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Research Paper

The Effect of Pediatric Pyeloplasty in Poorly Functioning Kidneys with Split Renal Function between 10% to 20%: A Single Institute Experience

Yousuf M. Al-Hallaq1, Yasir F. Al-Shatar 2

ABSTRACT:

BACKGROUND:

Management of poorly functioning kidneys with ureteropelvic junction obstruction (UPJO) is controversial, with some recommending direct nephrectomy others direct pyeloplasty, and others temporary diversion.

OBJECTIVE:

To find whether pyeloplasty allows for functional recovery in poorly functioning kidneys in pediatric age group.

PATIENT AND METHOD:

A prospective review of 25 patients with unilateral UPJO who underwent open Anderson-Hynes pyeloplasty (AHP) with a split renal function (SRF) of 10-20% at Baghdad Medical City from December 2019 to September 2022 was conducted. The changes in the SRF measured by the MAG-3 study after 1 year were compared. The informed consent forms given by the parents of all cases were reviewed.

Deterioration of SRF by more than 5% of the preoperative value was deemed to be FAILURE (deterioration). An increase in SRF of more than 5% in the ipsilateral kidney was deemed as SUCCESS (improvement). A change in SRF of within ± 5% was considered STABLE renal function

RESULTS:

25 patients divided into two groups: below (52%) and above (48%) 1-year-olds with preoperative SRF on 10% to 20% of the affected side.

Mean preoperative SRF was 15.4±2.8% in all cases, which increased postoperatively in the success group from 15.5±2.9% to 23.7±4.7%, and this improvement was highly significant, while in two cases with failure with SRF from 13.5±2.1% to 5.5±2.1%.

The success rate was 92%, whereas a secondary nephrectomy was necessary for two (8.0%).

CONCLUSION:

Poorly functioning renal units with SRF 10% - 20%, can show functional improvement and recoverability, so in these renal units, we can't rush to do a nephrectomy instead, we can proceed to pyeloplasty.

KEYWORDS: ureteropelvic junction (UPJ) obstruction, pyeloplasty, nephrectomy, mercapto-acetyl-

1consultant Urologist, Medical City Teaching Hospital Complex, Ghazi Al-Hariri Surgical Specialties Hospital, Baghdad, Iraq.

2Medical City Complex, Ghazi Al-Hariri Surgical Specialties Hospital, Baghdad, Iraq.

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INTRODUCTION:

The result of ureteropelvic junction obstruction (UPJO) is low or no flow of the urine into the bladder which will increase the intrarenal pressure. By that time high intrarenal pressure causes damage to renal function. [1] And defined as either primary (intrinsic or extrinsic) or secondary [2,3].

Diagnosis and initial evaluation:

From the history of prenatally or postnatally, any signs of symptoms of the distended abdomen or pyelonephritis or incidental findings during evaluation for other causes. Further investigation by renal function test, abdominal ultrasound, and the degree of hydronephrosis, need for radio-

isotope study (MAG-3) to see whether obstructed or not, and the split renal function test (SRF) of each kidney [4].

This study answers to the effect of pediatric pyeloplasty in poorly functioning kidneys with MAG-3 between (10% -20%), so if we can preserve the poorly functioning kidney in the pediatric age group after follow-up MAG-3 in 12 months postoperatively to see if it is better to do direct nephrectomy of pyeloplasty in such cases, hence, we consider the patient is either in success or failure.

Success was considered on either improvement in drainage, improvement in symptoms on the after-surgery diuretic renal scan, stability and/or improvement in Split Renal Function (SRF) on the renography done 12 months after surgery by an increase from preoperative MAG-3 by 5% or more while stability if the difference between (-5% to +5%) from preoperative MAG-3 [5].

A decrease of SRF by more than 5% was considered to be **a Failure** [5].

There is no clear cut-off value to define a poorly functioning kidney or to define the changes in SRF postoperatively, so according to El Sayed, Salih et al study in Egypt 2020 chose these numbers for their definition as in this study as a reference [5].

