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ORIGINAL ARTICLE

Efficacy and Safety of External Versus Internal Stenting in Children with Open Pyeloplasty for Primary Ureteropelvic Junction Obstruction. A Single Centre Experience

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ABSTRACT

Background: Ureteropelvic junction obstruction (UPJO), a condition, stops urine from freely passing from the renal pelvis to the ureter. It is a common urological condition, with a male to female ratio of 2:1 and an incidence of 1 in 500 (1). UPJ obstruction may be caused by inherited and acquired diseases. The majority of cases are congenital due to intrinsic or extrinsic causes (2).
Objective: To determine the efficacy and safety of external versus internal stenting in children with primary Ureteropelvic junction obstruction.
Material and Methods: At the Institute of Kidney Diseases in Hayatabad, Peshawar, Pakistan, a randomized controlled study was carried out from January 2021 to December 2021. Patients were split into two groups based on the kind of stent that was used. All patients with DJ stents were placed in Group A, and patients with PU stents (5–6 Fr feeding tubes) that passed through the kidney parenchyma on their way from the ureteropelvic junction to the skin belonged in Group B.
Results: 80 people in total (55 men and 25 women) were enrolled in the study. In groups A and B, the mean ages at surgery were 3.4 and 3.9 years respectively. Table 1 displays the patient's demographics and surgical factors. The two groups' mean operating times (124 ±3.4 for group A and 130 ± 3.1 for group B) were comparable. The DJS group's stent duration ranged from 3 to 4 weeks, with a mean of 27 days, while the PU group's ranged from 1 to 2 weeks, with a mean of 13 days. In DJS and PU stent, the median hospital stay was 1.3 and 2.8 days, respectively.
Practical Implication: The surgeon must compare the inconvenience of a second anaesthesia, the cost, and the DJ stent's potential for complications against the longer hospital stay that comes with PU stenting and advise parents accordingly.
Conclusion: According to our findings, the complication rates and mean operating time for both types of stents were comparable. Even though the DJS stent requires less recovery time than the PU stent, its removal still required a second anaesthesia
Keywords: External Versus, surgical factors, ureteropelvic junction obstruction, urine, Congenital

INTRODUCTION

The disease known as ureteropelvic junction obstruction (UPJO) prevents the free flow of urine from the renal pelvis to the ureter. It is a typical urological ailment with a prevalence of 1 in 500 and a male to female ratio of 2:1 (1). Congenital and acquired disorders can both lead to UPJ blockage. Because of intrinsic or extrinsic factors, the majority of cases are congenital (2). Prompt treatment is necessary to avoid renal failure, which could happen if the problem is not addressed.

Anderson-Hynes dismembered open pyeloplasty is the established gold standard as a means of treating ureteropelvic junction obstruction (UPJO) for 6 decades with a success rate reported in more than 90% of cases (1, 3-5)**.** Drainage of the system is a vital part of the procedure to provide sufficient time for the newly anastomosed junction to heal. Drainage can be done either internally or externally with double J (DJ) or pelviureteral (PU) stent respectively. But, there is still debate regarding which method to be used for optimal drainage (4, 5).

DJ stenting can cause stent-related lower urinary tract symptoms, can sometimes be difficult while negotiating through the vesicoureteral junction, is expensive, and require second anesthesia for removal. PU external stents, on the other hand, avoid the drawbacks related to DJ stents, for example; they are cheap, avoid lower urinary tract symptoms, avoid second anesthesia, and can be used for antegrade study but they may cause prolonged drainage, longer hospitalization and extra damage to parenchyma while externalizing(6, 7).

The effectiveness of these two approaches has only been the subject of a small number of research in the past (7-9). These studies' findings revealed no differences in the length of the operation or the number of complications, with the exception of one that found a shorter hospital stay (8).

This study examined the benefits and drawbacks of internal and external drainage during open pyeloplasty in patients less than 18 years with primary PUJ obstruction, as well as the effectiveness of the procedure after employing these stents. In terms of simple stent removal without anaesthesia, economic effectiveness, avoiding lower urinary tract discomfort associated with DJ stents, and usefulness for antegrade research, it was hypothesized that external stents could be preferable to internal stents.

