

# URETERIC JET FREQUENCY EXAMINATION USING COLOR DOPPLER ULTRASONOGRAPHY TO PREDICT SUCCESS OF RETROGRADE DJ STENT INSERTION

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## ABSTRACT

**Objectives:** To prove that ureteric jet examination using Color Doppler Ultrasonography (CDU) can be used as a diagnostic tool to predict success of retrograde Double J stent insertion in uterine cervix carcinoma patients with hydronephrosis. **Materials & Methods:** This observational analytic study on 32 renal units from May until October 2013, in Soetomo General Hospital Surabaya. Initially, ureteric jets were observed for 5 minutes using CDU, then continued with same day cystoscopy and retrograde stent insertion. The analysis was using chi-square and also contingency coefficient. **Results:** In both chi-square and contingency coefficient test, a significant correlation between success of retrograde DJ Stent insertion and Blood Urea Nitrogen (BUN), creatinine value, grade of hydronephrosis and also ureteric jet were observed ( $p < 0.05$ ). Normal values of BUN, creatinine level and lower grade of hydronephrosis, is associated with higher success rate of DJ stent insertion. Successful stent insertion is also greater in patients with positive ureteric jet on CDU examination, with sensitivity of 90.9% and specificity of 89.5%, positive predictive value of 83.3%, negative predictor value of 95% and accuracy of 0.9. **Conclusion:** Ureteric jet frequency examination using CDU can be used as a predictor of successful retrograde DJ Stent insertion in patients with uterine cervix carcinoma and hydronephrosis.

**Keywords:** Ureteric jet, Color Doppler Ultrasonography, DJ Stent, uterine cervicis carcinoma.

## ABSTRAK

**Tujuan:** Untuk membuktikan apakah pemeriksaan ureteric jet menggunakan Color Doppler Ultrasonography (CDU) dapat digunakan sebagai alat diagnostik untuk prediksi keberhasilan pemasangan Double J stent secara retrograde pasien karsinoma serviks uteri yang mengalami hidronefrosis. **Bahan & cara:** Penelitian ini bersifat analitik observasional pada 32 sampel sejak bulan Mei – Oktober 2013, di RSUD Dr. Soetomo Surabaya. Dilakukan dengan memeriksa ureteric jet selama 5 menit menggunakan CDU, kemudian pada hari yang sama dilakukan sistoskopi dan pemasangan DJ stent secara retrograde. Analisa menggunakan uji Chi-Square maupun uji Contingency Coefficient. **Hasil:** Pada uji Chi-Square maupun uji Contingency Coefficient terbukti bahwa ada hubungan bermakna antara keberhasilan pemasangan DJ stent secara retrograde dibandingkan dengan nilai blood urea nitrogen (BUN), kreatinin, derajat hidronefrosis maupun pemeriksaan ureteric jet menggunakan CDU dengan nilai probabilitas ( $p < 0.05$ ). Semakin normal nilai BUN, kreatinin maupun derajat hidronefrosis, maka pemasangan DJ stent secara retrograde semakin berhasil. Keberhasilan pemasangan DJ stent secara retrograde juga semakin besar pada sampel ureteric jet yang positif, dengan nilai sensitivitas 90.9%, spesifisitas 89.5%, nilai duga positif 83.3%, nilai duga negatif 95% dan nilai akurasi sebesar 0.9. **Simpulan:** Pemeriksaan frekuensi ureteric jet menggunakan CDU dapat digunakan sebagai prediksi keberhasilan pemasangan DJ stent secara retrograde pasien karsinoma serviks uteri yang mengalami hidronefrosis.

**Kata Kunci:** Ureteric jet, Color Doppler ultrasonography, DJ stent, karsinoma serviks uteri.

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## INTRODUCTION

Uterine cervix carcinoma is one of the most common malignancy found in women. Thirteen

pathology laboratories (2007) in Indonesia showed that uterine cervix carcinoma is the most frequent cancer in female reproductive organs in 2002, which accounted for 2.532 patients. It occurs in 75% of all

gynecologic oncology cases, which are mostly diagnosed in advanced stage, most frequent stage III (44.7%).<sup>1,2</sup>

Suarsana and Soebadi described the failure of double J (DJ) ureteric stent insertion at Soetomo General Hospital Surabaya was 41% out of 100 cases of uterine cervix carcinoma.<sup>3</sup> Ureteric jet frequency examination is an accurate, easy, non invasive and reliable tool to evaluate ureteric patency using Color Doppler Ultrasonography (CDU) for 5 minutes. Diagnostic value to evaluate ureteric jet frequency to differentiate upper urinary tract obstruction, has sensitivity of more than 80% and specificity of more than 90%.<sup>4,9</sup>

Considering the high failure rate of retrograde stent insertion in Soetomo General Hospital Surabaya (41%),<sup>10</sup> the need to improve pre-operative condition, and poor surgery risk this prospective study aimed to prove diagnostic value of CDU to predict success of retrograde DJ Stent insertion in uterine cervix carcinoma patients in Soetomo General Hospital Surabaya.