PATIENTS AND METHOD:

The Study design was A prospective interventional not randomized study because the cases were consented to and chosen to enter the study according to their SRF and if they were accepted to enter this trial from the beginning. The data collection was carried out during the period between the 1st of December 2019 to the 1st of September 2022. The study was conducted in the Iraqi surgical specialty center (El-Shaheed Ghazi el-Hariri Hospital) at Baghdad Medical City/urology department. A total of 25 children who diagnosed with UPJO and having SRF (split renal function) between 10-20% of affected kidneys. They were divided into 2 groups of cases above and below 1 year of age at the time of operation. The study number was limited by the period in our study and we wish to enter more cases in future studies. The patients attended urology departments and were selected to participate in the study on a convenient basis, consent was taken from all the participants' guardians to accept to participate in the study as a trial to preserve the remaining kidney function and told about the risk of surgery, postoperative complications, risk of failure, and need for 2nd operation. Data collection was done by interview, using preoperative data by:

1. History taking.
2. Physical examination.
3. Lab Ix. Of renal function test and routine preoperative Ix.
4. Abdominal U/S: position and size of the kidney, site, AP diameter, SFU grading of H.N (hydronephrosis), PT (parenchymal thickness), ureter if dilated or not, and presence of other abdominal anomalies, this imaging was done by radiology team in our hospitals.
5. MCUG (micturition cystourethrography) to exclude VUR and bladder capacity and PVRV or other anomalies like PUV, and spastic neurogenic bladder.
6. IVU (intravenous pyelography) to confirm UPJO site and anatomical like double moiety and functional information of both kidneys.
7. Nuclear medicine study we use MAG-3 to confirm the degree of obstruction and SRF. All the cases performed in this study in the El Andulus private hospital and reported by the same senior in their hospital.

The Children who were **included in our study**, have confirmed Dx of UPJO by clinical data and:

1. Have a normal renal function test.
2. Normal functioning contralateral kidney (only one side affected by UPJO).
3. SRF by MAG-3 study between 10%-20% for the affected side.

The children who were excluded from our study due to one or more of these reasons:

1. Bilateral affected kidneys or single kidney patients.
2. Active UTI (urinary tract infections) by urinalysis, urine culture, +ve CRP titer and elevated ESR were rescheduled and then proceeded to surgery only after complete eradication of infection.

Regarding the ethical considerations:

1. The research protocol was discussed and approved by the scientific and ethical committee in the Iraqi Council of Urology.
2. Written consent was taken from each parent before involving them in the study by explaining the aim of the study reassuring them about the confidentiality of the collected data and clarifying that this information will be used for research purposes only.

Regarding the Surgical procedure:

In this study, the type of surgery was AHP (Anderson-Hynes pyeloplasty) also known as dismembered pyeloplasty can be done either

laparoscopically or by a classical open technique. Our cases were operated by the same experienced consultant and his team, who proceeded with the open technique due to a shortage of tools for the laparoscopic procedure in our facility.

During post-operative follow-up, all the patients were doing well (no s&s of sepsis nor renal impairment, wound complications, frank hematuria nor pyuria, urine leak) in the ward were kept for an average of 2 days were discharged after stabilization and removal of Foley's catheter and drain if no leak was noticed and the drain is below 50cc, and then given a date for JJ stent removal in the next 6-8 weeks. Then IVP was done at a date of 3 months after the operation to see the anatomy and if the kidney could excrete contrast after the operation and make sure of good drainage and funneling of the pelvis. Then we did a MAG-3 study after 1 year and the results were conducted in this study to compare with pre-operative results this time was set to compare with other studies like the radionuclide study after 1 year.

Time is only constraint limitation of the study and the study was conducted during the era of COVID-19. Some patients were lost due to this conflict and not included in this study's results. Families could not afford the financial cost of this test after 1 year of the private sector treatment.

Statistical Analysis:

Analysis of data was carried out using the available statistical package of SPSS-28 (Statistical Packages for Social Sciences, version 28). The data were viewed by measuring the mean, percentage, frequency, standard deviation, and the range (lowest-biggest values).

