

Original Article

Ureteropelvic Junction Obstructions: Is Side a Prognostic Factor?

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INTRODUCTION

Antenatal hydronephrosis (HN) occurs in 1%–5% of all pregnancies.^[1] The most common cause of HN is ureteropelvic junction obstruction (UPJO; 10%–30% of cases), which reduces urine flow from the renal pelvis to the ureter.^[2] Surgery is required in 20% of patients due to severe, symptomatic obstruction.^[3] If symptomatic patients are not treated in a timely manner, UPJO can cause chronic infection, urolithiasis, and a progressive deterioration of kidney function.^[4]

In the literature, the natural history and pathophysiology of both asymptomatic and symptomatic UPJO have been evaluated, and management guidelines that consider the pathophysiology, epidemiology, diagnosis, and classification of UPJO have been proposed.^[5] Although

ABSTRACT

Background: Ureteropelvic junction obstructions (UPJOs) occur more frequently on the left than on the right side. Among patients diagnosed during the neonatal period, those with left-side UPJO have a more severe course than those with right-side UPJO. **Aim:** This study examined clinical advances in the surgical management of right and left symptomatic UPJOs preoperatively and postoperatively, based on a retrospective analysis of cases. **Patients and Methods:** In this retrospective clinical trial, 650 patients were evaluated at the time of diagnosis and at surgery. **Results:** Left-side UPJO was diagnosed in 66.1% of patients ($P = 0.017$). The median age of the patients at surgery for left- and right-side UPJO was 1.5 and 4.2 years, respectively ($P = 0.001$). At the preoperative evaluation, the ratio of parenchymal thickness (RPT) on the UPJO side versus the contralateral side was 0.55 ± 0.3 and 0.7 ± 0.3 for patients with left-side and right-side UPJO, respectively ($P = 0.029$). RPT during the first postoperative year was 0.83 ± 0.2 for patients treated on the left side and 0.9 ± 0.3 for those treated on the right side ($P = 0.25$). The respective values at 3 years postoperatively were 0.8 ± 0.3 and 0.9 ± 0.2 ($P = 0.09$). The preoperative kidney function value in the left-side group was 42.5 ± 13.4 , which declined to 39.52 ± 15.8 at the 3-year follow-up examination. In the right-side group, preoperative kidney function was 38.8 ± 16.1 , which increased to 40.2 ± 13.2 at 3 years postoperatively. Both the decline and improvement were significant (both $P = 0.006$). **Conclusions:** Those with left-side UPJO had a more severe course than those with right-side UPJO.

KEYWORDS: Hydronephrosis, pediatric, pyeloplasty, ureteropelvic junction obstruction

the guidelines for right and left UPJOs are identical, clinical experience suggests differences in the clinical course and postoperative outcome of UPJO according to the side.

Thus, in this retrospective clinical study, we evaluated the outcomes of patients who underwent surgical treatment for right-side or left-side UPJO to reveal whether the side offers prognostic criteria for follow-up.

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METHODS

Approval for this study was obtained from the local Ethics Committee (No: 2020/73). The clinical data of UPJO patients who underwent surgical treatment between 1980 and 2017 were retrospectively reviewed. The criteria for surgical intervention were as follows: presence of symptoms (pain, hematuria, etc.), a progressive increase in the renal pelvis anteroposterior (AP) diameter, a progressive decrease (> 10%) in functional uptake by the affected kidney on nuclear imaging studies, and urinary tract infection caused by obstruction. Voiding cystourethrography was performed preoperatively in all patients. Retrograde pyelography was not a routine component of the perioperative work-up.

The medical records of the patients were retrospectively reviewed, and the following information was extracted: age at diagnosis, time of surgery, median parenchymal thickness of the UPJ and contralateral sides (preoperatively, and 1 and 3 years postoperatively), pelvic diameter, kidney size, and kidney function. To obtain more objective data, the ratios of UPJO parenchyma thickness and intact kidney parenchyma thickness were also examined.

The patients were divided into two groups depending on whether the UPJO involved the right or left side. Differences between the groups were examined. Patients with bilateral UPJO were excluded from the study.

