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Outcome of Pyeloplasty in Children with Split Renal Function Less Than 10%: A Retrospective Study

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ABSTRACT

Background: Ureteropelvic junction obstruction (UPJO) is one of the most common causes of upper urinary tract obstruction in the pediatric age group. Surgical repair is indicated in cases with significantly impaired renal drainage or progressive deterioration of renal function.

Objective: The aim of the current study was to identify the outcome of pyeloplasty in children with split renal function (SRF) less than 10%.

Patients and methods: This observational retrospective analytical study carried out on 28 children ≤ 16 years with split renal function of ipsilateral kidney ≤ 10% in the Urology Department, Faculty of Medicine, Zagazig University. The study was conducted during the period from 2013 to 2019. All patients were subjected at the time of pyeloplasty to clinical assessment, laboratory investigation & imaging study.

Results: GFR, SRF were highly significantly increased in post-operative follow up renogram at 6 months and 12 months. Antero-posterior diameter (APD) and parenchymal thickness were highly significantly reduced at 6 month post-operative follow up ultrasound. There were a highly significant improvement in degree of hydronephrosis from grades III & IV to I & II.

Conclusion: Our data confirm emerging evidence that the outcome and prognosis of Anderson-Hynes pyeloplasty (AHP) in children with severely impaired renal function is good that show highly significant improvement of renal function postoperative.

Keywords: Ureteropelvic junction obstruction, Renal function, Pyeloplasty.

INTRODUCTION

Ureteropelvic junction obstruction (UPJO) is the commonest cause of pediatric hydronephrosis occurring in 1/1000-1500 live births. UPJO is defined as obstruction to the flow of urine from the kidney to proximal ureter that results in renal damage and symptoms [(1)].

The Gold standard surgical treatment for UPJO is Anderson Hynes (AH) dismembered pyeloplasty with or without surgical reduction of the renal pelvis. There are certain parameters to assess the post-operative outcomes of pyeloplasty. The ultrasound parameters are the reduction in the AP diameter of the pelvis and increase in parenchymal thickness in a growing kidney [(2)].

There are certain parameters to assess the post-operative outcomes of pyeloplasty. The ultrasound parameters are the reduction in the AP diameter of the pelvis and increase in parenchymal thickness in a growing kidney. The definitive evidence of improved function is by doing an isotope renogram in the follow-up period, objectively to look for the improvement in GFR (glomerular filtration rate) and also the radiotracer clearance from the PCS (pelvi-calyceal system). [(3)]

The indication for pyeloplasty versus nephrectomy is mainly based on the results of repeated renal ultrasonography (US) and diuretic renogram with SRF [(4)]. Nephrectomy is usually recommended if SRF is less than 10 %. However, recent studies with long-term follow-up indicate that even with an initial SRF of < 10%, a significant improvement of SRF may be seen when pyeloplasty is performed [(5)].

The aim of the present study was to identify the outcome of pyeloplasty in children with split renal function less than 10%.

PATIENTS AND METHODS

This observational retrospective analytical study was carried out on 28 children ≤ 16 years with split renal function of ipsilateral kidney ≤ 10% in the Pediatric Unit, Urology Department, Faculty of Medicine, Zagazig University, after review of our data base system to identify the outcome of pyeloplasty in children with split renal function less than 10%, during the period from 2013 to 2019.

Inclusion criteria: Children who were ≤ 16 years at the time of pyeloplasty for 1ry pelviureteric junction obstruction (UPJO), split renal function of ipsilateral kidney ≤ 10%. All patients underwent stented Anderson-Hynes dismembered pyeloplasty.

Exclusion criteria: Bilateral UPJO, redo pyeloplasty, children with ureteral anomalies associated with UPJO (VUR or ureteric stricture) and secondary cause of UPJO.

Intraoperative: All patients in our study underwent stented Anderson–Hynes dismembered pyeloplasty (with reduction of dilated renal pelvis).

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All patients were subjected at the time of pyeloplasty to the following:

Clinical assessment: History (Patient demographic characteristics such as age, gender, and past history), Complaint (Either from parents or from patient itself). General examination (including abdominal mass and external genitalia).

Laboratory investigations: Routine preoperative investigation including: Complete blood count, bleeding profile including prothrombin time, prothrombin concentration, and International Normalized Ratio, liver function tests, serum creatinine level and urine analysis – urine culture and if positive, patient was treated with the appropriate antibiotic before surgery.