The importance of the various means' differences (quantitative data) were calculated by using the Students-t-test for the calculated difference between two independent means or the paired t-test for the difference between paired results (or two dependent means). A significant difference of many percentages (qualitative data) was tested using the Pearson Chi-square test (χ^2-test) with an application of the Fisher Exact test or Yate's correction whenever it can be applied. A statistically significant result was presented whenever the P value was equal to or less than 0.05.

A successful AHP was considered by the resolution of symptoms, good drainage on the renal diuretic scan, and/or improvement or stability in SRF on the renal renography by using MAG-3 done 12 months after the operation [6].

A decrease of SRF by more than 5% from the degree of before the surgery was considered to be deterioration. An increase in SRF of more than 5% in the ipsilateral renal unit was considered an improvement. A difference in SRF of within ± 5% was considered a stable kidney function as in Salih et al study done in Egypt [6].

RESULTS:

Demographic distribution of cases:

about half (48.0%) of those operated upon for pyeloplasty were below one-year-old with a mean age of 16.5±2.5 months ranging from 5 months to 52 months. About one-third (36.0%) of them were females and the others were male. In this study more than half of the cases (56.0%) are on the left side. The most frequent cause that led to the diagnosis of our cases was UTI in more than half (56.0%) of the cases we operated on. The distribution of cases according to anteroposterior diameter in millimeters (mm) most of them 60% ranged from 20-29mm at the time of diagnosis with a mean of 25mm. The most frequent parenchymal thickness of cases by ultrasound at the time of diagnosis was 5mm in 44% and ranged from 3 to 8 mm with a mean of 5.1mm in thickness.

Table 1: Demographic distribution of cases.

		No	%
Age (year)	<1year	12	48.0
	=>1year	13	52.0
	Mean±SD (Range)	16.5±2.5(5-52)	
Gender	Male	16	64.0
	Female	9	36.0
Side	Left kidney	14	56.0
	Right kidney	11	44.0
Diagnosis	Urinary Tract Infection (UTI)	14	56.0
	Abdominal distension/ mass	2	8.0
	Ante-Natal Care (ANC)	4	16.0
	Incidental	5	20.0
APD (mm)	<20mm	4	16.0
	20---29	15	60.0
	30---39	5	20.0
	=>40mm	1	4.0
	Mean±SD (Range)	25.0±6.4	(15-45)
PT (mm)	<4.0mm	3	12.0
	4.0---	4	16.0
	5.0---	11	44.0
	6.0---	5	20.0
	=>7.0mm	2	8.0
	Mean±SD (Range)	5.1±1.1	(3-8)

The distribution of SFU grading score pre-op. and postop:
reveals that about three-quarters (76.0%) of cases had G4 scores on the SFU grading system preoperatively with preop. Mean of MAG-3 = 15.4% ranging from 10%-19%.
While about 60% of cases gain postop. G2 score on SFU grading system with a mean of MAG-3 = 22.3% ranging from 4% to 32%.

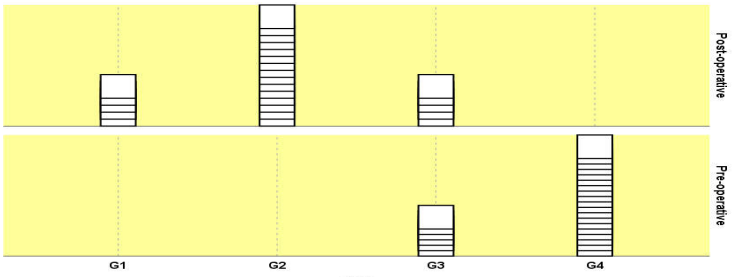

Fig 1: Preop. & postop. sfu grading.

The MAG-3 study with their difference preop & postop:
Considering the aim of the study, cases with increasing MAG-3 study postop. By 5% or more as improvement in kidney function [19], 80% of cases get an improvement in their results. Also considering a decrease in MAG-3 study postop. By 5% or more as a failure of salvaging the kidney and

may need future nephrectomy. The cases with no more than 5% decrease or increase as equivocal results and need further follow-up. only 2 cases (8.0%) get failure of operation.

