

## Original Research Article

# A comparative study of outcome of pyeloplasty in stented and non-stented children

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### ABSTRACT

**Background:** It is a matter of debate whether to use a stent (double J) or not during pyeloplasty in patients of pelvic ureteric junction obstruction (PUJ obstruction). This study was conducted to assess which technique- stented or non-stented is better for paediatric patients with PUJ obstruction.

**Methods:** 45 paediatric patients aged 0-12 years were included in this prospective comparative simple randomized sample study during the period of June 2015 to August 2017 in paediatric surgery division of department of surgery in M.Y. Hospital, Indore. All patients except one underwent open A-H dismembered pyeloplasty. The parameters used for comparison were renal parenchymal diameter, renal pelvis AP diameter, GFR (by DTPA scan) and rate of complications. Minimum follow up period was 3 months.

**Results:** The M:F ratio was 2:1. Stented children had significant improvement in renal parenchymal diameter (i.e. increase) and GFR (of affected kidney) after pyeloplasty, whereas non-stented children too had improvement in renal parenchymal diameter and GFR (affected kidney) but was not significant. The percentage of postoperative complications were more in non-stented group as compared to stented group.

**Conclusions:** In all paediatric cases with PUJO undergoing A-H pyeloplasty, both stenting and non-stenting have similar results and to place a double J stent should depend on choice of surgeon.

**Keywords:** PUJO, A-H pyeloplasty, Double J stent, Renal parenchymal diameter, Renal pelvis AP diameter, GFR

### INTRODUCTION

Pelvic ureteric junction obstruction (PUJ obstruction) is a common urological anomaly in children leading to renal damage.<sup>1,2</sup> A-H Dismembered pyeloplasty is the gold standard surgical procedure for PUJ obstruction.<sup>3,4</sup> It is a matter of debate whether to use a stent (double J) or not during pyeloplasty in patients of PUJ obstruction. This study was conducted to assess which technique- stented or non-stented is better for paediatric patients with PUJ obstruction. PUJ obstruction is defined as an obstruction of flow of urine from the renal pelvis to the ureter. Most cases are congenital, but it may not become clinically apparent until much later in life. The incidence of PUJ

obstruction is less well defined in adults than in children. In the paediatric age group, it is the most common cause of upper urinary tract dilation.<sup>1</sup> The male-to-female predominance is greater than 2:1, and the left kidney is affected about twice as often as the right.<sup>1,2</sup>

PUJ obstruction from congenital causes may result from either an anatomic or a physiologic defect in the upper ureter. Primary luminal narrowing caused by an incomplete recanalization process in utero at the cephalad end of the developing ureter. Presence of an aperistaltic segment of the ureter. Histopathologic studies reveal the replacement of spiral musculature by abnormal longitudinal muscle bundles, thus normal peristaltic wave

cannot be generated for flow of urine. Cytokine produced in the urothelium, transforming growth factor- $\beta$ , epidermal growth factor expression, nitric oxide, and neuropeptide Y have also been found as cause of PUJ obstruction. Ureteral kinks or valves produced by infoldings of the ureteral mucosa and musculature may also cause obstruction.

During development, the ureter is believed to become solid and then recanalize later. This is thought to occur mostly at the mid ureter. Incomplete recanalization has been speculated to possibly lead to UPJ obstruction. Additionally, smooth muscle differentiation begins in the bladder at 7 weeks' gestation and reaches the upper ureter by approximately the 16th week. An abnormality in smooth muscle development may lead to a section of ureter that does not appropriately contract and, thus, also to primary UPJ obstruction due to poor peristalsis.<sup>1,2</sup>

PUJ obstruction can present at any time of life. Initial presentation in neonates and infants can be a palpable flank mass. Use of antenatal USG has resulted in increase in number of patients diagnosed with hydronephrosis. In older children, intermittent abdominal or flank pain, at times associated with nausea or vomiting, is a frequent presenting symptom. Findings of microhematuria, pyuria or frank urinary tract infection may be present.

#### **Aims and objectives**

- To assess which type of pyeloplasty is better stented and non stented in children with PUJO.
- To study the complications in paediatric population after the pyeloplasty.

#### **METHODS**

This study was approved by Ethical committee (with reference number EC/MGM/FEB-17/15) and it was a part of post graduate dissertation in M.Y. Hospital, Indore.

#### **Sample size**

45 children with PUJ obstruction which were diagnosed on the opd basis during June 2015- August 2017.

#### **Inclusion criteria**

Inclusion criteria were all pediatric patient (age upto 12 yr) with urogenital anomalies coming to paediatric surgery; all operated cases of pyeloplasty in paediatric surgery; patient with written consent.