## OBJECTIVE

To prove that ureteric jet examination using CDU can be used as a diagnostic tool to predict success of retrograde ureteric stent insertion in uterine cervix carcinoma patients with hydronephrosis.

## MATERIAL & METHOD

This is an observational analytic study performed from May until October 2013 with 32 renal units in Soetomo General Hospital Surabaya. The mean age is 50 years old. Ureteric jet examination used CDU probe of 3.5–3.75 MHz, placed on suprapubic area to the base of the bladder area for 5 minutes. Then on the same day, the patients underwent cystoscopy and retrograde DJ Stent insertion. Results were analyzed using Chi-square

and contingency coefficient test, also not to the least, sensitivity and specificity value.

## RESULTS

There were 32 renal units who met the inclusion criteria and not excluded. The average age was 50 years old, the youngest was 46, the oldest was 55 years old, with standard deviation of 2.9.

Most of the patients came in stage IIIb accounted for 20 samples (75%), and IVa accounted for 8 samples (25%), the others with distant metastases to the lung and liver accounted for 4 samples (12.4%). A majority of subjects had normal creatinine level  $\leq 1.3$  mg/dL in 56.3%, the lowest is 0.8 and the highest is 9.2 with standard deviation of 2.9. The lowest blood urea nitrogen (BUN) is 8 and the highest 83 with standard deviation 18.8.

After the data were analyzed with independent sample t test and chi square we found that BUN, creatinine and hydronephrosis variables are not homogenous, ( $p < 0.05$ ), so we continued with chi-square and contingency coefficient tests. There was Chi-Square value = 13.037 with probability = 0.001 and contingency coefficient test = 0.538. It showed there was correlation between BUN and creatinine value with successful DJ Stent insertion.

Kidney ultrasound was performed before the surgery showing 10 samples with mild hydronephrosis (31.3%), 18 with moderate hydronephrosis (56.3%) and the other 4 severe one (12.5%). In comparison to ureteric jet examination using CDU it was known that ureteric jet was only found in 10 samples with mild hydronephrosis (83.3%) and 2 samples with moderate hydronephrosis (16.7%). Ureteric jet was not found in 16 samples (80%) with moderate hydronephrosis and 4 sample with severe hydronephrosis (20%).

During operation it appeared that there were 10 samples (66.7%) with mild hydronephrosis and 2 samples with moderate hydronephrosis were

**Table 1.** Descriptive data of age, BUN, and creatinine.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std Deviation
Age	32	46	71	52.19	5.682
BUN	32	7	83	20.63	18.273
Creatinine	32	0.8	9.2	2.894	2.8634

**Table 2.** Analysis of BUN and creatinine value compared to DJ Stent Insertion.

			DJ Stent Insertion		Total
			Succeed	Fail	
BUN & Cr	Normal	Count	11	7	18
		% within Bun	61.1%	38.9%	100.0%
	Abnormal	Count	0	14	14
		% within Bun	0.0%	100.0%	100.0%
Total		Count	11	21	32
		% within Bun	34.4%	65.6%	100.0%

$X^2 = 13.037$ ,  $P = 0.001$ ,  $CC = 0.538$

**Table 3.** Analysis of hydronephrosis compare with DJ Stent insertion.

			DJ Stent Insertion		Total
			Succeed	Fail	
Hydronephrosis	Mild	Count	9	1	10
		% within DJ Stent Insertion	81.8%	4.8%	31.3%
	Moderate	Count	2	16	18
		% within DJ Stent Insertion	18.2%	76.2%	56.3%
	Severe	Count	0	4	4
		% within DJ Stent Insertion	0.0%	19.0%	12.5%
Total		Count	11	21	32
		% within DJ Stent Insertion	100.0%	100.0%	100.0%

$X^2 = 20.130$ ,  $P = 0.001$ ,  $CC = 0.621$

**Table 4.** Analysis of ureteric jet on CDU compare with ureteric jet on cystoscopy.

			Ureteric jet on Cystoscopy		Total
			Positif	Negatif	
Ureteric jet on CDU	Positif	Count	12	0	12
		% within Ureteric jet on Cystoscopy	80.0%	0.0%	37.5%
	Negatif	Count	3	17	20
		% within Ureteric jet on Cystoscopy	20.0%	100.0%	62.5%
Total		Count	15	17	32
		% within Ureteric jet on Cystoscopy	100.0%	100.0%	100.0%

$X^2 = 21.760$ ,  $P = 0.001$ ,  $CC = 0.636$

observed with ureteric jet on cystoscopy, while 3 samples with moderate hydronephrosis with no ureteric jet in CDU before, found ureteric jet. From 13 samples and 4 samples with severe hydronephrosis (76.2%) with no ureteric jet on CDU, were also proven by cystoscopy.

Nine samples (81.8%) with mild hydronephrosis and 2 samples with moderate hydro-

nephrosis (18.2%) had successful stent insertion. While 1 sample with mild hydronephrosis (4.8%), and 16 samples with moderate hydronephrosis (19.4%) failed retrograde stent insertion.

