0 is no pain and 10 is the worst pain that the patient can imagine. A person rates their pain on a scale from 0 to 10.

### **Patient eligibility selection**

Inclusion criteria:

1. Patients aged from 18 to 80 years
2. Patients posted for DJS in operation theatre

Exclusion criteria:

1. Patients aged below 18 years and above 80 years
2. Bladder tumour obstructing both ureteric orifices
3. Previous cystectomy and diversion procedures
4. Post-renal transplant
5. Pregnant women
6. Congenital causes

### Double J stenting procedure

Double J stenting was done under regional anesthesia with subarachnoid block, with or without conscious sedation. General anesthesia was only used exceptionally based on the patients' co-morbidity. Patients received prophylactic antibiotics (intravenous cefuroxime 1.5 g stat) prior to the procedure. Double J stenting was first attempted by the medical officer and if they encountered any difficulty, the general surgeon on call would be called in on-table. Retrograde DJS was done using rigid cystoscopy; 0-degree lens and HydroPlus coating DJS (Boston Percuflex, 6 French, 22-26 cm) were placed. Retrograde pyelography, with concurrent usage of image intensifier intra-operatively, was performed in most of the cases to confirm the placement. Retrograde pyelography was not performed if there was evidence of infected urine and history of allergy to contrast. X-ray KUB was done post-operatively. Successful DJS was defined as one with a complete loop in both the renal pelvis and bladder.

### Statistical analysis

The data was recorded and processed using Microsoft Excel. Statistical analyses were performed using Epi Info 7.2.2.6 (Centers for Disease Control) and SPSS Version 22 software (IBM SPSS Statistics). Data were analysed using descriptive and inferential statistics and presented in tables. For continuous variables, descriptive statistics, like the means with standard deviation, were calculated. For categorical variables, frequencies along with percentages were calculated. The success rate of DJS placement and socio-demographic variables were presented as frequency, along with percentages. In order to verify the relationship of the predictive factors with the success rate of DJS, bivariate analysis (Chi-square, Fisher's exact test) were done and the level of significance was set at 0.05.

### Ethics committee approval

This study was registered with the National Medical Research Registry (NMRR) [NMRR-20-678-54487 (IIR)]. Research ethical approval was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health, Malaysia, on 8 May 2020 prior to data collection (Reference No: KKM/NIHSEC/P20-897 (5))

### Privacy and confidentiality

The confidentiality of the data collected was maintained and the data kept securely. To maintain the confidentiality of data, once the data was obtained from the electronic Hospital Information System (HIS), the data were submitted to the principal investigator and only accessible by him. The patient's name and ID were kept anonymous and each of them was given a serial number throughout the study. The collected data were kept by the principal investigators during the period of the study. The data will be deleted one year after completion of the study.

## Results

### Socio-demographic characteristics of study samples and indications of DJS

Table 1 illustrates the socio-demographic characteristics of the study samples. Of the 57 patients scheduled for DJS, the majority of patients were female (54.4%) and of Iban (59.6%) race. The largest proportion of the study samples (61.4%) were between 40 – 60 years old, while 21.1% and 17.5% of them were 20 – 40 and 60 – 80 years old, respectively. The mean age was 49.9 years with a range from 24 to 72 years old. Furthermore, 87.7% of them belonged to ASA 1 to 2. In addition, 91.2 % of our study samples required DJS because of ureteral obstruction. Other indications included prophylactic DJS prior to extracorporeal shock wave lithotripsy (ESWL) and ureteral injury (trauma, iatrogenic). Most of the cases were due to urolithiasis, which comprised 80.7%.

**Table 1.** Study samples' profiles

Variables	Total N (%)
<b>Age (Years)</b>	
20 - 40	12(21.1)
40 - 60	35(61.4)
60 - 80	10 (17.5)
Mean (SD)	49.9 (11.2)
<b>Gender</b>	
Male	26(45.6)
Female	31 (54.4)
<b>Ethnicity</b>	
Iban	34 (59.6)
Malay	6 (10.5)
Chinese	4 (7)
Others	13 (22.8)
<b>ASA</b>	
1 - 2	50 (87.7)
3 - 4	7 (12.3)
5 - 6	0 (0)
<b>Indications of DJS</b>	
Ureteral Obstruction	52 (91.2)
Others	5 (8.8)
<b>Diagnosis</b>	
Urolithiasis	46 (80.7)
Gynaecological malignancy	5 (8.8)
Trauma	2 (3.5)
Tuberculosis	2 (3.5)
Bladder Diverticulum	2 (3.5)

### Success rate of DJS of total samples

Based on this study, the success rate of DJS was 63.2% (36 cases) from the total sample of 57 cases.