MATERIAL AND METHODS

At the Institute of Kidney Diseases in Hayatabad, Peshawar, Pakistan, a randomised controlled study was carried out from January 2021 to December 2021. Patients with primary PUJ obstruction from the indoor department of urology, institute of kidney disorders, Hayatabad Medical Complex Peshawar were assessed and chosen in accordance with inclusion and exclusion criteria after receiving ethics committee permission. Patients have been briefed on the advantages of the study, and prior to inclusion, informed consent was obtained. Age, gender, and the length of the complaints were documented as basic demographics. All necessary investigations, including a thorough history and physical exam, were conducted. Complete blood count, coagulation profile, renal function tests, virology, routine urine examination, ultrasound of the abdomen and pelvis, and renal DTPA scan were a few of the investigations that were conducted.

According to the inclusion criterion, a total of 80 patients were enrolled, of which 25 were women and 55 were men. Patients were split into two groups based on the kind of stent that was used.

Inclusion and exclusion criteria: Group A: The DJ stent was inserted in 40 patients in Group A, and the DJ stent size was chosen based on age of the patient, general built, ureteral size and any prior retrograde studies that had been performed. The stent used were of different sizes (3-6 French) and lengths (10-20cm). To confirm the DJ stent's placement, an X-ray of the kidney, ureter, and bladder was done the following day. Under general anaesthetia, the DJ stent was removed using cystoscopy four weeks following the pyeloplasty.

Group B: 40 patients in Group B had PU stents (5–6 Fr feeding tubes) that were passed from the ureteropelvic junction through the renal parenchyma (the lower calyx in most of the times) to the skin. Vicryl 5/0 sutures were used to secure the feeding tube to the renal tissue and silk 2/0 sutures were used to secure it to the skin to lessen the chance of displacement. On the second surgical day, the PU stent was clamped, dressed, and then removed on follow-up visit after one to two weeks without sedation.

A specialist urologist at a minimum level of assistant professor carried out the treatment under general anaesthesia in an operating room outfitted with the necessary tools. Through an anterior subcostal incision and an extraperitoneal approach, all patients underwent the typical open Anderson-Hynes dismembered pyeloplasty procedure. Stay sutures were placed at the ureter and pelvis after the ureteropelvic junction had been exposed. The ureter was then spatulated below the level of obstruction on its postero-lateral wall to a distance where the normal calibre ureter approached, which was approximately 0.5–1 cm, and the extra dilated portion of the renal pelvis was excised. To assess the distal half of the ureter's patency, a 5–6 Fr feeding tube was inserted distally into the bladder.

Vicryl 5/0 continuous sutures were used to complete the anastomosis. A DJ stent (3-4.7 Fr) and a feeding tube (5-6 Fr) were then passed after the posterior layer of the ureter was closed with the pelvis in Groups A and B, respectively. The anterior layer was then sealed(10). In every case, a perinephric drain was inserted, and the urine catheter was left in for 5 to 7 days.

In group A, persistent urine leakage through the perinephric drain was treated by re-inserting the Foley catheter for a further two to three days until the leakage stopped. In group B, the stent was opened again so that free drainage could occur, and it was then reclaimed two to three days later. If unsuccessful, an antegrade nephrostogram was done to determine whether the anastomosis was still intact. Incase of leakage and no opacification of the ureter below, a retrograde study was done with the insertion of a DJ stent and the removal of the PU stent. Urethral catheter adjustment or exchange was carried out in the instance of displaced stent into the upperl urethra to ensure the DJ stent's lower end was in the right location. A paediatric ureteroscopy was carried out while the child was under general anesthesia, with the DJ stent being adjusted or replaced if the distal end of the DJ stent had m into the lower ureter.

Following surgery, antibiotics were given to all patients for 7 to 10 days. Regardless of the kind of stent utilised, the initial follow-up appointment with a fresh renal bladder ultrasound and urinalysis was planned for 4-6 weeks after the stent was removed. After then, a routine follow-up was conducted for two years every three to six months. The grade of hydronephrosis could typically be determined by renal ultrasound, and a renal scan (DTPA) was required 6–12 months after surgery to determine the extent of split renal function and blockage.

The efficacy of the therapy was assessed by the symptoms' improvement and the stability of the split renal function on DTPA. The study identified post-operative complications included stent displacement, lower urinary tract discomfort, and persistent drain leakage.[19-20]

Numerous variables including age, gender, operating time, hospital stay, stent type and price, duration, post-op complications, ease of stent removal, and success rate were examined and compared between the two groups. SPSS version 22 was used to conduct the statistical analysis. When applicable, the median, mean, and standard deviation (SD) were computed for quantitative data. We used the Chi-square test for categorical variables. A p-value of less than 0.05 was regarded as statistically significant.