Study results that out of 12 samples with positive ureteric jet examination using CDU were proven by cystoscopy (100%), and 3 samples (15%) with negative ureteric jet examination using CDU

**Table 5.** Analysis of ureteric jet on CDU compare with DJ Stent insertion.

			DJ Stent Insertion		Total
			Succeed	Fail	
Ureteric jet on CDU	Positif	Count	10	2	12
		% within DJ Stent Insertion	90.9%	9.5%	37.5%
	Negatif	Count	1	19	20
		% within DJ Stent Insertion	9.1%	90.5%	62.5%
Total		Count	11	21	32
		% within DJ Stent Insertion	100.0%	100.0%	100.0%

$$X^2 = 20.401, P = 0.001, CC = 0.624$$

showed ureteric jet during cystoscopy. Seventeen samples which did not show ureteric jet in CDU were proven by cystoscopy.

During observation of ureteric jet examination using CDU compared to success of retrograde DJ Stent insertion showed that 10 samples (83.3%) with ureteric jet succeeded to be inserted DJ stent. Although 2 samples (16.7%) which showed positive ureteric jet failed. One sample (5%) with negative ureteric jet finally made the DJ Stent insertion, and 19 samples (95%) with no ureteric jet in CDU failed the retrograde DJ Stent insertion.

Calculations using chi-square test resulted probability value ( $p < 0.005$ ). There is correlation of success in retrograde DJ Stentinsertion in uterine cervix carcinoma patients with hydronephrosis and ureteric jet examination using CDU for 5 minutes.

Calculations using contingency coefficient test resulted in probability value ( $p < 0.005$ ). It means a strong correlation between both, and it can be concluded that ureteric jet frequency examination using CDU can be used as a predictor of success of retrograde DJ Stent insertion in uterine cervix carcinoma patients with hydronephrosis.

From cross table 2 x 2, 10 patients (83.3%) with positive ureteric jet on CDU succeeded retrograde DJ Stent insertion. Meanwhile, 19 patients (95%) with negative ureteric jet on CDU failed. Only 1 patient without ureteric jet (5%) succeeded for retrograde stent insertion. From those result, diagnostic characteristics for ureteric jet were 90.9% sensitivity, 90.5% specificity, and 83.3% positive predictive value, 95% negative predictive value and 0.9 accuracy.

## DISCUSSION

The data showed there was a correlation between BUN and creatinine value with the success of DJ stent insertion. Normal BUN and creatinine

level was more likely to undergo successful DJ stent insertion. When BUN and creatinine values are increased, declining total kidney function may result from progressive disease of uterine cervix carcinoma obstructing both ureters, followed with a decrease of urine production, may impact success of retrograde DJ stent insertion.

By analyzing the result of ureteric jet examination and comparing it with the severity of hydronephrosis, the ureteric jet was positive in all patients with mild hydronephrosis and on the contrary patient with severe hydronephrosis had no ureteric jet in the examination using CDU. Both Chi-square test or contingency coefficient showed significant difference ( $p < 0.05$ ). Thus the more severe hydronephrosis, the smaller chance we have in getting positive ureteric jet during CDU examination and the milder hydronephrosis is, the better chance we have in getting positive ureteric jet either in CDU examination or in cystoscopy.

In the analysis which compared the presence of ureteric jet in CDU and in cystoscopy, 12 samples with positive ureteric jet in CDU were proven to also have ureter jet in cystoscopy. Meanwhile 3 out of 20 samples which didn't have any ureteric jet in CDU were found to have ureteric jet on cystoscopy. This condition might be due to the duration of cystoscopy which was longer than 5 minutes and the aid of medications such as furosemide and extra hydration, given during cystoscopy.

In the analysis of successfulness retrograde insertion of DJ Stent compared with the presence of ureteric jet in CDU, 19 out of 20 samples with negative ureteric jet in CDU were failed of retrograde DJ Stent insertion and only 1 were succeeded. The one succeeded might be due to the guide of radiological examination so the ureteral opening can be searched and DJ Stent can be inserted from retrograde. Meanwhile 10 out 12 samples with positive ureteric jet in CDU were succeeded for

retrograde DJ stents insertion. There were 2 patients who failed and they might be due to the ureteral opening which was difficult to be found in between the infiltration of cervicis cancer mass.

In calculation using Chi-square test and Contingency Coefficient, the probability value were less than 0.005 ( $p < 0.05$ ). It means that there's a statistically significance relationship between ureteric jet result in the CDU and the successfulness of retrograde DJ Stent insertion. Thus retrograde DJ Stent insertion was likely to succeed if the ureteric jet was positive and vice versa. In cross table 2 x 2, ureteric jet examination using CDU in predicting whether DJ Stent insertion will succeed or not had sensitivity of 90.9% and specificity of 90.5%.

## CONCLUSION

Examination of ureteric jet frequency using CDU in 5 minutes can be used as a predictor of successfulness of retrograde DJ Stent insertion in uterine cervix cancer patient with hydronephrosis.

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