Imaging studies: Abdominopelvic ultra sound (serial) to assess (A – P diameter of renal pelvis, parenchymal thickness, degree of hydronephrosis according to the classification of the Society for Fetal Urology (SFU), ureter status (dilated or not) and bladder status (post voiding residual urine). Magnetic resonance urography (MRU) when indicated to delineate the anatomy of the urinary tract. Renal isotope scans using 99 m Diethylenetriaminepenta acetic acid (DTPA**)** (to look for split renal function, T 1/2 and GFRvalue.

Primary endpoint: Improvement of GFR and SRF post-pyeloplasty.

Secondary endpoint: Relation between age and degree of improvement of renal function post pyeloplasty.

Ethical consent:

An approval of the study was obtained from Zagazig University Academic and Ethical Committee. Every patient signed an informed written consent for acceptance of participation in the study. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical Analysis

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The distribution of quantitative data was tested by Kolmogorov-Smirnov test of normality. The quantitative data were presented as mean ± SD and ranges when parametric while non-parametric were presented as median with inter-quartile range (IQR). Also, qualitative variables were presented as number and percentages. The comparison between groups regarding qualitative data was done using Chi-square test and/or Fisher exact test when the expected count in any cell found less than 5. The comparison between two independent groups with quantitative data and parametric distribution was done using Independent t-test while with non parametric distribution was done using Mann-Whitney test. P value ≤ 0.05 was considered significant.

RESULTS

Mean age of patients was 30 ± 2.26 month, 16 were male and 12 were female. Left side in 16 patients and right side in 12 patients (Table 1).

Table (1): Demographic data of the studied group

	N = 28
Age (months)	
$\bar{X}$ **± SD**	30 ± 26.6
Range	3- 84
Gender	
Male	16 (57.1%)
Female	12 (42.9%)
Side	
RT	12 (42.9%)
LT	16 (57.1%)

GFR was highly significantly increased in post-operative follow up renogram at 6 months and 12 months (10.4 ± 2.33 and 16.9 ± 3.2 ml/min) respectively (Table 2).

Table (2): Changes in glomerular filtration rate (GFR)

	GFR (ml/min)	**Paired t**	**P**
Preoperative			
$\bar{X}$ **± SD**	6.8 ± 2.06		
Range	3- 10.4		
6 month postoperative			
$\bar{X}$ **± SD**	10.4 ± 2.33	16.5	< 0.001**
Range	6.5 – 16.6		
1 year postoperative			
$\bar{X}$ **± SD**	16.9 ± 3.2	17.45	< 0.001**
Range	11.7 – 22.6		

SRF was highly significantly increased in postoperative follow up renogram at 6 and 12 months (12.1 ± 2.49 and 17.3 ± 3.5) %, respectively (Table 3).

Table (3): Changes in split renal function (SRF)

	SRF (%)	**Paired t**	**P**
Preoperative			
$\bar{X}$ **± SD**	8.85 ± 2.63		
Range	4 – 17		
6 month postoperative			
$\bar{X}$ **± SD**	12.1 ± 2.49	12.17	< 0.001**
Range	7.5 – 20		
1 year postoperative			
$\bar{X}$ **± SD**	17.3 ± 3.5	13.75	< 0.001**
Range	12 – 22		

Antero-posterior diameter (APD) was highly significantly reduced at 6 months postoperative follow up ultrasound (P < 0.001) (Table 4).

Table (4): Changes in A-P diameter

	APD (mm) $\bar{X}$ ± SD (Range)	Paired t	P
Preoperative	56.7 ± 11.3 (32 – 70)	16.7	< 0.001**
6 month postoperative	25.8 ± 3.5 (20 – 30)		

Parenchymal thickness was highly significant increase in the postoperative follow up ultrasound at 6 months (P < 0.001) (Table 5).

Table (5): Changes in parenchymal thickness

	Parenchymal Thickness (mm) $\bar{X}$ ± SD (Range)	Paired t	P
Preoperative	3.9 ± 1.3 (2 – 6)	47.6	< 0.001**
6 month postoperative	9.6 ± 1.1 (7 – 11)		

There were a highly significant improvement in degree of hydronephrosis from grades III and IV to I and II. (Table 6).