Assuming that cases with improvement or equivocal results have success in their operation and that we salvage their kidney from nephrectomy and maintain or improve residual renal function, shows that the success of the study was 92%(23 out of 25 cases).

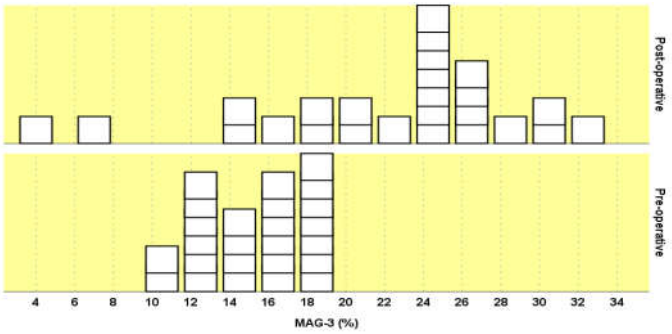

Fig 2: Postop. & preop. mag-3 results.

The association between demographic features with the success & failure of the surgery:

There is no failure of operation on children operated on before 1 year and only 2 failed out of 13 cases after 1 year of age but there is no significant association between the child's age at operation with the success of operation also the same for gender and side of surgery. There is a higher success rate in male cases (65.2%) compared to females (34.8%) although there is no statistical significance.

The success of the surgery was comparable between the left (47.8%) and right side (52.2%) and the 2 cases were on the right side but also not statistically significant.

The highest percentage of success in surgery was with cases presented with UTI and this may be due to the highest number of cases presented with this diagnosis, but there is no significant association between success and cause that led to the diagnosis someone with UTI and the other with Antenatal care (ANC) diagnosis get failure of their surgery.

Table 2: Demographic data association with success.

		Success		Failure		P value
		No	%	No	%	
Age (year)	<1year	12	52.2	-	-	0.157
	=>1year	11	47.8	2	100	
	Mean±SD	15.4±12.3		29.0±9.9		0.144
Gender	Male	15	65.2	1	50.0	0.667
	Female	8	34.8	1	50.0	
Side	Left kidney	12	52.2	2	100	0.191
	Right kidney	11	47.8	-	-	
Diagnosis	UTI	13	56.5	1	50.0	0.533
	Abdominal distension/ mass	2	8.7	-	-	
	ANC	3	13.0	1	50.0	
	Incidental	5	21.7	-	-	
*A Significant difference between percentages using Pearson Chi-square test (χ^2-test) at 0.05 level.						
# The significant difference between two independent means using the Students-t-test at 0.05 level.						

The association between the success of surgery with results from ultrasonographic measurements & MAG-3 study

High percentage of success in cases with preop. APD ranging 20-29mm (60.9%) and this may be due to the high percentage of our cases in this range.

The failure of surgery was seen mainly in cases with parenchymal thickness of 4.0 mm or with less than 4.0mm, while the success was mainly in cases with parenchymal thickness of 5.0mm (47.8%) & 6.0mm (21.7%).

All cases presented with preop. SFU G3 & G4 and after dismembered pyeloplasty, most cases show SFU of G2 (15 cases, 14 of them get success (60.9%) while 1 case (50.0%) ended with failure).

Although there is no significance between the success of surgery with preop. APD or PT or preop. & postop. SFU grading system.

Most cases with success get improvements (=>5%) in 20 cases (87.0%) as compared to equivocal (<-5% - <+5%) results in 3 cases (13.0%).

Table 3: Radiographic data association with success.