#### **Exclusion criteria**

Exclusion criteria were patient with no or irregular follow up; patient without written consent; patient died during study due to other cause; age above 12 years.

**Indications of surgery:** Symptomatic patients of PUJ obstruction

**Table 1: Chief complaints of patients (n=45).**

Chief Complaints	No. of patients	%
<b>Lumbar pain</b>	10	22
<b>Flank mass</b>	10	22
<b>Incidental (on USG)</b>	3	7
<b>UTI</b>	5	11
<b>Others (stones, hematuria, etc)</b>	2	5
<b>Fever</b>	5	11
<b>Nausea and vomiting</b>	10	22

Out of 45 children 10 (22%) presented with complaint of lumbar pain, 10 (22%) with complaint of flank mass, 10 (22%) with nausea and vomiting, 5 (11%) presented with complaints suggestive of UTI, 5 (11%) presented only with fever, 3 (7%) children were identified as a case of PUJO on ultrasound imaging, remaining 2 (5%) presented with complaint of rare complaint like hematuria and renal calculi. These were further investigated by methods afformentioned to be diagnosed as case of PUJ obstruction. Most common complaints in our study were lumbar pain (22%), flank mass (22%) and nausea and vomiting (22%). Children presented with complaints of hematuria and renal calculi were least common (5%). No children were diagnosed antenatally by ultrasound imaging and only 7% children were diagnosed as a case of PUJ obstruction by ultrasound imaging.

#### **Investigations**

- USG whole abdomen with KUB (renal parenchymal thickness, renal pelvis AP diameter)
- DTPA scan
- IVP (in non affordable patients)
- Complete blood count and renal function test.

On the basis of clinical symptoms and investigations described above patients were diagnosed as case of PUJ obstruction. A team of three surgeons operated all the patients.

**Duration of study:** 2015 to 2017.

**Type of study:** Prospective randomized study.

45 patients were randomized into 2 groups including stented (35) and non-stented (10) after taking consent from guardians after explaining the advantages and disadvantages of both stenting as well as non-stenting and the results of both the methods in the previous studies. So there was difference in the sample for both the groups. No case was detected antenatally.

**Statistical method:** Chi-square test.

DTPA scan was done in 15 patients (12 in stented group and 3 in non-stented group). The mean age, weight and height was calculated.

## RESULTS

Out of 45 children, 35 were stented and 10 were not stented. Mean age of stented children was 3.3 years and that of nonstented was 4.5 years suggesting no significant difference in age group. Mean height of children in stented group was 81.4 cm and that in nonstented group was 87.4 cm and this was also insignificant as per comparison. Male to female ratio was nearly same i.e. 3:1 in stented group and 4:1 in nonstented group. Mean serum creatinine value before surgery in stented group was 0.62 mg/dl and in nonstented group was 0.64mg/dL and both were insignificant as per comparison. Mean AP diameter was 12.89 mm in stented group and 14 mm in nonstented group and both were insignificant comparison wise before surgery. Mean GFR was 35.6mL/min in stented group before surgery and 35.3 ml/min in nonstented group before surgery and both values were comparable because of insignificant difference. Similarly mean parenchymal diameter in stented group before surgery was 11.17 mm and in nonstented group was 11.35 mm before surgery and both the values were nearly same and comparable due to insignificant difference.

**Table 2: Preop comparison parameters between stented and nonstented group.**

	Stented group (n=35)	Non-stented group (n=10)	P value
Mean age at surgery in years	3.3	4.5	0.229**
Mean height at surgery (cm)	81.4	87.4	0.303**
Mean weight at surgery (kg)	10.95	12.54	0.300**
Gender (Male: Female)	3:1	4:1	-
Means-creatinine at surgery(mg/dl)	0.62	0.64	0.044*
Mean APPD at surgery, (mm)	12.89	14	0.084**
Mean (GFR) before surgery (ml/min)	35.6	35.3	0.449**
Mean parenchymal diameter (mm)	11.17	11.35	0.403**

\*significant; \*\*insignificant.

Table 2 shows that children that were operated with stenting or nonstenting had all parameters comparable before surgery. The mean values of renal parenchymal diameter, APPD and GFR in both stented and non-stented group, before surgery were comparable as the p value was insignificant (Table 2).

All patients underwent Anderson Hyne's dismembered pyeloplasty and 35 children had double J stent (DJ stent) placed during surgery and 10 had no double J stent placed during surgery.

All patients were followed up every 3 months with ultrasonography (for mean renal parenchymal diameter and mean AP diameter); and serum creatinine and 15 patients had DTPA scan done because of non affordability.