### Post-operative outcomes of DJS

Of the 36 cases where DJS was successful, 4 post-operative outcomes (returning of renal profile to baseline, post-operative fever, post-operative pain score and post-operative length of hospital stay) were evaluated (Table 2). Among the 36 successful cases, 82.1% of the patients managed to return to their baseline renal profile within 14 days post-operative. 83.3% of them did not develop fever within 3 days post-operatively. The mean length of hospital stay post-operatively was 3.16 days (range: 1 – 11 days) and the mean pain score post-operatively was 0.72 (range: 0 – 5)

**Table 2:** Post-operative outcomes in patients with successful DJS

<b>Return to Baseline Renal Profile within 14 days</b>	<b>N (%)</b>
Yes	32 (82.1)
No	4 (10.3)
<b>Fever within 3 days post DJS</b>	<b>N (%)</b>
Yes	6 (16.7)
No	30 (83.3)
<b>Post-Operative Length of Stay (Days)</b>	<b>N</b>
Range	1 to 11
Mean (SD)	3.16 (2.79)
<b>Pain Score on Post DJS Day 1</b>	<b>N</b>
Range	0 to 5
Mean (SD)	0.72 (1.31)

### Exploratory analysis of the relationship of possible predicting factors with the success rate of DJS

Of the 57 cases, 54.4% had obstruction at mid to distal ureteric level, 75.4% were due to intrinsic obstruction, 80.7% were diagnosed with urolithiasis, 52.6% had pre-operative creatinine level more than 106  $\mu\text{mol/L}$  and 71.9% had mild to moderate hydronephrosis. Out of the 46 cases of urolithiasis, 33 cases (71.7%) were radiopaque stones and 43 cases (93.4%) had ureteric stone causing ureteric obstruction. Among the 43 cases of ureteric obstruction caused by stone, 25 cases (58.2%) had stone sizes more than 1 cm.

Bivariate analysis (Chi-square) was performed to analyse the relationship of the above possible predicting factors with the success rate of DJS (Table 3). Causes of obstructions, diagnosis and pre-operative creatinine level had significant association with the success rate of DJS ( $p$  value <0.05). DJS is significantly more likely to be

inserted successfully in cases of obstruction by intrinsic factors compared to that of extrinsic factors. (OR: 18.6, 95% CI 2.01 – 845.5, [ $p=0.002$ ]). The intrinsic cause of ureteric obstruction in our study samples was due to ureteric lithiasis. Cases of extrinsic ureteric obstruction in our study included extrinsic compression from cervical or uterine cancer, bladder diverticulum and genitourinary tuberculosis. DJS is significantly more likely to succeed among patients diagnosed to have urolithiasis compared to other diagnoses like ureteric or renal trauma, ureteric stricture and external compression from gynecological malignancy. (OR: 6.76, 95% CI: 1.55 – 29.51, [ $p=0.012$ ]). Patients with pre-operative creatinine level less than 106  $\mu\text{mol/L}$  were significantly more likely to succeed in DJS compared to those with creatinine level more than 106  $\mu\text{mol/L}$ . (OR: 5.02, 95% CI 1.50 - 16.8, [ $p=0.007$ ]). However, other variables, like nature of surgery, level of obstruction, nature of stone, stone size, imaging prior to operation and degree of hydronephrosis, do not show significant association with success rate of DJS.

### Discussion

This is the first available clinical audit that evaluates the success rate of DJS placement and factors predicting success rate in a hospital without a resident urologist in Sarawak, Malaysia. According to the Department of Statistics Malaysia, Sarawak has an estimated population of 2.81 million with more than 40 sub-ethnic groups, in a vast land of 124,450  $\text{km}^2$  (18). There are 7 hospitals with specialty under the Sarawak Health Department. There is only one with major specialty and full sub-specialty services with resident urologists (Sarawak General Hospital (SGH), Kuching), three with basic specialty and between 2 to 6 sub-specialty services without resident urologists (Sibu, Miri and Bintulu hospitals), and three with minor specialty services (Sarikei, Kapit and Limbang hospitals) (19). In the year 2020, there are only 2 government-based urologists in Sarawak and both practise in Sarawak General Hospital, Kuching. Information on the number of hospitals providing emergency urological services without resident urologists in Malaysia is lacking. With the prevalence of 5%–19.1% for urolithiasis in Asia (20), it is important that the other 6 specialty government hospitals in Sarawak are able to provide emergency urological services such as DJS to reduce the burden on the only tertiary Centre and improve the health care services in Sarawak.