		Success		Failure		P value
		No	%	No	%	
APD (mm)	<20mm	4	17.4	-	-	0.694
	20---29	14	60.9	1	50.0	
	30---39	4	17.4	1	50.0	
	=>40mm	1	4.3	-	-	
	Mean±SD	24.9±6.6		26.5±4.9		0.737
PT (mm)	<4.0mm	2	8.7	1	50.0	0.218
	4.0---	3	13.0	1	50.0	
	5.0---	11	47.8	-	-	
	6.0---	5	21.7	-	-	
	=>7.0mm	2	8.7	-	-	
	Mean±SD	5.2±1.0		3.5±0.7		0.032*
Pre-operative SFU	G1	-	-	-	-	0.369
	G2	-	-	-	-	
	G3	5	21.7	1	50.0	
	G4	18	78.3	1	50.0	
	Pre-operative mean MAG-3 (%)	15.5±2.9		13.5±2.1		0.343
Post-operative SFU	G1	4	17.4	1	50.0	0.485
	G2	14	60.9	1	50.0	
	G3	5	21.7	-	-	
	G4	-	-	-	-	
	Post-operative mean MAG-3 (%)	23.7±4.7		5.5±2.1		0.0001#
Improvement %	Improvement (=>5%)	20	87.0	-	-	-
	Equivocal (<-5%---<+5%)	3	13.0	-	-	
	Failure (<= -5%)	-	-	2	100	
	Mean±SD	8.2±3.3		-8.0±		0.0001#

*A Significant difference between percentages using the Pearson Chi-square test (χ^2-test) at 0.05 level.

#A Significant difference between two independent means using the Students-t-test at 0.05 level.

Table 4: Master Chart for all 25 patients.

#	age in months	Sex*	Side**	DX***	APD (mm)	PT (mm)	SFU (before)	MAG-3 (before) (SRF%)	MAG-3 (after) (SRF%)	SFU (POST)
1	7	M	Lt.	1	22	6	G4	16_84	24:76	G2
2	37	F	Lt.	4	26	5.5	G4	12_88	19_81	G2
3	5	F	Lt.	3	18	5	G4	19_81	27_73	G2
4	10	M	Rt.	1	31	5	G4	88_12	74_26	G3
5	6	M	Lt.	2	18	6	G3	19_81	30_70	G1
6	15	M	Rt.	4	32	5	G4	89_11	83_17	G2
7	52	F	Lt.	1	24	7	G4	18_82	21_79	G2
8	6	M	Lt.	2	46	3.5	G4	16_84	25_75	G2
9	11	M	Rt.	4	21	6	G4	86_14	78_22	G2
10	20	F	Rt.	1	15	8	G3	82_18	70_30	G1
11	6	M	Lt.	3	18	5	G3	19_81	28_72	G2
12	36	F	Lt.	1	23	3	G4	15_85	7_93	G2
13	18	M	Lt.	1	29	5	G4	10_90	18_82	G3
14	6	F	Rt.	3	24	4.5	G3	82_18	68_32	G2
15	9	M	Lt.	1	26	5	G4	13_87	15_85	G3
16	42	M	Rt.	4	33	3	G4	85_15	76_24	G2
17	12	F	Rt.	1	21	6	G4	83_17	75_25	G1
18	9	F	Rt.	1	21	4.5	G3	19_81	27_73	G2
19	16	M	Lt.	1	25	5	G4	17_83	25_75	G2
20	22	M	Lt.	3	30	4	G3	12_88	4_96	G1
21	20	M	Rt.	4	20	4.5	G4	15_85	20_80	G2
22	10	M	Rt.	1	31	5	G4	88_12	74_26	G3
23	12	F	Rt.	1	21	6	G4	83_17	75_25	G1
24	9	M	Lt.	1	26	5	G4	13_87	15_85	G3
25	16	M	Lt.	1	25	5	G4	17_83	25_75	G2

*sex (M=male ; F=female)
**side (Lt.= left ; Rt.=right)
***cause leading to diagnosis (1=UTI ; 2=abdominal mass/distention ; 3=antenatal diagnosis ; 4=incidental finding)

DISCUSSION:

The age of patients at the time of diagnosis is very crucial for the success of an intervention, in this study patients are divided into two groups (below or above 1-year-old). Although the outcome in our study statistically showed no significant difference but during the COVID era some cases get delay in their operation date but not more than 3 to 4 months, which may explain why 2 cases in our study above 1 year of age failed. That is comparable to Elsayed Salih et al (2020) where one case (1/20) below and three cases (3/26) above 1 year failure also of no clinical significance [6].