Patients in both the groups were then compared on the basis of renal parenchymal diameter and renal pelvis AP diameter and GFR (DTPA scan) and serum creatinine after surgery.

**Table 3: Intra-op and post-op and follow up in stented and non-stented group.**

	Stented group (n=40)	Non-stented group (n=10)	P value
Mean operative duration (mins)	55	45	insignificant
Mean Foley duration (days)	2	2	-
Mean LOS (days)	3.34	3.6	0.280**
Mean FU duration (months)	3 Month	3 Month	-

\*\*insignificant.

All patients were catheterized with Foley's catheter of 8 Fr and 10 Fr depending on the age. Foley's catheter removed after 48 h of surgery in both the groups stented or nonstented. Double J stent was placed intraoperatively and removed 21 days postoperatively in stented group; and perinephric drain placed in both stented as well as nonstented children and was removed when collection was minimal. The mean duration for surgery in stented group was 55 minutes and in non-stented group was 45 minutes suggesting that both techniques had nearly same duration, i.e. insignificant as per p-value after applying Chi-square test. Mean length of stay or total duration of stay after surgery in stented group was 3.34 days and in nonstented group was 3.6 days and this was insignificant and both group children were discharged within 3-4 days. Follow up duration for stented and nonstented group was same i.e. 3 months after surgery. No intraoperative complication was encountered during surgery in both the groups and all children underwent uneventful surgery and recovered well postoperatively. Table 3 shows the mean duration of surgery, duration for which foley's catheter was placed and mean length of stay of children in both stented and nonstented group.

Parameters including renal parenchymal diameter, renal pelvis AP diameter, GFR after DTPA scan (affected kidney) and rate of complications were compared in both stented and non-stented group.

**Table 4: Comparison between presurgery and postsurgery parameters in stented group.**

Stented group				
S. No.	Parameters	Pre-surgery	Post-surgery	P value
1	Serum creatinine	0.62	0.58	0.010*
2	Mean APPD	12.89	12.37	0.083**
3	Mean GFR	35.6	39	0.007*
4	Mean renal parenchymal diameter	11.17	11.37	0.020*

\*significant; \*\*insignificant.

After surgery parameters were compared to that before surgery in stented group. The mean renal parenchymal diameter before surgery in stented group was 11.17 mm and postoperatively it increased to 11.37 mm suggesting an improvement in parenchymal thickness after surgery and this improvement was significant as per p value (0.020). The mean GFR before surgery in stented group was 35.6 ml/min and after surgery was 39 ml/min and this was significant improvement in renal function as measured by DTPA scan (p=0.007). The mean AP diameter in stented group before surgery was 12.89 mm and it was 12.37 mm after surgery, though there was a decrease in AP diameter after surgery yet it was insignificant improvement as per renal anatomy (p=0.083). Mean serum creatinine value before surgery in stented group was 0.62 mg/dl and it was 0.58 mg/dl after surgery but this difference was insignificant as per renal functions (p=0.010). There was significant improvement in both mean GFR and mean renal parenchymal diameter after surgery in stented group i.e. with DJ stent placed (Table 4).

**Table 5: Comparison between pre surgery and post surgery parameters in non-stented group.**

Non-stented group				
S. No.	Parameters	Pre-surgery	Post-surgery	P value
1	Serum creatinine	0.64	0.59	0.001*
2	Mean APPD	14	13.76	0.409**
3	Mean GFR	35.3	41	0.457**
4	Mean renal parenchymal diameter	11.35	11.46	0.074*

\*significant; \*\*insignificant.

The mean renal parenchymal diameter in nonstented group before surgery was 11.35 mm and 11.46 mm after surgery, though the parenchymal diameter was increased yet it was not significant (p=0.074). The mean glomerular filtration rate was 35.3 ml/min before surgery and it improved to 41 ml/min but this improvement was insignificant (p=0.457). The mean AP diameter in nonstented group before surgery was 14 mm and it

decreased to 13.76 mm after surgery but this change too was insignificant. Only parameter which showed a significant change was serum creatinine value which improved from 0.64 mg/dl before surgery to 0.59 mg/dl after surgery but this had no importance as it was in normal range of serum creatinine values.

Except mean APPD and mean GFR, rest two parameters showed significant difference stating that these two parameters were improved after surgery in non stented group (Table 5).

These results in case of nonstented group were might be due to less number of children operated (only 10 children out of 45).

There was a significant improvement renal parenchymal diameter and GFR in stented group after Pyeloplasty (Table 4).