Statistical analysis

The conformity of the data to the normal distribution was examined with the Shapiro–Wilk test. Comparison of two continuous variables conforming to normal distribution was performed with student's *t*-test, and examination of the relationship between two continuous variables not conforming to normal distribution was performed with the Mann–Whitney *U* test. The variation between two dependent continuous variables that did not conform to the normal distribution was examined using the Wilcoxon signed-rank test. The relationship between categorical variables was examined with the Chi-squared test. The statistical significance level was determined as 0.05. The analyses were performed using MedCalc statistical software version 12.7.7 (MedCalc Software bvba, Ostend, Belgium; <http://www.medcalc.org>; 2013).

RESULTS

Among the 650 patients with surgically treated UPJO, 513 without bilateral obstruction and who followed-up for at least 3 years were included in the study (361 males (70%) and 152 females (30%); ratio: 2.3:1). Of these, 315 cases (61.4%) were diagnosed prenatally, and 198 were diagnosed

Table 1: Comparison of the right- and left-side ureteropelvic junction obstruction (UPJO) groups

Side	Left	Right	<i>P</i>
Total cases	316 (61.5%)	197 (38.5%)	
Sex (male: female)	3:2	3:1	
Prenatal diagnosis	66.1%	33.9%	0.017
Delayed diagnosis	93 (54.7%)	77 (45.3%)	0.431
Age at surgery (y)	2.7 (0.1-17)	4.2 (0.1-17)	0.001
Parenchymal ratio (UPJO/Opposite kidney) at diagnosis	0.6±0.3	0.7±0.5	0.061
Parenchymal ratio at surgery	0.55±0.3	0.7±0.3	0.029
Parenchymal ratio at the 1-year postoperative follow-up	0.82±0.2	0.9±0.3	0.556
Parenchymal ratio at the 3-year postoperative follow-up	0.8±0.3	0.9±0.2	0.090
Pelvic diameter at surgery	29.6±11.3	28.6±11.3	0.431

Table 2: Kidney function scores at various timepoints

Side	Left	Right	<i>P</i>
Kidney function at diagnosis	44.9±11.1	42.7±12	
Kidney function at surgery	42.5±13.4	38.8±16.1	0.706
Kidney function at 1 year postoperatively	41.8±13.8	40.5±13.4	0.493
Kidney function at 3 years postoperatively	39.5±15.8	40.2±13.2	0.493
<i>P</i>	0.006	0.006	0.672
	(Functional decline)	(Functional improvement)	

thereafter (38.6%) (ratio: 1.6:1). The obstruction involved the left side in 316 patients (61.5%) and the right side in 197 patients (38.5%) (ratio: 1.6:1). Regarding the diagnoses during the neonatal period, 66.1% of the UPJOs were on the left side, and 33.9% were on the right side (2:1). Among patients diagnosed after this period, 108 (54.6%) had left-side involvement, and 90 (45.4%) had right-side involvement (1.2:1). The difference in sides between the left and right groups was significant only for the neonatal group (*P* = 0.017) [Table 1]. Patients with right- and left-side UPJO underwent surgery at a mean age of 4.2 (range: 0.1–17) years and 1.5 (range: 0.1–17) years, respectively (*P* = 0.001).

At the time of diagnosis, the ratio of parenchymal thickness (RPT) on the UPJO side/contralateral side kidney was 0.7 ± 0.5 in patients with right-side UPJO and 0.6 ± 0.3 in those with left-side UPJO (*P* = 0.061). The pelvic diameter of the left UPJO group was 29.6 ± 11.3 mm and that of the right UPJO group 28.6 ± 11.3 mm (*P* = 0.431). The kidney function percentage was $42.5 \pm 13.4\%$ and $38.8 \pm 6.1\%$ in the right- and left-side UPJO groups, respectively (*P* = 0.876). There was no significant difference in the RPT, pelvic diameter, or kidney function between the two groups [Table 1].

At the time of surgery, the RPT of the UPJO versus the contralateral kidneys was 0.7 ± 0.3 and 0.55 ± 0.3 for patients with right- and left-side involvement, respectively ($P = 0.029$).

At the 1-year postoperative follow-up, the RPT of the UPJO / intact kidney was 0.9 ± 0.3 and 0.82 ± 0.2 in the right- and left-side groups, respectively ($P = 0.556$).