PUJO was more common in males (64%) & on the left side (56%) as noted in this study and the same in the A.Y. Abdelaziz et al study done in Cairo in 2018 and also in the Pramod S. et al study done in India in (2018) in contrast to Elsayed Salih et al

(2020), more than half of the cases were on the right side while male to female ratio of 4:1 also predominate in males [6,7,8].

The criteria to define poorly functioning kidneys show a big variability. We define the kidney to be poorly functioning if SRF < 20%, and in the

literature, other cut-offs were used, ranging from < 30 to < 5%. This is the reason for the big differences in the results of many studies. We assume that there is no evidence to justify the use of a clear cut-off, so that's why in this study the SRF of 20% was chosen to compare it mainly with Elsayed Salih et al (2020) because it is the most recent study and also in Arabic country as well [6,9,10].

All children in the beginning had ultrasonography of the abdomen. On ultrasonography, a classical finding of UPJ obstruction is dilatation of the renal pelvis and calyces with no dilatation of the ureter. A diuretic renogram is an investigation of choice to identify the obstruction [6].

The traditional intervention for poorly functioning renal unit was nephrectomy but recently, some studies recommend pyeloplasty even with SRF<10% as these kidneys show significant improvement (Lone et al., 2017) [10].

In this study, the presentation mode is abdominal swelling (8%), antenatal diagnosis (16%), accidentally discovered (20%), and UTI, (56%). There were no patients who needed admission with pyonephrosis or needed DJ stents or percutaneous nephrostomy (PCN). One case out of four cases with ANC got a failure of the operation and needed a nephrectomy while only one case presented with UTI from fourteen cases got a failure, although there is no statistical significance due to the small sample size of the study. Gench et al (2019) found that none of the pre-operative characteristics proved to be a strong predictor of postoperative function improvement. The only variable statistically different in patients experiencing recovery was a postnatal diagnosis. It can be explained by the fact that prenatal UPJO influences the normal development of the whole kidney. In contrast with this hypothesis, others have reported better function recovery in cases diagnosed prenatally (Menon et al (2016) [6, 11].

In this study, there was no signification association between the improvement of SRF after AHP and other preoperative demographic features & ultrasonographic characteristics, which is the same as the Elsayed Salih et al. study in Azhar Medical City in Egypt in 2020. The results were most cases at diagnosis with SFU grade 4 (76%) preoperatively while postoperative ultrasonography done after 1 year, most cases had a significant reduction in hydronephrosis to SFU grade 2 (60%) and comparable outcome to Elsayed Salih et al. study with postoperative SFU grade 2 (60.9%) they did ultrasound after 6 months postoperatively. [6]

The success rate in our study was 92% with only 2 cases (8%) needing future nephrectomy with preop. SRF% ranging from 10%-19% and a median of MAG-3 results preoperatively of 15.4±2.8% as shown in table (4-6) and a significant increase in postop. SRF% by MAG-3 renography done after one year with median results of 23.7±4.7% in success cases, the increase of MAG-3 for the cases was by 8.2±3.3 with stability or improvement after one year of surgery, the improvement in the MAG-3 results was statistically significant with a p-value of 0.0001.

In comparison to the Elsayed Salih et al study done in 2020, Cairo was 91.3%. Redo-pyeloplasty was done in three children, while only one case proceeded with a future kidney removal. The stability or improvement of SRF was detected in forty-two cases on follow-up radiological exams with no additional complaints. Renal scans at 6 and 12 months after AHP revealed significantly increased SRF compared to preoperative one (median: 14.8% and 15.7%, p = 0.002 and 0.009, respectively). The SRF continued to be the same in 50% of the patients and decreased in the remainder despite an overall improvement in renal pelvic dilatation on renal sonography [6].