The mean parenchymal diameter showed improvement in both stented and nonstented group though less significant in nonstented group after surgery i.e. 11.36 mm and 11.46 respectively, but on comparing both it was not significantly different suggesting improvement in renal parenchymal diameter after surgery in both stented and nonstented group was comparable (p=0.456).

The mean GFR increased in both the stented and nonstented group after surgery i.e. 39 mL/min and 41 mL/min respectively yet on comparison it was not significantly different (p=0.116) showing that children in both the groups showed similar change in GFR after surgery.

The mean AP diameter improved in stented group significantly after surgery and improved too but insignificantly in nonstented group after surgery, the postoperative comparison of this parameter in both the groups showed insignificant difference (p-value 0.052). This suggested that improvement in both groups in mean AP diameter was comparable.

The mean serum creatinine value improved significantly in nonstented group after surgery despite being in normal range of serum creatinine value of a normal child and no change in stented group after surgery; both postoperative values were comparable (p=0.302).

Thus it can be concluded from above data that children in both the groups stented or nonstented showed improvement in all measurable parameters used in this study and placing a DJ stent showed less complications.

The mean values of renal parenchymal diameter, APPD and GFR in both stented and non-stented group, after surgery was also comparable (Table 6).

Only 5 (14.28%) children out of 35 in stented group showed up with some complications after surgery. These

were urinary tract infection in 2 (40%), wound infections in 2 (40%) and 1 (20%) of urinoma formation or PUL.

5 (50%) children who underwent surgery in non stented group showed similar complications like stented group. These were urinary tract infection in 2 (40%), wound infection in 1 (20%), urinoma formation or PUL in 1 (20%), and restenosis in 1 (20%).

Only one complication was different between the groups and it was restenosis which was present only in nonstented group suggesting that a DJ stent might have reduced this complication in stented group.

Complications were present in both the groups after surgery but the number with respect to total operated cases was more in nonstented group i.e. 5 children out of 10 had complications and it was merely 5 children out of 35 in stented group.

The types of complications in both the groups stented or nonstented were same but their frequency of occurrence varied, more in nonstented group and less in nonstented group.

Though complications were more in nonstented group, on comparison both the groups stented and nonstented had insignificant difference ( $p=0.722$ ). This deduces that complications were present in both the groups after surgery and their nature was same.

This discrepancy in result despite of being more number of complication in nonstented group could be due to less number of cases in nonstented children in our study. All the parameters (complications) were present in both groups after surgery without any significant difference.

The % of complications were more in non-stented group (Table 7).

**Table 6: Post surgery parameters.**

	Stented group (n=35)	Non-stented group (n=10)	P value
Mean s-Creatinine after surgery, (mg/dl)	0.58	0.59	0.302 (insignificant)
Mean APPD after surgery, (mm)	12.37	13.76	0.052 (insignificant)
Mean (GFR) after surgery (ml/min)	39	41	0.116 (insignificant)
Mean parenchymal diameter (mm)	11.37	11.46	0.456 (insignificant)

**Table 7: Comparison of complications in stented and non-stented group.**

Complications	Stented	% complications	Non-stented	% complications
Fever (UTI)	2	40	2	40
Urinoma formation	1	20	1	20
Wound infection	2	40	1	20
Restenosis	0	00	1	20
P value	0.722 (insignificant)			

## DISCUSSION

Numerous studies have investigated whether stents are needed during pediatric pyeloplasty, but the question remains unanswered and the decision remains controversial and largely surgeon dependent. However, the original report by Anderson and Hynes described a stentless procedure; currently, one can find reports supporting no stents, externalized stents (percutaneous catheter), and internalized (JJ) stents.<sup>3,5-7,11-20</sup> This plethora of studies proves all methods to be safe and effective, but conflicting summaries of the results have not proved any single method as superior.<sup>21</sup> Through our comparative study on pyeloplasty we tried to answer the optimal method whether to do a stented or non-stented pyeloplasty in PUJ obstruction in paediatric patients.