The ratio at the 3-year postoperative follow-up examination was 0.9 ± 0.2 and 0.8 ± 0.3 in the right- and left-side groups, respectively ($P = 0.09$). Kidney function declined in the left-side UPJO group from 42.5 ± 13.4 preoperatively to 39.52 ± 15.8 at the 3-year follow-up, but in the right-side UPJO group, it improved during the same period, from 38.8 ± 16.1 to 40.2 ± 13.2 . Both the decline and improvement were significant (both $P = 0.006$) [Table 2].

Vesicoureteral reflux (VUR) occurred in 20 (6.3%) of the patients in the left-side UPJO group and in 14 (7.1%) of those in the right-side UPJO group.

DISCUSSION

UPJO causes a reduction in urine flow from the renal pelvis into the ureter.^[5] Congenital HN due to UPJO affects 1 out of every 2000 children, and the ratio of male to female is $\sim 2\text{--}3:1$.^[6,7] UPJO occurs more frequently on the left than the right side.^[8] Most cases of UPJO are congenital, but the disease can be clinically silent until adulthood.^[9] In the present study of patients diagnosed during the neonatal period, those with left-side UPJO had a more severe course than those with right-side UPJO. For patients with a late diagnosis, there was less difference in the clinical course.

The aim of HN management is to determine whether surgery is needed to avoid renal dysfunction. According to established guidelines, the management strategy depends on the results of a comprehensive assessment focusing on the degree of HN and the AP diameter of the renal pelvis; if necessary, a nuclear medicine evaluation to determine urine drainage and renal function status may also be performed. Although many algorithms for the diagnosis and treatment of UPJO have been published, these do not distinguish between UPJO of the right and left kidneys.^[10] However, our clinical experience suggests differences in the clinical course by side, with left UPJO more often diagnosed in the prenatal and neonatal stages, showing more aggressive behavior, and causing a decrease in kidney function by the time surgery is performed.

Patients with UPJO are typically assessed based on differences in renal function. If HN continues to progress, the prognosis with respect to renal function

is poor. Spontaneous improvement cannot be expected, and surgical intervention is recommended.^[11] The main goal of therapy is to relieve symptoms and maintain or improve renal function, but treatment success after UPJO therapy is difficult to define because renal function may change several years after surgery.^[12,13]

It has been reported that renal function stabilizes within approximately 5 years, and is maintained at this level for a long time thereafter. However, impaired renal function has been reported in 0%–28% of patients.^[14,15] The most important finding of our study was that, although patients with right or left UPJO might initially have the same level of renal function, long-term postoperative improvement could only be expected in patients with right-side UPJO; no improvement or further decline in function was likelier in patients with left-side UPJO.

The prevalence of VUR associated with UPJO on the affected side due to a malformed renal tract ranged from $\sim 7.3\%$ to 11.3% .^[16,17] UPJO was seen in $\sim 20\%$ of patients with horseshoe kidney, and in 8%–15% of those with multicystic dysplastic disease involving the contralateral kidney.^[18,19] VUR was detected in 6.3%–7.1% of our patients, with a very similar frequency between the right and left sides.

The advantage of this study was that it included a large number of UPJO patients; however, they were all from a single center. More accurate and detailed data could be obtained with a larger, multicenter series conducted as part of a multidisciplinary study, and we could compare the functional loss of the renal units with the UPJO with those that only end with the surgery. It may be added in asymptomatic cases in future, larger studies.

CONCLUSION

In conclusion, worse kidney function may become symptomatic more quickly in patients with left-side UPJO, and there may be greater loss of function at the decision stage of going to surgery. Therefore, the left side must be accepted as a poor prognostic factor for function in renal units with UPJO preoperatively, and even postoperatively. As written in the guidelines, care should be taken in the stage of pelvic enlargement, 10% loss of function, closer follow-up and, when necessary, tailored surgical management and more frequent postoperative follow-up are recommended.

Author contributions

The authors confirm their contribution to the paper as follows: study conception and design by SO, SC; data collection by SO, SC; analysis and interpretation of results by SO, SC; draft manuscript preparation by SO,

SC. All authors reviewed the results and approved the final version of the manuscript.

Ethical approval

Approval for this study was obtained from the Ethics Committee of Mehmet Akif Ersoy Training and Research Hospital (No: 2020/73).

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Conflicts of interest

There are no conflicts of interest.

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