Original Article

Optimal length of follow-up after successful pediatric pyeloplasty

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Abstract

Objective: Ureteropelvic junction obstruction (UPJO) is a common congenital anomaly, and dismembered pyeloplasty is the standard treatment. However, following surgery, the appropriate duration of follow-up has not been described well. We conducted this study in order to investigate the optimal length of follow-up after a successful operation.

Material and Method: This is a retrospective study performed in all pediatric patients who underwent pyeloplasty at Chulalongkorn Memorial Hospital from January 2007 to December 2016. The inclusion criteria were patients who demonstrated improvement in the degree of hydronephrosis from postoperative ultrasound, became asymptomatic and required no further operation. We excluded patients who had bilateral disease, solitary kidney or other associated KUB anomalies. All patients underwent periodic KUB ultrasound to identify the degree of hydronephrosis, classified by the Society of Fetal Ultrasound (SFU) system. We assessed the optimal duration of follow-up until the degree of hydronephrosis was stable.

Result: A total of 42 UPJO patients were included in the study (36 males and 6 females). The median age at surgery was 1 year, and disease on the left side was slightly predominate (57.1%). Preoperative imaging revealed SFU Grade III hydronephrosis in 4 patients (9.5%) and grade IV in 38 patients (90.5%). The median duration of follow-up was 36 months. Following pyeloplasty, the degree of hydronephrosis stabilized in 73% at 24 months, 80.4% at 36 months, 85.3% at 48 months, 90.2% at 60 months, 97.6% at 72 months, and 100% at 84 months.

Conclusion: After successful pyeloplasty, a reduction in the degree of hydronephrosis correlated well with the follow-up duration and stabilized at 7 years. Result from this study may be useful for establishing a guideline for follow-up in the future.

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Introduction

Ureteropelvic junction obstruction (UPJO) is a common congenital anomaly found in pediatric patients. The incidence is more common in males[1] in infant and toddler age groups[2]. The disease occurs bilaterally in 10-40%[3], and up to 50% of the affected patients have other associated urologic abnormalities[4]. These include contralateral UPJO followed by renal dysplasia, multicystic dysplastic kidneys, renal agenesis[1] and VATER syndrome[5]. In addition, VUR is seen in 40% of UPJO patients and is likely to resolve spontaneously[6].

Most of the UPJO cases ultimately resolve over time. Only one third of the affected patients require dismembered pyeloplasty,[7] which is the gold standard surgical treatment[8]. Surgery is indicated in the following situations: increasing anteroposterior diameter of the renal pelvis on follow-up imaging, low or decreasing differential renal function, break-through infection on top of prophylactic antibiotics, and flank or abdominal pain resulting from hydro-nephrosis. Following surgery, surveillance imaging is required to evaluate the resolution of hydronephrosis, monitor renal growth, and detect any possible recurrent obstruction. However, a standard guideline for postsurgical follow-up is still lacking. Thus, this study was purposed to define the acceptable length of postoperative follow-up imaging in patients who have undergone pyeloplasty.

Material and Method

After approval from the institutional ethics committee, we retrospectively collected the clinical data from all pediatric patients who successfully underwent pyeloplasty at Chulalongkorn Memorial Hospital from January 2007 to December 2016. The inclusion criteria were patients who demonstrated improvement in the degree of hydronephrosis from postoperative ultrasound, became completely asymptomatic and required no further operation. We excluded patients who had bilateral disease, solitary kidney, associated vesicoureteral reflux, or other associated KUB anomalies. All patients underwent serial KUB ultrasound to identify the degree of hydronephrosis, classified by the Society of Fetal Ultrasound (SFU) system: grade 1 - dilatation of the renal pelvis without dilatation of the calyces, grade 2 - mild dilatation of the renal pelvis and calyces, grade 3 - moderate dilatation of the renal pelvis and calyces with blunting of fornices and flattening of papillae and grade 4 - gross dilatation of the renal pelvis and calyces which appear ballooned and cortical thinning[9-11]. We assessed the optimal duration of follow-up until the degree of hydronephrosis was improved and stable.

Statistical Analysis

Continuous data are presented with median and interquartile range (IQR). Categorical data are expressed as a percentage. Time to event analysis was used to calculate the time and rate of hydronephrosis grading improvement, and the log rank test was used for comparisons between the groups. Statistical significance was defined as $p<0.05$ STATA version 13.1 (StataCorp, College Station, TX, USA) was used to perform all statistical analyses.

Result

Eighty pediatric patients underwent successful pyeloplasty during the study period. Thirty-eight patients were subsequently excluded due to bilateral disease (18 cases), associated anomalies (11 cases), incomplete data (7 cases) and solitary kidney (2 cases). A total of 42 patients were included in the analysis (36 males and 6 females). The median age at surgery was 1 year, and disease of the left side (57.1%) slightly predominated the right side (42.9%). According to the SFU grading system, 4 renal units (9.5%) demonstrated grade III hydronephrosis and 38 renal units (90.5%) demonstrated grade IV hydronephrosis preoperatively. All patients were operated on with open Anderson-Hynes dismembered pyeloplasty. The median follow-up duration was 36 months (range: 9 to 84 months) (Table 1).