According to this study, the success rate of DJS in hospitals without resident urologists is 63.2 %. The rate is slightly lower than the 81% to 94% quoted by similar studies performed in overseas tertiary urology centres (1,11). One of our limitations is we are only equipped with rigid cystoscopy with 0-degree angle which may lead to difficulty in identifying ureteric orifices, especially in cases with high bladder neck. Double J Stenting is a relatively straightforward procedure with an acceptable learning curve. Furthermore, the benefits of a successful placement outweighed the risks of failure. For those unsuccessful cases of DJS, they were either sent over to a tertiary urology

**Table 3.** The relationship of predicting factors with the success rate of DJS

	Total N (%)	Success DJS, N (%)		Odds Ratio (95% Confidence Interval)	$\chi^2$ Statistics (df)	P-value
		Yes	No			
<b>Level of Obstruction</b>						
Proximal Ureteric	21 (36.8)	14 (66.7)	7 (33.3)	1 (ref)		
Mid to Distal Ureteric	31 (54.4)	17 (54.8)	14 (45.2)	1.65 (0.52 - 5.20)	0.73 (1)	0.394 (a)
No Obstruction	5 (8.8)	5 (100)	0 (0)		NA	0.278 (b)
<b>Causes of Obstruction</b>						
Intrinsic	43 (75.4)	30 (69.8)	13 (30.2)	1 (ref)		
Extrinsic	9 (15.8)	1 (11.1)	8 (88.9)	18.46 (2.01-845.5)	NA	0.002 (b)
No Obstruction	5 (8.8)	5 (100)	0 (0)		NA	0.304 (b)
<b>Diagnosis</b>						
Urolithiasis	46 (80.7)	33 (71.7)	13 (28.3)	6.76 (1.55 - 29.51)	7.543 (1)	0.012 (a)
Others	11 (19.3)	3 (27.3)	8 (72.7)			
<b>Nature of Stone</b>						
Radiopaque	33 (57.9)	24 (72.7)	9 (27.3)	1 (ref)		
Radiolucent	13 (22.8)	9 (69.2)	4 (30.8)	1.19 (0.29 - 4.83)	0.056	0.812 (a)
NA	11 (19.3)	3 (27.3)	9 (72.7)	8.00 (1.47 - 53.56)	NA	0.006 (b)
<b>Stone Size</b>						
<1cm	18 (31.6)	14 (77.8)	4 (22.2)	1 (ref)		
>1cm	25 (43.9)	16 (64.0)	9 (36.0)	1.96 (0.50 - 7.82)	0.942 (1)	0.332 (a)
NA	14 (24.6)	6 (42.9)	8 (57.1)	4.66 (0.81 -29.01)	4.097 (1)	0.068 (a)
<b>Pre-Operative Creatinine Level</b>						
Creatinine < 106 $\mu$ mol/L	27 (47.4)	22 (81.5)	5 (18.5)	5.02 (1.50 - 16.8)	7.402 (1)	0.007 (a)
Creatinine > 106 $\mu$ mol/L	30 (52.6)	14 (46.7)	16 (53.3)			
<b>Degree of Hydronephrosis</b>						
Gross	11 (19.3)	6 (54.5)	5 (45.5)	1 (ref)		
Mild to Moderate	41 (71.9)	25 (61.0)	16 (39.0)	0.77 (0.20 - 2.94)	0.149 (1)	0.700
No Hydronephrosis	5 (8.8)	5 (100.0)	0 (0)		NA	0.119

a: Chi-square Test for Independence b: Fisher's Exact Test N: Frequency df: degree of freedom

centre for further management or to proceed with PCN insertion. In a secondary specialty hospital, PCN placement was done by a radiologist depending on their availability.

