

Glomerular Filtration Rate Outcome in Stented versus Non-Stented Dismembered Pyeloplasty in Patients with Ureteropelvic Junction Obstruction: A Comparative Prospective Randomized Controlled Study

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Keywords:

GFR, Ureteropelvic, Pyeloplasty, Hydronephrosis, Stent.

ABSTRACT

To compare the outcomes of management of ureteropelvic junction obstruction by open pyeloplasty using a stent or without a stent. Operating on a total of 48 patients diagnosed with UPJO randomly allocated to either group (I): patients managed with double J stent including 24 patients or group (II): the non-stented group (24 cases). Dismembered pyeloplasty was performed for the two groups. The obtained results showed that, after 1 week of the surgical procedure, group (II) had a significantly higher rate of complications as compared to group (I). However, urine analyses didn't differ significantly among both groups. At six weeks post-operative, dysuria was the significant complaint among the group (I) compared to group (II). The percentage of patients with no complaint was higher among the group (II) compared to group (I). Post-operative hydronephrosis after six weeks was higher in the group (II) compared to group (I). GFR and split function were significantly higher among group A patients after three months postoperative in comparison to group B patients. Significant improvement was noted in patients managed with DJ stent compared with those non-stented regarding postoperative hydronephrosis, GFR, and split function when assessed by postoperative ultrasound (U/S) and DTPA, giving the high priority for the stent use in patients with UPJO.



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1. Introduction

One of the main congenital anomalies in the urological system is ureteropelvic junction obstruction which is usually associated with loin pain, recurrent urinary tract infection, impaired renal functions, formation of stones, and hypertension [1]. The incidence of UPJO is one in 1250 births, and it occurs more commonly in the male population (male/female, 2:1) [2].

Ureteropelvic junction obstruction may be caused by intrinsic factors such as a peristaltic ureteral segment

or true ureteral stricture. Also, extrinsic factors such as crossing vessels are included [3].

Using a stent with pyeloplasty facilitates good drainage and is believed to provide great support and alignment ensuring effective tissue healing. However, their use may be associated with different complications like stricture, recurrent infections, anastomosis site injury or to the adjacent renal tissue and may be associated with dislodgment from its site [4].

The pyeloplasty procedure started to be performed 70 years and is still the gold standard surgery for management of UPJO with high success rates. As regards to the use of stent, still no previous study provided an evidence or a clear advantage to their use in the pyeloplasty especially improving the ureteric obstruction and reducing morbidities associated with the surgical procedure. So, we aimed to compare between the use of stent or non-stent procedure in open pyeloplasty for the management of UPJO regarding their efficacy and complications after the surgery.

2. Methods

We utilized a study designed to be a prospective and randomized clinical trial from the period of May 2020 to May 2021 in Beni-Suef University Hospitals. The ethical approval from the faculty of medicine, Beni-Suef University's research ethical committee, was obtained prior to the beginning of the work.

Target population & baseline inclusion criteria:

The study included 48 patients (6 months – 40 years) who were diagnosed to have UPJO and were randomly allocated to Group I is the stented group with a DJ stent (24 cases), and Group II is the non-stented group (24 cases). Dismembered pyeloplasty was performed for the two groups.

Exclusion criteria:

We excluded from our study all patients having a single functioning kidney, patients exposed to recurrent UPJO or those performed percutaneous nephrostomy and inserted a DJ stent, patients having congenital kidney diseases and patients with vesico-ureteric reflux.

Randomization:

Subjects were allocated to the stud groups randomly performed using a computer-generated random list.

All patients were subjected to the following:

A detailed history-taking with special emphasis on the mode of discovery of the disease (whether it is symptomatic or accidentally discovered by U/S), Full general and abdominal examination, Necessary laboratory investigation (urine analysis, urine culture, and serum creatinine), An imaging study (abdominal U/S and CT urinary track without contrast, voiding cystourethrogram, and diuretic renogram), Full counseling for the patient's parents.

Postoperative follow-up:

After the surgical procedure, antibiotics and analgesics were prescribed according to the condition of the patients. Close observation was ensured to all patients regarding their vital data, pain, fever, ambulation and their ability for food intake. Monitoring of complications, like hematuria, pain or dysuria and frequency from the patients or their parents was performed and if free from complications the drain was removed, and the patient was discharged, Oral antibiotics and analgesics in the form of paracetamol at a dose of 15 mg/kg/dose were prescribed and the patients were scheduled for regular follow up visits.

