

# Anderson-Hynes pyeloplasty in children – long-term outcomes, how long follow up is necessary?

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**Introduction** Pyeloplasty is commonly conducted in children with uretero-pelvic junction obstruction. Standard post-operational procedure involves only a short period of time after the surgery. What is the real number of complications, including those in the long-term? What is the function of the operated kidney? The aims of this study are to assess the effectiveness of pyeloplasty and to assess the suitability of conducting long term follow-up after pyeloplasty.

**Material and methods** 35 of 137 patients after open pyeloplasty between 1992–2006 responded to the invitation and returned for a control appointment. The median age was 8 years (range 1 month – 19 years). In 26 kidney units the disease proceeded with symptoms and in 10 cases it proceeded without symptoms. The predominant symptom was abdominal pain (n = 21). In each child both the control ultrasound and the diuretic renal scintigraphy of the kidneys were conducted.

**Results** Regression of symptoms after the operation was obtained in 19 kidney units (73%). Improvement in scintigraphy was observed in 23 kidney units (82.1%), improvement in ultrasound was obtained in 32 (91%) kidney units. Complications which required surgical intervention occurred in 4 (11.1%) patients. One patient required operative removal of a pyelostomy tube, 2 patients (11.1%) required repeated pyeloplasty (23 and 27 months after the operation), one child required nephrectomy due to nephrogenic arterial hypertension (after 4 years).

**Conclusions** Statistically, there are improvements of scintigraphic function of the kidney, improvements in ultrasound examinations, and the remission of symptoms after pyeloplasty. Most complications occur within 2 years after the surgery. Long-term follow up should be continued.

**Key Words:** pyeloplasty ↔ Anderson-Hynes ↔ pediatric pyeloplasty  
↔ uretero-pelvic junction obstruction ↔ long term follow up

## INTRODUCTION

Repairs of the ureteropelvic junction are commonly conducted in both children and adults. They belong to one of the most popular surgeries performed in urology. The first historical surgery of hydronephrosis was conducted by Trendelenburg in 1886, however, later the patient died due to complications [1]. The effectiveness of pyeloplasty surgeries has been widely described in worldwide research, and various operative techniques have been taken into account. However, little has been written about the long-term follow up. Standard post-operational procedure in-

volves only a short period of time after the surgery. It especially refers to patients operated during their childhood, who after turning 18 are no longer under the control of a surgical clinic or a pediatric urology clinic. There is still an interesting question as to what happens to the patients after 5, 10 or even more years after repairs of the ureteropelvic junction. What is the real number of complications, including those in the long-term? Do the patients suffer from urolithiasis, hypertension, pain or urinary tract infections? Are the patients, partially remaining under the care of a urologist and a nephrologist for adults, treated pharmacologically? What is the

function of the operated kidney? Is the effectiveness of the repairs of the ureteropelvic junction, which is assessed in papers as up to 80–98% [2–5], actually that high many years after the surgery?

Aims of the study:

1. The assessment of the effectiveness of the pyeloplasty with the age of the patient at the time of the surgery taken into account, the changes of scintigraphical functions of the kidney, the changes in ultrasound, regression of the symptoms and complications in the long-term follow-up.
2. The assessment of the suitability of conducting long-term follow-up after pyeloplasties.

## MATERIAL AND METHODS

A group of 137 patients who had been operated due to ureteropelvic junction obstruction by the Anderson-Hynes pyeloplasty in the Department of Paediatric Surgery and Urology, Medical University in Wrocław, between 1992 and 2006, was invited for a follow-up examination. The qualifying criterion was the follow up after the pyeloplasty not shorter than 4 years. Thirty-five patients (36 kidney units) reported back, which constituted 26.2% of all patients. Only this group was analysed. The age of operated patients ranged from 1 to 233 months (19 years), with a median age of 8 years. In 20 cases (57%) left-sided hydronephrosis was proven, in 14 cases (40%) right-sided and in 1 case (2.8%) bilateral. In 26 kidney units the disease proceeded with symptoms and in the remaining 10 cases it proceeded symptomless. The predominant symptom was pain in the lumbar and abdominal regions ( $n = 21$ ). Moreover, urinary tract infections ( $n = 12$ ) and hypertension ( $n = 4$ ) was proven. All the patients were operated by the Anderson-Hynes method, using an open technique. The ureteropelvic junction was resected, without the removal of an excess of the renal pelvis. The ureter was incised lengthwise. Anastomosis was conducted with single layer absorbable suture Vicryl 6/0 or 5/0. After the operation the Double-J catheter (DJ) was left in the lumen of the renal pelvis and the lumen of the ureter in 8 cases, in another 8 patients pyelostomy was used for splinting the pyelo-ureteral junction, and the nephrostomy tube was used in 4 patients. In 16 cases, splinting of the pyelo-ureteral junction was not conducted.