RESULTS

The study comprised a total of 80 individuals (55 men and 25 women). In groups A and B, the mean ages at surgery were, respectively, 3.4 and 3.9 years old. Clinically symptomatic patients, worsening hydronephrosis on sequential renal ultrasound, progressive deterioration of differential renal function (DRF) below 40% on sequential diuretic renogram (DR), and failure of drainage after furosemide stimulation with plateau curve on renogram were all indications for pyeloplasty in all patients. Table 1 displays the patient's demographics and surgical variables. The two groups' mean operating times (124 ±3.4 for group A and 130 ±3.1 for group B) were comparable. The DJS group's stent duration ranged from 3 to 4 weeks, with a mean of 27 days, while the PU group's ranged from 1 to 2 weeks, with a mean of 13 days. In DJS and PU stent, the mean hospital stay was 1.3 and 2.8 days, respectively.

Complications in the post-op period occurred in 3 out of 40 patients with PU stent (7%), compared to 5 out of 40 patients (12%) with DJ stent. Lower urinary tract discomfort in 3 individuals, stent displacement in 1, and persistent drain leakage in 1 patient were complications in patients using DJ stents. Children with PU stent complications included extended leakage through the drain in 3 individuals. (Table 3)

In group A, persistent urine leakage through the perinephric drain was treated by re-inserting the Foley catheter for a further two to three days until the leakage stopped. In group B, the stent was opened again so that free drainage could occur, and it was then reclaimed two to three days later. If unsuccessful, an antegrade nephrostogram was done to determine whether the anastomosis was still intact. Incase of leakage and no opacification of the ureter below, a retrograde study was done with the insertion of a DJ stent and the removal of the feeding tube (PU stent). Urethral catheter adjustment or exchange was carried out in the instance of displaced DJ stent into the upper urethra to ensure the DJ stent's lower end was in the right location. A paediatric ureteroscopy was carried out while the child was under general anaesthesia, with the DJ stent being adjusted or replaced if the distal end of the DJ stent had moved into the lower ureter.

Table 1: Demographic data of patients and surgical variables in both groups

	Type of stent	N	Mean	Std. Deviation	Std. Error Mean
Serial Number	DJS	40	20.5000	11.69045	1.84842
	PU stent	40	60.5000	11.69045	1.84842
Age at surgery (Years)	DJS	40	3.4250	2.45876	.38876
	PU stent	40	3.9000	2.21649	.35046
Operative time (minutes)	DJS	40	124.7750	3.42306	.54123
	PU stent	40	130.4000	3.16876	.50102
Stent duration (days)	DJS	40	27.5250	1.61702	.25567
	PU stent	40	13.4500	.90441	.14300
Length of hospital stay (days)	DJS	40	1.3000	.46410	.07338
	PU stent	40	2.8000	.60764	.09608

Table 2: Gender distribution in both groups

Count				
		Patient's gender		
		Male	Female	Total
Type of stent	DJS	40	0	40
	PU stent	15	25	40
Total		55	25	80

Table 3: Comparison of the postoperative complications between the two groups

Count						
		Post-operative complications				
		None	Stent Migration	Persistent leakage	LUTS	Stent displacement
Type of stent	DJS	35	0	1	3	1
	PU stent	37	0	3	0	0
Total		72	0	4	3	1

According to the statistical analysis, the mean postoperative hospital stay was statistically significantly different between the two groups in favour of the DJ stent group. Furthermore, group A patients had to undergo re-anesthesia in order to remove their stents, whereas group B patients could do so without undergoing anaesthesia. Similarly, there was a significant price difference between the two stents. While the feeding tube that we used in

group B cost only 35 PKR, the DJ stent nearly cost 2600 PKR when combined with the additional requirement of a guide wire, which in and of itself cost about 400 PKR. Between the two groups, there was no statistically significant difference in the complications rate or mean operating time.

DISCUSSION

The preferred and recommended treatment for UPJO is Anderson-Hynes dismembered pyeloplasty. On the other hand, there is still debate over the best technique for transanastomotic drainage (3), and some people even favor stent-less repair (11).