1st visit: was a week after discharge. Patients were followed up by US to observe any intra-abdominal collection especially in the perinephric area. Also, urine analysis or culture and sensitivity were performed according to the symptoms of the patients, 2nd visit: after six weeks. Patients were followed by U/S, and urine analysis and culture in symptomatic patients were performed. For patients with a stent, using a short-term general anaesthesia, we removed the stent in one day procedure, 3rd visit: was after three months. Patients were followed by U/S and diuretic renogram.

GFR measurement

GFR measurement method and protocol were according to Kass and Fink-Bennett [5].

Statistical analysis

The collected data were analyzed and processed using the statistical package for social sciences version 19 (SPSS-19). The descriptive data were presented in tables and graphs. The level of statistical significance was pre-sated at a P-value of 0.05. Variables having a P-value of less than 0.05 were considered significant.

3. Results

Our study was done on 48 patients with a primary diagnosis of UPJO divided into group I, the stented group using double J stent (DJ) (24 cases), and group II, the non-stented group (24 cases). Dismembered pyeloplasty operation was performed for the two groups.

Table 2 demonstrated that there was no significant difference between both groups as regards to their age, gender, and the laterality ($p > 0.05$). Similarly, no statistical significant difference was observed regarding the preoperative complaints and urine analysis of patients (P-value > 0.05) (Table 1).

Table 3 demonstrated no statistical significant difference between the preoperative degree of hydronephrosis, GFR, and split function between both groups. Moreover, patients without DJ stents had a statistically higher hospital stay days than patients with DJ stents.

Table 4 showed that complications at 1week post-operative, fever, leakage, and clot formation were highly significant in group II compared to group I. There was no significance between urine analyses among both groups. Moreover, dysuria was the most significant complaint among group I compared to group II. The percentage of patients with no complaint was higher in group II compared to group I with significant difference between both groups. Residual mild hydronephrosis after 6 weeks post-operative showed no significance between both groups. However, the rate of marked hydronephrosis after 6 weeks was higher in group II than in group I.

Table 6 declared that GFR and split function were significantly higher among patients with DJ stents after 3 months post-operative than in patients without DJ stents.

4. Discussion

Several studies have searched for the value of using a stent in pyeloplasty but with no clear answer and controversial issues emerged to finally depend on the surgeon's decision. Moreover, the best method for management of those undergoing urinary diversion remains unclear [6], [7]. The study conducted by [8] matching with the opinion of a stent-less procedure. Other studies performed by [9], [10] support non using of a stent. On the other hand, the studies performed by [6], [11] preferred the use of external stent or percutaneous catheter, and that of [12] preferred internal JJ stents.

The doubt from using the stent is coming from the fact that they have many advantages like minimizing the extravasation of urine by maintaining a perfect anastomosis alignment and they avoid the transient obstruction induced by edema occurring around the anastomosis enhancing prophylaxis against subsequent stenosis [6], [7], [13], [14].

One of the drawbacks of using a stent includes infection being a foreign body. Stricture may develop at the anastomosis site from compression by the stent. Other complications include bleeding, fragmentation and migration of the stent, injury at the anastomosis site or adjacent renal tissues. All these complications may increase the duration of hospital stay or if discharged the patients may need a second visit for stent removal [4], [8], [9], [12], [13].

All previous studies concluded that the different methods were safe and effective however, no previous study demonstrated a single superior method [15].

The baseline data of participants in both groups were similar with no significant differences as regards to their age, sex, side of operation, the degree and presentation of hydronephrosis in addition to the GFR and the split function detected by DTPA scan. The mean age of patients in our study was 16.9 years of them 30 patients had UPJO on the left side and the remaining 18 patients had it on the right side.

Similarly, [16] found in their study that the preoperative data including the GFR, the AP diameter of the renal pelvis and the split function were nearly comparable in both groups.

Also, matching with [16], we found that complications at 1 week post-operative, fever, leakage, and clot formation were highly significant in group B when compared to group A. However, no significant variation was detected between urine analyses among both groups. Hospital stay was statistically higher among patients without DJ stents than patients with DJ stents. Also, in our work, we found that with 6 weeks post-operative complaints among both groups, dysuria was the most significant complaint among stented patients compared to non-stented patients and those with no complaint was higher among non-stented patients compared to stented pyeloplasty. Residual mild hydronephrosis after 6 weeks post-operative showed no significant variation between groups, while marked hydronephrosis after 6 weeks post-operative rate was 4 cases in the non-stented group that was higher than in the stented group patients (no cases).