During the follow-up period, the degree of hydronephrosis was stabilized at 24 months in 73.04%, at 36 months in 80.39%, at 48 months in 85.29%, at 60 months in 90.2%, at 72 months in 97.55% and at 84 months in 100% of all patients (Table 2) (Figure 1).

Table 1. Preoperative patient characteristics.

Parameters	Value
Age (years)	
• Mean (SD)	3.5 (3.7)
• Median (IQR)	1 (0.9-7)
• Min-max	0.5-13
Gender, n (%)	
• Male	36 (85.7)
• Female	6 (14.3)
Laterality, n (%)	
• Right	18 (42.9)
• Left	24 (57.1)
Hydronephrosis grading, n (%)	
• SFU grade 3	4 (9.5)
• SFU grade 4	38 (90.5)
Duration of follow-up (months)	
• Mean (SD)	44.4 (22)
• Median (IQR)	36 (24-60)
• Min-max	9-84

Table 2. Cumulative rate of improvement in the degree of hydronephrosis following surgery.

Months	N of follow-up	N of degree decreased	% degree decreased	95%CI	
				Lower	Upper
6	42	1	2.38	0.34	15.72
9	41	6	16.67	8.32	31.81
12	34	10	41.18	27.95	57.65
18	24	3	48.53	34.60	64.61
24	21	10	73.04	59.02	85.43
36	11	3	80.39	67.14	90.79
48	8	2	85.29	72.85	94.03
60	6	2	90.20	78.90	96.88
72	4	3	97.55	88.93	99.81
84	1	1	100	-	-

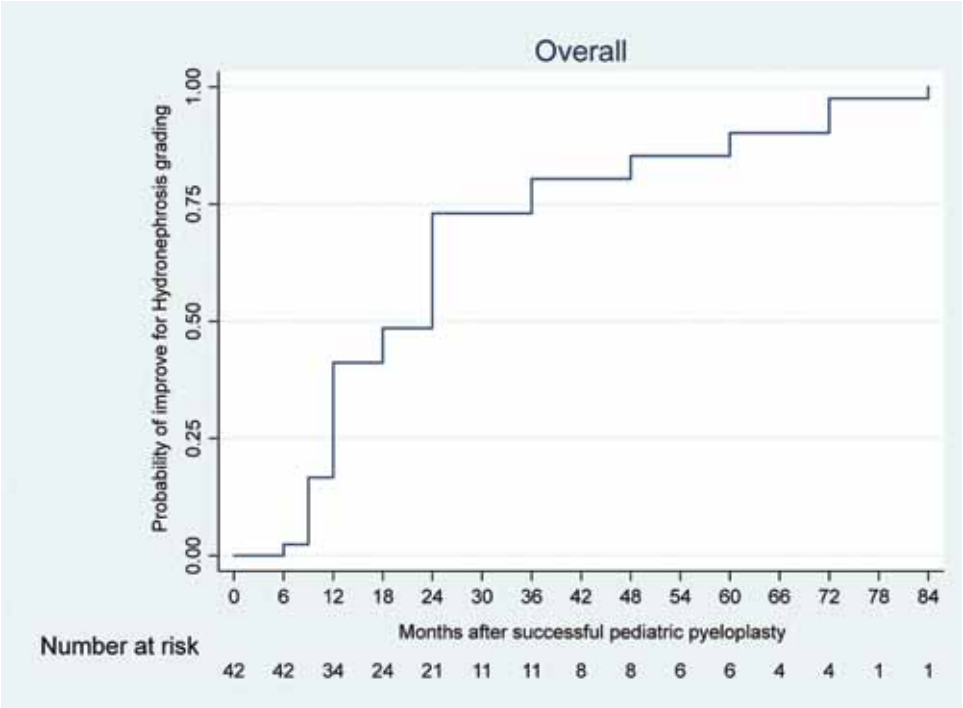

Figure 1. Probability rate of improvement in the degree of hydronephrosis following surgery.

Subgroup analysis was performed based on the preoperative degree of hydronephrosis. For 4 patients with SFU grade 3, the degree of hydronephrosis stabilized at 24 months and 48 months in 75% and 100%, respectively. For the 38 patients with hydronephrosis SFU grade 4, the degree of hydronephrosis was stabilized at 24 months, 48 months and 84 months in 72.84%, 83.7% and 100%, respectively (Table 3) (Figure 2).

Discussion

At the present time, the standard guideline of postoperative follow-up for patients undergoing pyeloplasty is still unavailable. A primary outcome of our study was evaluating the ideal follow-up time after successful pyeloplasty. We used ultrasounds as the imaging modality, which is a non-invasive investigation, to evaluate an acceptable length of follow-up. Although MAG-3 renal scan provides more information, the cost is higher and also causes excessive exposure to radiation.