Table (6): Classification of hydronephrosis before and after intervention

	Degree								P
	I		II		III		IV		
	N	%	N	%	N	%	N	%	
Preoperative	0	0.0	0	0.0	6	21.4	22	78.6	< 0.001**
Postoperative	7	25.0	21	75.0	0	0.0	0	0.0	

DISCUSSION

Uretero-pelvic junction obstruction (UPJO) is the most common obstructive pathology in the upper urinary tract, with a reported incidence of 1:500 to 1:1250 live births. Pyeloplasty is indicated in the following: Split renal function (< 40%), deterioration of split renal function of > 10% in serial studies, impaired drainage after the injection of lasix, increased anteroposterior diameter on serial ultrasound and Grade III and IV dilatation according to the Society for Fetal Urology **(6).**

The intervention for poorly functioning kidneys has no clear protocol, which can be used as a guideline. The traditional intervention is nephrectomy but recently, there were studies, which recommend pyeloplasty even with SRF<10% as these kidneys show significant improvement. Poorly functioning kidneys with UPJO [split renal function (SRF) < 10% on renal dynamic scan (RDS)] present a therapeutic dilemma wherein one has to choose between pyeloplasty and nephrectomy. Performing pyeloplasty in a kidney with irreparable damage would unnecessarily add to the cost of treatment and increase the morbidity of the patient. On the other hand, doing nephrectomy in a potentially salvageable kidney would be disastrous **(7).**

This is observational retrospective analytical study that was carried out in the Urology Department, Faculty of Medicine, Zagazig University, after review of our data base system to identify the outcome of pyeloplasty in children with split renal function less than 10%, during the period from 2013 to 2019.

The current study showed that split renal function was improved from 8.85 ± 2.63 pre-operative to 12.1 ± 2.49 after 6 months and 17.3 ± 3.5 at one year postoperative with a statistical significant difference between preoperative and postoperative differential functions (P < 0.001). This is in agreement with the study of **Lone *et al.*** **(8)** where they studied 24 patients with SRF ≤ 15% and divided them into two groups: group A (11%-15%) and group B (≤ 10%). The overall preoperative mean SRF was 10.61 ± 5.23% that increased in post-operative follow up to 18.08 ± 7.3%, 18.17 ± 8.63% and 18.42 ± 8.42% at 3 months, 9 months and 18 months respectively. Preoperative mean SRF in group A was 14.4 ±1.01% increased in postoperative follow up to 19.6±6.1% (p value 0.29) and in group B was 5.3±3.7% increased to 16.7±8.8% (p-value 0.03), so they concluded that in spite both group shows improvement, it was significant in group B and overall but not in group A. another study of **Ibrahim *et al.*** **(9)** reported that in patient with initial SRF 10-20%, SRF increased from15.74 ± 2.30% to 23.07 ± 6.75, (p-value 0.001) which is highly significant and in patient with initial SRF < 10%, SRF increased from 6.21 ± 2.26 to 15.04 ± 7.09 which is significant.

The current study showed that there was a significant increase in GFR from 6.8 ± 2.06 preoperative to 10.4 ± 2.33 at 6 months postoperative and 16.9 ± 3.2 at one year postoperative (P < 0.001). **Underbjerg *et al.*** **(10)** reported that 71% (12 of 17) of patients showed improved GFR after pyeloplasty.

The current study showed that the APD was significantly reduced from 56.7 ± 11.3 preoperative to 25.8 ± 3.5 at 6 month postoperative (P < 0.001). Similarly **Abdelaziz *et al.*** **(11)** who analyzed the data from 25 cases of ureteropelvic junction obstruction (UPJO) candidate for pyeloplasty with SRF less than 10% and they reported that the median APD of the renal pelvis was 3 cm (range: 2.2–5). There was significant improvement of median APD 0.8 cm (range: 0.5–1.9) (P value <0.05).

The current study showed that there was a significant improvement in degree of hydronephrosis from grades III and IV to I and II. **Tapia and Gonzalez** **(12)** reported that pyeloplasty in children younger than 1 year with grades 3 or 4 hydronephrosis secondary to UPJO is effective at improving renal function and they recommended early pyeloplasty for children with reduced function of the involved kidney.