A similar study done by [17], stated that the gold standard method for management of UPJO was Anderson Hynes Pyeloplasty. However, they mentioned that during pyeloplasty stents are not necessary to be placed. On the other hand, our study suggested that a DJ stent should be placed depending on the rate of complications in both groups.

Our study found that the condition was not discovered antenatally. However, the percentage was about 53.9% in the study of [11], 40% in the study of Hussain and Frank's [18], 52% in the study of [14], 47% in the study of [13] and 70% in the study of Wooand Farnsworth's [8]. This high percentage should increase the awareness of physicians and attention towards the antenatal screening for fetal hydronephrosis.

The limited hospital resources with high hospital load by patients making the length of hospital stay is an essential issue [4], [6], [9], [15].

In our study, hospital stay was statistically higher among patients without DJ stents than patients with DJ stents. We discharged the stented patients within 2-3 days and the drain inserted in the perinephric space

was removed before the discharge. The patients were asked for follow up after 6 weeks to remove the stents. Similarly, non-stented patients were discharged from the hospital when the drain inserted in the perinephric space was dry and removed. Like our results, some authors found in their studies short duration of hospital stay in patients who were managed with stents [7], [12], [15], [11] explained the differences. On the other hand, some authors found that long duration of hospital stay was associated with the stented patients rather than those with no stent [4], [16], [20] and attributed this to the higher incidence of UTI in patients with stent after the surgical procedure.

[21] in their study were managing a less literate patients and found difficulties in the dealing with the drainage tubes. [14] in their study revealed that 81% of their patients with no stents were discharged within 1 day of the surgery with average length of hospital stay 1.3 days. They assumed that urinary leakage was not an indication for hospital stay and home care could provide perfect management in case of drain inflammation. However, in our study we kept our patients admitted till removal of the drain as most of them were poor economically and living in rural area.

In our study, there was no difference between both groups as regards to the complications post-operatively. All non-stented patients were only discharged following the removal of the foley's catheter and the perinephric drain. One week post interventional, fever, leakage, and clot formation were highly significant in non-stented patients compared to the stented group. However, there was no significance between urine analyses among both groups.

The risk of infection might be associated with the insertion of the stent being a foreign body so, early removal may lower the risk of infection [12]. Several studies support the fact that stent use and urinoma were associated with higher rates of infections [4], [15], [19], [22]. The study of [13] reported that in their study patients with stents had no UTI as they used antibiotics as a prophylaxis against infection till removal of the stent.

The non-stented repair is commonly associated with the presence of urinoma [4], [7], [9], [12], [15]. Following the study of [9] in our study, the leakage of urine from the Penrose drain was not significant. Some reports compared between both approaches of pyeloplasty and showed the same results [12], [16].

In our study, we performed an isotope scan to patients who could afford its cost or the findings of US were not clear. The follow up of patients by some authors was ensured by US and isotope scanning was indicated only for those showing worsening of hydronephrosis or presenting with obstruction symptoms [13], [15], [19].

Within 3 months post-operatively, we observed improvement in hydronephrosis as detected by the US. Residual mild hydronephrosis after 6 weeks postoperatively showed no significant variation between groups. While the rate of marked hydronephrosis after 6 weeks was elevated in the non-stented patients. Some studies reported that pyeloplasty improved hydronephrosis, but this improvement was described to occur within 6 – 12 months and early improvement was not observed [17], [23].

Follow up of patients in our study extended to at least 3 months. In some studies, discontinuation of follow up was done after 3 months. However, [24] advised to extend the period of follow up to at least 1 year.

Our study found a comparable results of the two techniques whereas the nature and rate of complications differed. The rate of urinoma in our study was about 25% in those with no stent and 0% in stented patients.

This was similar to the study of [14] who found 14% of their patients complicated with urinoma.

Other observed complication was in the study of [25] who found stent dislodgement in 5% of patients. However, in our study, this complication was not observed.

The study of [11] matched with our results regarding the pyeloplasty complications. They concluded that the non-stented patients had a significantly higher rate of complication related to the surgical repair. Unlike, patients with a stent who had only complications related to the insertion of the stent such as pyuria (8 cases) and hematuria (3 cases).

Several studies found that open Anderson Hynes' dismembered pyeloplasty have a high success rate ranging between 94 – 100% [7], [9], [12], [15], [19- 21], [23]. Secondary procedures like redo pyeloplasty and the insertion of DJ stent or nephrostomy tube were reported to have a high rate following non-stented procedure [7], [13], [15], [19]. The study of [14] was not certain that failure of the procedure was attributed to the non-stenting.