More than 80% of our cases were able to return to their baseline renal profile. Our postoperative outcomes were comparable to a prospective bi-centered study (21). It is clear that complete or prolonged partial obstructive uropathy can lead to tubular atrophy, interstitial fibrosis and eventually irreversible renal injury (22, 23). Most of the functional recovery will be seen in the first 7 to 10 days after relief of the obstruction (23). Prognosis of renal function was also dependent upon the severity and duration of the obstruction. Studies showed that relatively complete recovery of glomerular filtration rate (GFR) can be achieved if obstruction is relieved within one week, while little or no recovery occurs after 12 weeks (23). Some of our patients presented late to a healthcare facility, which then led to long duration of obstruction and complete ureteric obstruction. This might explain the reason that some of

our patients were unable to return to their baseline renal function after DJS.

One study showed that severe hydronephrosis, large stone (>2 cm), bilateral stones and patients presenting with high creatinine levels were predictive factors for failure of DJS in patients with intrinsic ureteric obstruction (24). There were also other studies focusing on the factors for predicting stent functional failure in patients with malignant ureteric obstructions. The factors identified were baseline levels of serum creatinine, degree of hydronephrosis and being male in gender (6, 25, 26). According to this study, 3 factors were significantly associated with the success rate of DJS, which included causes of obstruction, diagnosis and pre-operative creatinine level. DJS was significantly more likely to be successful among patients diagnosed to have urolithiasis compared to other diagnoses ( $p=0.012$ ). A study has shown that the failure rate was higher if the obstruction was caused by extrinsic factors, especially malignancy (27). Higher failure rate in extrinsic factors

may be associated with extrinsic compression or invasion of the ureter by tumours, which may lead to the bending and deformation of the ureter, which then increases resistance during intubation in the majority of cases (27). A densely-impacted stone, which leads to difficulty in passing a guide wire and stent migration were common problems encountered during DJS placement which may also lead to failure (28).

According to this study, patients presenting with obstructive uropathy (creatinine >106  $\mu\text{mol/L}$ ) prior to DJS placement have lower success rate compared to normal renal profile ( $p=0.07$ ). Strong association of pre-operative creatinine level as predictive factors for successful DJS placement was also demonstrated in other studies (6, 29).

In Sarawak, most of the patients live in rural areas and have limited access to a healthcare facility. Once the DJS was done to relieve the ureteric obstruction, the date for definitive treatment in a tertiary urology centre will be given upon discharge. Due to a long waiting list, the appointments are usually scheduled 4 to 6 months after DJS. Those who remain asymptomatic after DJS are more prone to neglect or to forget their stent and therefore develop serious complications that are time-related, such as encrustation, fragmentation and obstruction (30). Frequent follow-up in our outpatient clinic, DJS registry in log book and change of stent every 6 months are done to prevent these complications.

### Limitations

The cases were only done in one hospital without a resident urologist in Sarawak. Characteristics of cases treated at our hospital may be different from those at Peninsular Malaysia and Sabah. All the cases were performed by our medical officers and general surgeons. General surgeons in our hospital have clinical experience as specialists for less than 2 years. All DJS were assisted by non-urology trained scrub nurses with rigid cystoscope 0-degree lens. Outcomes might be different if the cases were performed by more experienced surgeons using 30-degree or 70-degree lens rigid cystoscope with urology-trained scrub nurses. This is a retrospective study and there are problems of bias and inaccurate data and the study may not be suitably powered to look for predictive factors as the sample size is small.

### Recommendations

Double J stenting urology services should be made available in secondary specialty hospitals without resident urologists in Malaysia. Acceptable success rate is achievable with good outcomes and benefits include minimizing disruption to the patient's and family members' life, decreased inter-hospital transfer and its cost and reducing the workload on tertiary urology centres. Organizing double J stenting workshops, sending medical officers for attachment in tertiary urology centres and inviting consultant urologists to perform surgery can be done to improve the success rate of DJS in secondary specialty hospitals. Future prospective studies should be done where multiple factors are

controlled and variables are powered to show that certain factors do indeed predict chances of successful stenting. Besides that, we should also compare the outcomes of DJS in all hospitals without resident urologists with urology centres in Sarawak and aim to identify the reasons of unsuccessful DJS in future studies.

### Conclusion

Our study shows that double J stenting is feasible and safe to be done in a secondary specialty hospital without a resident urologist with available facilities, despite the limitations. Our success rate of DJS is slightly lower if compared with overseas urology centres. However, patients presenting with ureteric obstruction with these favourable predictive factors (intrinsic causes of ureteric obstruction, urolithiasis cases and pre-operative creatinine level less than 106  $\mu\text{mol/L}$ ) should be offered DJS in the local setting without undue delay of inter-hospital transfer.

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### Competing interest

The authors have no conflicts of interest to declare.

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