The patients who responded to the invitation came for a control appointment. In each child, both the control ultrasound and the diuretic renal scintigraphy of the kidneys were conducted. The patients were divided according to the change from the baseline of differential renal function (DRF) in diuretic renal scintigraphy after the operation into two

groups: DRF decrease to 4% – ‘increased or stable function’ and DRF < to 5% or more – ‘decreased function’. The period of observation after the operation lasted from 4 to 18 years (median 8.5 year). For statistical analysis, the d'Agostino-Pearson test and Shapiro-Wilk test were used.

## RESULTS

The increase of the mean result of scintigraphy after the operation was 4.6% ( $p < 0.05$ ) (Table 1). As a result of the operation, improvement in the level of DRF in scintigraphy was observed in 23 kidney units (82.1%), and the lack of improvement in 5 kidney units (17.9%). The 8 kidney units, in which the scintigraphy was not conducted before the operation, or the description of the research did not contain the level of DRF, were excluded from the analysis.

Significant improvement in the level of hydronephrosis in ultrasound after the operation was obtained in 32 (91%) kidney units, and the lack of improvement in 3 (9%) cases. One patient was not classified due to a nephrectomy that had been previously conducted. The comparison of the level of dilation of the pelvic calyceal system, expressed in renal pelvis AP

**Table 1.** The comparison of the results of differential renal function (DRF) in scintigraphy conducted before and after the operation and the results of the student t-test for related variables

	Before the operation	After the operation	The result of the test
The number kidney of units	28	28	
Mean	40.1	44.7	$t = -2.172$
SD	13.1	15.0	$p = 0.039$

**Table 2.** The dilation of the renal pelvis before and after the surgery

	Before the surgery	After the surgery	The result of the test
The number (the percentage) of patients with the size of renal pelvis in AP-diameter	36 (100%)	36 (100%)	$\chi^2 = 37.67$
No dilation	0 (0%)	20 (56%)	$df = 4$
10–20 mm	8 (32%)	10 (28%)	$p < 0.0001$
20–50 mm	24 (67%)	5 (14%)	
>50 mm	4 (11%)	0 (0%)	
*		1 (3%)	

\*One patient was not classified in the post-operational research due to a nephrectomy that had been previously conducted.

measurement before and after pyeloplasty, is presented in Table 2.

Regression of symptoms of hydronephrosis after the operation was obtained in 19 kidney units (73%) (Table 3). In 5 kidney units (27%) the ailment remained despite the surgical treatment. In another two cases, arterial hypertension occurred, which was not present before the operation. In one case in which the patient did not undergo pharmacological treatment, removal of the kidney was necessary. Major complications requiring secondary surgery occurred in 4 patients (11.1%) (Table 4). The only early complication occurred 12 days after the operation. Surgical removal of pyelostomy was necessary, as it was tightened with the suture used to sew the renal pelvis. In a further 4 patients, late complications occurred (Table 4).

Two patients required repeated pyeloplasty due to secondary stricture of uretero pelvic junction (UPJ). In one child it was necessary to conduct nephrectomy due to nephrogenic arterial hypertension, which could not be treated pharmacologically (nephrectomy 4 years after the pyeloplasty surgery). One patient required multiple surgical treatment of urolithiasis using different techniques. Symptoms occurred 13 years after the pyeloplasty.

The follow-up after pyeloplasty lasted from 4 to 18 years (mean 8.5 years). The comparison of major complications number according to follow-up period is presented in Table 5. Due to a low number of patients with follow-up more than 8 years, we compared the results in the table only up to 7 years.

## DISCUSSION

In the literature, there is no homogenous scale for the assessment of the effectiveness of treatment, which would consider all parameters. In order to assess the treatment of patients we have determined my own, very strict scale of surgery results, which contains post-operative complications, the necessity of re-surgery, the functional decrease of kidney function and the persistence of the ailment despite surgical treatment. Taking into consideration the aforementioned criteria, good results of the treatment were obtained in 64% kidney units. Krasnopolski provides the general efficacy of surgery in 64% [6], Bednarczyk 90% [7], Materny 95% [8]. In foreign research literature, Madi presented 88% of good results after one year and 83% in further control [9]. Gogus shows dependence between the efficacy of the surgery and the level of dilation of the kidney pyelocalyceal system presenting from 25% to 100% (I-IV level of hydronephrosis) [10]. In the majority of research papers the effectiveness

**Table 3.** The comparison of occurrence of clinical symptoms in patients before and after the operation

	Before the surgery	After the surgery	The result of the test
The number (the percentage) of kidney units	36 (100%)	36 (100%)	$\chi^2 = 18.126$
Without symptoms	10 (68%)	29 (36%)	df = 1
With symptoms	26 (32%)	7 (64%)	p < 0.0001

**Table 4.** Major complications requiring secondary surgery after pyeloplasty

Type of complication	Number of patients (%)	Time when the complications occurred
Tightening of pyelostomy tube	1 (2.7%)	12 days
Secondary UPJO	2 (5.4%)	2 years (23 and 27 months)
Hypertension (nephrectomy)	1 (2.7%)	4 years