Considering the time of MAG-3 renography after operation in this study was performed only once after one because it's not readily feasible to decrease the radiation dose to the children; in other studies, only one nuclear renal scan was done after surgery between 6 and 12 months postoperatively, but this gives a narrow space to the hypothesis that SRF improvement would have been greater on later scans, as almost all available series show that improvement is greatest in the first months after obstruction release and plateaus thereafter [6,9].

It's comparable to Pramod S. et al study done in India in 2018 for children above 1 year old where 7 out of the 26, had poorly functioning kidneys less than 20% showed that on follow-up. Most of the 26 children, 4 children need a future nephrectomy. In the remaining 22 children, Anderson Hynes dismembered pyeloplasty was done. The target of the surgery is to get a patent ureter with good flow of urine across the PUJ. The success rate of Dismembered pyeloplasty is around 98%. All the children after the pyeloplasty had resolution of their symptoms and also in the function on the dynamic renography [8].

Regarding Gench et al study done in a multicenter in Italy in 2019 regarding the comparison of nephrectomy vs. pyeloplasty in poorly functioning kidneys. 80% (36 cases) of cases undergone pyeloplasty we found that these results according to regarding children with Anderson-Hynes pyeloplasty (AHD) with poor function kidneys with SRF 7-20% showed an increase in the SRF in only one-third of cases. The postnatal diagnosis was associated with a significantly increased likelihood of functional recovery [11].

To get a better chance to choose those cases who are more prone to get function recovery after the operation with pyeloplasty, the predictors of function recovery were researched. Nevertheless, as in the previous studies, no one of the pre-operative characteristics is shown to be a predictor of improving postoperative renal function. The only variable statistically significant in patients having recovery was a postnatal diagnosis, irrespective of the presence of symptoms or a crossing vessel. It can be manifested by the fact that prenatal UPJO influences the normal developmental growth of the entire renal unit [6,9].

The main disadvantage of pediatric pyeloplasty occurs in the reliability that patients who undergo this treatment strategy will need a follow-up with frequent ultrasounds and a renal nuclear scan which can be unnecessary otherwise. Although, even though complications occur only occasionally, they carry a larger risk of morbidity than those occurring after nephrectomy and can have another operation, as was the case in 3 of our 62 pyeloplasties vs. none of the 15 nephrectomy cases [9]. Still, nephrectomies are more likely to be performed using a minimally invasive approach. These differences could be presented as significant from a clinical point of view. On the other hand, however, direct kidney removal results in the loss of some renal units that can approach a reasonable function, if not removed [9].

These pieces of information are important, at least, for counseling preoperatively. One important limitation of other studies is the retrospectively designed and the low number of patients included. This makes the study possibly low power to discover some differences. Ureteropelvic junction obstruction in poorly functioning kidneys, however, is a relatively uncommon condition, and this seems to be one of the important series anyway, which empowers the clinical relevance of the study results. Still, pre-operative and postoperative renal nuclear scans were available in around 60% of cases only in their country regions. This is not fully surprising because, in clinical practice, not all surgeons still recommend a follow-up nuclear scan if improvement of the dilatation is seen on ultrasound [6,9].

The major limitation of this thesis would be a single-center experience. Furthermore, postoperative diuretic renal scan studies were not affordable for all cases, decreasing the ability to conclude the difference in SRF postoperatively [9].

CONCLUSION:

The results of the present study suggest that:

1. If we have a low SRF alone (as this study includes SRF 10% to 20%) is not considered with bad outcomes and gives no difference in the failure rate.
2. The type and incidence of complications were not increased for the low SRF (10% - 20%) functioning groups.
3. Our data confirm a piece of important evidence that the prognosis and outcome for kidney function are good options in cases with moderately decreased SRF.
4. The significant difference in increasing the SRF 12 months after AHP in all cases with poorly functioning kidneys validates our approach of performing pyeloplasty even if the initial SF is between (10% - 20%) and avoiding removing the poorly functioning kidneys.

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