5. Conclusions

Hydronephrosis, GFR, and split function improved significantly as detected by postoperative US and DTPA in patients managed with DJ stented pyeloplasty compared to those with non-stented pyeloplasty patients. In addition, postoperative complications such as fever, leakage, and clot formation were significantly less in stented pyeloplasty patients. Lastly, hospital stay was statistically less in the stented pyeloplasty group.

6. List of abbreviations

DJ: double J stent

GFR: Glomerular Filtration Rate

U/S: ultrasound

UPJO: ureteropelvic junction obstruction

7. References

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Table (1): Clinical data of the studied patients

variable		Count	%
Gender	Female	26	54.2%
	Male	22	45.8%
Laterality	L	30	62.5%
	R	18	37.5%
Complaint (Pre)	UTI	20	41.7%
	Loin pain	14	29.2%
	Fever	14	29.2%
Urine analysis (Pre)	Pyuria	36	75.0%
	Hematuria	12	25.0%
DJ	Stented	24	50.0%
	Non-stented	24	50.0%

Table (2): Age, gender, and laterality distribution in patients with DJ stents and patients without DJ stents

		Group				P-value
		Group I (With DJ Stent)		Group II (Without DJ Stent)		
		Count	%	Count	%	
Age	Mean ± SD	15.75 ± 16.82		18.21 ± 18.55		0.494
	Median (Range)	6.5(2-53)		6.5(3-55)		
Gender	female	14	58.3%	12	50.0%	0.562
	male	10	41.7%	12	50.0%	
Laterality	L	13	54.2%	17	70.8%	0.233
	R	11	45.8%	7	29.2%	

Table (3): Preoperative complaint and urine analysis among groups I and II

		Group				P-value
		Group I (With DJ Stent)		Group II (Without DJ Stent)		
		Count	%	Count	%	
Complaint (Pre)	UTI	12	50.0%	8	33.3%	0.161
	Loin pain	8	33.3%	6	25.0%	

	Fever	4	16.7%	10	41.7%	1.000
Urine analysis (Pre)	Pyuria	18	75.0%	18	75.0%	
	Hematuria	6	25.0%	6	25.0%	

Table (4): Preoperative P.ABD, GFR, split function and hospital stay among groups I and II

	Group										P-value
	Group I (With DJ Stent)					Group II (Without DJ Stent)					
	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum	
P.ABD (Pre) (mm)	35.34	9.23	34.50	20.00	58.00	36.13	8.88	38.50	21.00	54.00	0.764
GFR(ml/min) (Pre)	93.54	6.08	90.00	80.00	95.00	94.04	6.44	95.50	81.00	101.00	0.812
Split Function (Pre)	37.09	3.63	36.91	32.21	45.53	38.34	4.34	38.65	30.93	44.48	0.284
Hospital stay (days)	1.75	0.74	2.00	1.00	3.00	4.46	1.25	5.00	2.00	7.00	< 0.001

Table (5): Complications and urine analyses 1 week and complaints and hydronephrosis 6 weeks post-operative among groups I and II

		Group				P-value
		Group I (With DJ Stent)		Group II (Without DJ Stent)		
		Count	%	Count	%	
Complications (1W)	Clot formation	0	0.0%	4	16.7%	0.001
	Fever	5	20.8%	6	25.0%	
	Leakage	0	0.0%	6	25.0%	
	Nil	19	79.2%	8	33.3%	
Urine analysis (1W)	Hematuria	4	16.6%	3	8.3%	0.934
	Pyuria	6	25%	6	25%	
	Normal	14	58.3%	15	62.5%	
Complaints (6W)	Dysuria	9	37.5%	3	12.5%	0.046
	No	15	62.5%	21	87.5%	
Hydronephrosis BY U/S (6W)	Residual mild HN	6	25.0%	7	29.2%	0.745
	Marked HN	0	0.0%	4	16.7%	0.036
	Normal	18	75.0%	13	54.2%	0.131

Table (6): GFR and split function 3 months post-operative among groups I and II

	Group										P-value
	Group I (With DJ Stent)					Group II (Without DJ Stent)					
	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum	
GFR (3 mon)	92.33	6.52	90.00	80.00	101.00	88.84	4.51	92.00	80.00	101.00	0.0315
Split function (3 mon)	45.86	2.04	45.80	40.21	49.13	41.90	4.12	43.23	34.14	49.01	< 0.001