UPJO – ureteropelvic junction obstruction

**Table 5.** The comparison of major complications number according to follow-up period

Follow-up (years)	No. of patients with major complications (%)	No. of patients in follow-up
0.5	1 (2.7%)	36
1	1 (2.7%)	36
2	3 (8.3%)	36
5	4 (16%)	25
7	4 (17%)	23

of surgery is assessed based on the lack of necessity of re-operation and on the regression of symptoms. The result is often evaluated positively in the research, if these conditions are fulfilled, despite the decrease of the renal function. It is also possible that the period of observation, which is significantly shorter in the majority of research in comparison with our own paper, has an impact on the results of the treatment. Without a doubt, a percentage amounting to 64% of good results in our own research is unsatisfactory and leaves much to be desired. The high effectiveness of the hydronephrosis surgeries presented in research, around 90–95%, might result from different effectiveness criteria and a short period of observation.

In our material, complications requiring surgical intervention occurred only in 4 (11.1%) patients. Taking into consideration this criterion, good results of the treatment were obtained in 88.9% of patients. A limitation of this study is the survey used to identify respondents, which may introduce a selection bias

into our results. In the literature, in similar criteria but in adult patients after lumbotomy, Psoy et al. achieved good results of treatment in 98% patients in a cohort of 77 adults, and Onol et al. in 100% (n = 59) of patients [11, 12].

In our study, in three out of 4 aforementioned cases, complications did not appear until 16 months after the primary pyeloplasty. In 2 cases the patients required re-operation of UPJ. In both patients the secondary stricture of ureteropelvic junction appeared within about 2 years after the operation. In previous controls these patients presented neither clinical nor radiological symptoms of stricture.

In one child, 4 years after the repairing operation, nephrectomy was conducted due to nephrogenic arterial hypertension, which was not subject to medical treatment. The only early complication requiring surgical treatment occurred 12 days after the operation. Surgical removal of pyelostomy was necessary, as it was tightened with the suture, used to sew renal pelvis. In another patient, within 13 years after the operation, renal calculosis of previously operated kidney occurred; which we did not include as a complication after pyeloplasty.

Many authors refer to the fact that the time of observation after the pyeloplasty surgery may have a significant influence on the percentage of complications. In papers concerning the control after the pyeloplasty surgery, the minimum time of observation lasted 3 months [13], 6 months [13] and 12 months [14, 15]. Authors report that most of the complications after the pyeloplasty surgery occur no longer than a year after the operation [16, 17, 18]. It is a common procedure among doctors to desist from further control of patients a few months after the surgery of hydronephrosis. The lack of control concerns especially teenagers operated by paediatric surgeons, who after becoming adults are no longer subject to the control of paediatric clinics. Some patients, or actually their parents, individually resign from control examinations, due to their belief that the disease has been cured during the short post-operative control, usually lasting only a few months. There are some articles suggesting the reasonableness of long-term post-operative care. Dimarco presents the effectiveness of pyeloplasty in adults (classical and laparoscopic) without the necessity of re-surgery in 85%, 80%, 75% respectively after 3, 5 and 10 years of observation [19]. The author emphasises that the effectiveness of surgical treatment of hydronephrosis is much lower than it was previously described

in research. Although the majority of complications concern the first 2 years after the surgery, in some of patients they also occurred 5 and 10 years later. Such patients should undergo long-term control. Madi describes 10 complications in a group of 65 adult cases [9]. Among these patients, in 3 cases the complications requiring repeated surgery occurred respectively 2; 2.5 and 6 years after the primary procedure. Interestingly, all 3 patients presented neither clinical nor radiological symptoms during the 12-month post-operative control. Referring both to our own results and to other research, short-term control after the repairing surgical treatment of UPJ is not believed to be sufficient. The insufficiency of long term follow-up after pyeloplasties in research inspired us to conduct further research concerning this illness. In order to accomplish this, cooperation with surgeons for adults was necessary, due to the fact that almost half the patients are currently over 18. The minimum observation period in our material lasted 4 years, the mean 8.5 years, and the longest took 18 years. Based on our research, typical and most common complications such as secondary uretero-pelvic junction obstruction occurred during the first 2 years after the surgery. In our opinion all patients after pyeloplasty should be regularly controlled during this period. Especially due to the fact that the basic instrument in diagnosis of hydronephrosis is ultrasound, which is non-invasive and commonly available. After this time a sensible solution is to make patients aware that some problems or symptoms like hypertension or flank / abdominal pain could occur later. Such patients should be controlled during the next years perhaps not so intensively, for example one visit (appointment) with a urologist per year. Another option is that informed patients or their parents after 2 years of follow-up would visit a physician only in the event of occurring symptoms.

## CONCLUSIONS

1. Statistically, there are improvements of scintigraphic function of kidney, the improvements of ultrasonographic image and the remission of symptoms as a result of pyeloplasty.
2. Complications occur usually within 2 years after the surgery. Long-term post-operative observation after pyeloplasty should be continued.

## CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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