The insertion of a nephrostomy tube with or without stenting the anastomosis(4, 11), a DJ stent with an externalized string that can be used to remove the stent at the outpatient clinic(12), and a magnetic ureteral stent that does not require general anesthesia for catheter retrieval(13, 14) are a few drainage options. However, others have preferred to employ an external stent that may be removed percutaneously in an outpatient clinic without anesthesia as part of an external drainage procedure (15–18).

Internal and external stenting (DJ and PU stenting respectively) were evaluated in our study cases in terms of benefits and drawbacks. Patients in group A received a DJ stent, whereas those in group B received a PU stent. However, if DJ stent insertion proved to be technically challenging or the ideal size or length wasn't readily available, an external PU stent was occasionally employed.

Both advantages and drawbacks apply to each of these drainage techniques. To avoid an additional general anesthesia procedure for the removal of the stent and to prevent symptoms of the lower urinary tract, external stenting in Pyeloplasty has been utilized successfully by urologists for years (12, 17, 18). Longer hospital stays, kinking, and extended drainage was among its drawbacks, though. Internal DJ stents, however, come with the limitations of bladder spasm and second general anesthesia in addition to their disadvantage in minimizing postoperative urine leakage and allowing for early patient discharge (11).

In this study, we compared the two groups' surgical complications, success rate, hospital stay, cost, and ease of stent removal. The mean operative duration in groups A and B was 120 minutes and 126 minutes, respectively, and was comparable between the two groups. Similar findings were found by Lee et al. and Sarhan O. et al. in their research, with no discernible differences between the two groups (6, 7).

In terms of mean hospital stays, our study's findings were different from those of the other research. These research studies usually found that patients with PU stenting had lengthier hospital stays than patients with DJS (7). The mean length of stay in the hospital we recorded in our study for the two groups was 24 hours for Group A and 28 hours for Group B, which was comparable.

In favor of group B, the price of the two types of stents used in these groups was much lower. In the external stented group, we employed a multi-hole feeding tube that only cost about 35 rupees. However, DJS costs more per unit than a feeding tube and requires additional guide wire, which adds to the expense. According to Braga L. et al. (3), the insertion of a single intraoperative pyeloplasty stent was linked to a reduction in costs of $565 per patient in Canada.

The ability to remove the stent in an outpatient clinic without requiring additional anaesthesia is a significant benefit of external stenting in pyeloplasty that has been consistently noted in the literature (3, 6, 7). In contrast to group A patients, who had their DJS removed after 4 weeks under general anaesthesia, group B patients had their feeding tubes removed after 14 days following pyeloplasty without the use of anaesthesia.

We observed post-operative complications in both groups, including stent displacement, persistent drainage, and symptoms of the lower urinary tract among the DJS group (12%) and prolonged drain leaking in group B (7%). Two patients from each group had post-operative fever on record. In our study, the rate of postoperative complications was comparable between both of the groups; however, group A's management of complications was either more troublesome, such as urinary tract symptoms, or required second anesthesia for management in cases where the stent displaced.

All of the cases in our study were treated with open pyeloplasty since our facilities lack the expertise to do laparoscopic or robotic pyeloplasty. According to hospital guidelines, the minimum age for patients in pediatric age group is 18 years, after which adult urology services are offered.

The findings of our study supported previously conducted studies that found no disparities in outcomes or complication rates between DJ and PU stents when used for dismembered pyeloplasty. In the view of our authors, external PU stents are superior in many ways, including the fact that they can be removed safely in an outpatient environment without a requirement for anesthesia, reducing the likelihood of having to undergo repeated general anesthesia, costing only 35 Pakistani rupees as opposed to almost 3000 for DJS, and having relatively simple post-operative management of complications. On the other hand, Compared to PU stent, internal stenting offers a shorter stay in the hospital and equivalent success and complication rates but, it is costly, requires second anesthesia for removal, and management of complications is either more bothersome like urinary tract symptoms or needs second anesthesia for management in case of stent displacement.

CONCLUSION

The results we obtained show that the mean operative time and complication rates for both types of stents were comparable. DJS stent removal required a second anesthesia, even though it required a more brief hospitalization than a PU stent. When deciding between DJ stenting and PU stenting, the surgeon must consider the inconvenience of second anesthesia, the cost, and the risk of complications against the longer hospital stay associated with DJ stenting.

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