The current study showed that there was a highly significant increase in parenchymal thickness from 3.9 ± 1.3 pre-operative to 9.6 ± 1.1 after 6 month post-operative ($p < 0.001$). Similar results were reported by **El-Desoukey *et al.* [13]** who revealed that the parenchymal thickness increased along with the serial follow-up with a statistically highly significant difference between pre- and post-operative values at the 6th month post-operative.

By contrast, **Ransley *et al.* [14]** reported that deterioration of renal function occurred in only 23% of renal units with good function as ascertained by renography initially, and they proposed that conservative observation could be possible in infants who demonstrate relatively good renal function postnatally.

CONCLUSION

Our data confirmed emerging evidence that the outcome and prognosis of Anderson-Hynes pyeloplasty (AHP) in children with severely impaired renal function is good and showed highly significant improvement of renal function post-operatively.

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Conflict of interest: Nil.

REFERENCES

1. **Pramod S, Ramji A (2018):** Clinical profile and outcome of pelvi-ureteric junction obstruction (PUJO) in children presenting above 1 year. International Surgery Journal, 5 (9): 3066-3071.
2. **Goguş Karamürsel T, Tokatli Z (2004):** Long-term results of Anderson-Hynes pyeloplasty in 180 adults in the era of endourologic procedures. Urol Int., 73 (1): 11-15.
3. **Romao R, Farhat W, Pippi Salle J *et al.* (2012):** Early postoperative ultrasound after open pyeloplasty in children with prenatal hydronephrosis helps identify low risk of recurrent obstruction. J Urol., 188 (6): 2347-53.
4. **Nishi M, Matsumoto K, Fujita T *et al.* (2016):** Improvement in renal function and symptoms of patients treated with laparoscopic pyeloplasty for ureteropelvic junction obstruction with less than 20% split renal function. Journal of Endourology, 30 (11): 1214-1218.
5. **Nordenström J, Koutozi G, Holmdahl G *et al.* (2020):** Changes in differential renal function after pyeloplasty in infants and children. Journal of Pediatric Urology, 16 (3): 329-e1.
6. **Radmayr C, Bogaert G, Dogan H *et al.* (2016):** Management of undescended testes: European Association of Urology/European Society for Paediatric Urology Guidelines. J Pediatr Urol., 12 (6): 335-343.
7. **Kumar V, Yadav R, Hasan Z *et al.* (2019):** Role of Nephrostomy in poorly functioning kidneys in patients with ureteropelvic junction obstruction (UPJO). Iranian Journal of Pediatric Surgery, 5 (1): 1-5.
8. **Lone Y, Samujh R, Bhattacharya A *et al.* (2017):** Outcome of poorly functioning kidneys secondary to PUJO preserved by pyeloplast. Journal of Pediatric Surgery, 52 (4): 578-581.
9. **Ibrahim Selmy G, Mohamed Salih E, Salah El-Din Zykri M *et al.* (2019):** outcome of pediatric pyeloplasty in renal units with split renal function less than 20%. Al-Azhar Medical Journal, 48 (4): 489-500.
10. **Underbjerg E, Munch T, Taagehøj-Jensen F *et al.* (1987):** The functional outcome of Anderson-Hynes pyeloplasty for hydronephrosis. Scandinavian Journal of Urology and Nephrology, 21 (3): 213-217.
11. **Abdelaziz A, Shaker H, Aly H *et al.* (2018):** Early outcome of pediatric pyeloplasty in kidneys with split renal function less than 10%: A prospective study of 25 cases. African Journal of Urology, 24 (4): 324-330.
12. **Tapia J, Gonzalez R (1995):** Pyeloplasty improves renal function and somatic growth in children with ureteropelvic junction obstruction. The Journal of Urology, 154 (1): 218-222.
13. **El-Desoukey M, Khalil S, Salem E *et al.* (2021):** Role of Renal Parenchymal Thickness and Renal Isotope Scan in Predicting Outcome after Pyeloplasty in Children with Ureteropelvic Junction Obstruction (UPJO). Egyptian Journal of Hospital Medicine, 82(2): 329-334.
14. **Ransley P, Dhillon H, Gordon I *et al.* (1990):** The postnatal management of hydronephrosis diagnosed by prenatal ultrasound. The Journal of Urology, 144 (2): 584-587.