In a larger series, Utsav K. reviewed 264 pyeloplasties of which 14 patients (5.3%) had a recurrent obstruction, 85% of those with failure were diagnosed and underwent successful redo pyeloplasty within 3 years. Based on the results, they concluded that a minimum of 3 years of follow-up is necessary to detect the majority of recurrent obstructions.[12]

Polok M. reviewed 35 patients after open pyeloplasty to assess the effectiveness and conducted a long-term follow-up after the operation (4 years at least). Four patients required surgical intervention and most complications occurred within 2 years after surgery.[13]

Reis et al.reviewed 28 patients who underwent pyeloplasty with a median follow-up of 10.7 years. They found that the diuretic renogram at 3 to 6 months after the operation with maintained renal function and stable hydronephrosis suggests no need for further follow-up and indicates no functional loss with time.[14]

Table 3. Cumulative rate of improvement in the degree of hydronephrosis, classified by the preoperative SFU grading.

Months	N of follow-up	N of degree decreased	% degree decreased	95%CI	
				Lower	Upper
SFU3					
9	4	1	25	3.95	87.21
12	3	1	50	15.51	94.22
24	2	1	75	33.47	99.11
48	1	1	100	-	-
SFU4					
6	38	1	2.63	0.37	17.25
9	37	5	15.79	7.42	31.81
12	31	9	40.24	26.53	57.67
18	22	3	48.39	33.82	65.35
24	19	9	72.84	58.06	85.84
36	10	3	80.98	67.08	91.62
48	7	1	83.70	70.24	93.38
60	6	2	89.13	76.85	96.55
72	4	3	97.28	87.87	99.79
84	1	1	100	-	-

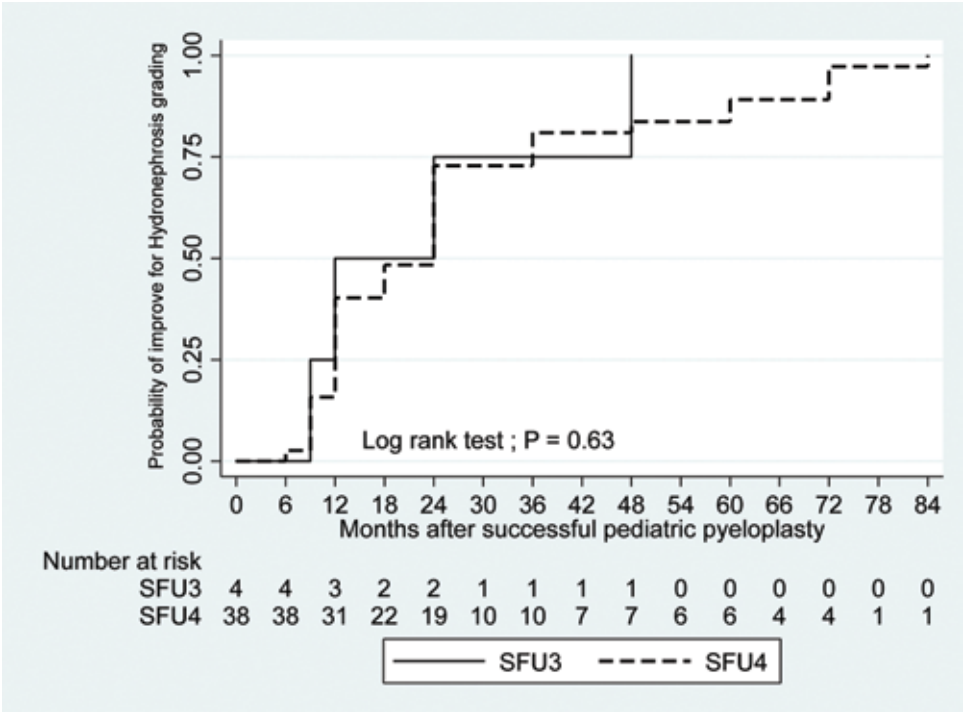

Figure 2. Probability comparison of the improvement in the degree of hydronephrosis between SFU grade 3 and SFU grade 4.

Our study demonstrated that the degree of hydronephrosis stabilized at 7 years following successful pyeloplasty. This finding may be useful in designing a follow-up plan for UPJO patients. However, 2 limitations existed in the study. First, it is a single-center study with retrospective design, which may lead to bias in patient selection and incomplete data collection. Second, more than 1 surgeon took part in the pyeloplasty procedures. Different surgical techniques were utilized which potentially affected postoperative outcomes.

Conclusion

Surveillance ultrasound following successful pyeloplasty beyond 7 years may be unnecessary. Further large scale prospective studies with longer follow-up periods are required to confirm our results.

Conflict of interest

The authors declare no conflict of interest.

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