Although the operative time was longer by a few minutes in the stented than in the nonstented group, the difference was not significant. A similar finding was reported by Elmalik et al and our study (Table 2).<sup>18</sup> The duration of

hospitalization has become an increasingly important issue in hospitals that have limited resources and lot of patient load.<sup>4,5,8,12,21,22</sup> In our study, the duration of hospitalization was nearly same in both groups i.e. mean length of stay (LOS) (Table 2). We discharged the stented patients after 3-5 days after removal of perinephric drain and recalled them for removal of the stents after 21 days, similarly we kept the nonstented patients in hospital until the perinephric drain content was minimal and was removed. Some authors reported similar results with a shorter hospital stay in the stented group.<sup>3,18-23</sup> Elmalik et al also explained this difference on the basis of keeping patients with PUL (urinoma) in patient.<sup>18</sup> In contrast, some authors stated that the nonstented group had a shorter hospital stay than the stented group.<sup>8,12,14,15,23-27</sup> However in our study the length of stay for both stented and non-stented patients was nearly the same (3 days) (Table 2). Most of the patients in our study were from rural area and were poor economically, so we kept the patients in ward until perinephric drain was removed. So, in contrary to Liss et al we discharged the non-stented

patients only after perinephric drain and Foley's catheter was removed.

The mean preoperative GFR and renal pelvis AP diameter (hydronephrosis) and renal parenchymal thickness was nearly same in both groups (Table 2). The mean operative duration in both groups was not significant. Postoperatively there was improvement in hydronephrosis and GFR in both stented and non-stented group but statistically not significant (Table 3 and 4). The complication rates were more in non-stented group than stented group however p-value was insignificant (Table 5).

The incidence of postoperative complications in both groups was comparable, with no significant difference (Table 7). We also had two cases in the nonstented group who suffered from a UTI despite antibiotic prophylaxis whether this was related to the stent or not cannot be judged from only four cases.

It was suggested that earlier removal of stents may reduce the risk for infection.<sup>18</sup> The rate of infections increased with stent use and in patients who have PUL (urinoma).<sup>2,8,21,23,28,29</sup> Özdemir and Arikan had no UTI in their stented patients where they used antibiotic prophylaxis until the stents were removed.<sup>23</sup> In the literature, PUL is more common in the non stented repairs.<sup>3,8,12,18,21,23</sup> In accordance with Arda et al in their study, there was no statistically significant difference regarding urine leakage through the perinephric drain in the stented and nonstented groups (Table 7).<sup>13</sup> The rate of PUL (urinoma) was 14% in Liss et al study.<sup>2</sup> The rate of urinoma formation in our study is 2.85% in stented group and 10% in non-stented group. In our study there was no stent dislodgement. Smith et al found also that there is no significant difference between the complications of the stented and nonstented repairs our study too have similar results (Table 7).<sup>21</sup> In our study out of the 35 stented repairs, complications developed in five (14.28%). Of the 10 nonstented repairs, complications developed in 5 (50%). In similar view to study of Bayne et al our study found no significant difference in the complication rate between the stented and nonstented patients (Table 7).<sup>25</sup> The results of our study on complications of pyeloplasty matches the analysis by Elmalik et al which concluded that complications related to surgical repair were significantly higher in the non-stented group, whereas stented patients suffered only stent-related complications, namely UTI and stent migration.<sup>18,23</sup> The success rate of open A-H dismembered pyeloplasty varies from 94 to 100% in different series.<sup>2,3,12,15,18,21,23,30,31</sup> Our success rate in both groups was nearly 100%. The outcome of repair regarding improvement of hydronephrosis and GFR was comparable in both groups (Table 3 and 4). There was significant improvement in both parameters as detected by postoperative USG and DTPA, with no significant difference between both groups. This is consistent with many other reports comparing the two techniques of pyeloplasty.<sup>12,18</sup> Some surgeons followed the patients only

with USG and performed an isotope scan only if USG showed worsening hydronephrosis or if patients develop symptoms of obstruction.<sup>2,21</sup> In our study Isotope scan was performed if patient's guardian were affordable or USG findings were inconclusive. The improvement in hydronephrosis observed in USG was noted from 3months post-operatively. Earlier improvement of hydronephrosis in stented than in nonstented patients was described.<sup>18,23,32</sup> Some authors denied early improvement in hydronephrosis after pyeloplasty and described improvement from 6months to 1 year.<sup>30,33,34</sup> We followed up patients for a minimum of 3 months. However, some surgeons concluded that follow-up can be discontinued after 3 months.<sup>35</sup> Psooy et al advised extending the follow-up period to 1 year to avoid repeat referrals.<sup>36</sup>

In dissent to study by Muhammad Siddique et al according to which open Anderson Hyne's Pyeloplasty is the gold standard for puj obstruction, but stents are not necessary to be placed during pyeloplasty, Our study shows both stenting and non-stenting shows similar results after Anderson Hyne's pyeloplasty remaining the gold standard (Tables 3-7).<sup>37</sup>

The comparable results of both techniques in our study shows that both the techniques have good results and to place a stent or not depends on the choice of surgeon but a stent should be placed wherever possible explaining the patient guardians about the time of removal and complications associated with it if not removed.

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