Anderson-Hynes Pyeloplasty: Three Questions

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The results of Anderson-Hynes pyeloplasty are far from perfect. Urinary tract infections (UTI) and problems arising from ureteral stenting and/or nephrostomies can cause additional problems in this delicate procedure.

We propose to discuss the following questions in the context of our clinical experience:

1. Can the results of the Anderson-Hynes pyeloplasty be improved with earlier diagnosis or surgery?
2. What is the significance of UTI regarding the outcome of this operation?
3. Does stenting make any difference?

Clinical material and method

During 1982-1991 a total of 145 Anderson-Hynes pyeloplasties were carried out on 143 children for uretero-pelvic junction (UPJ) obstruction. The age range was between 19 days and 14 years; 18 patients were in the first months of life, and another 50 patients were less then a year old at the time of surgery. The male patients outnumbered the females by a ratio of 1.6 to1. The UPJ obstruction was on the left side in 63.3 %, and on the right in 35.4 % of the cases. Only 2 children needed bilateral operations.

The clinical material covers the periods both before and after the intoduction of ultrasound into obstetric and pediatric practice. Therefore, the ages at diagnosis vary considerably (Table 1).

Table 1. Age at diagnosis

prenatally until 3 months postnatally	57
3 to 6 months	27
6 to 12 months	30
1 to 2 years	20
2 to 4 years	6
4 to 6 years	4
13 years	1

The causes of UPJ obstruction in this series are summarized in Table 2.

Routine investigations demonstrated that in the majority of patients the urine was sterile prior to operation. In 16 cases out 145 (11 %), however, bacteriuria was present (Table 3).

Intra-operative stenting and drainage

Various stenting and drainage procedures were employed for the pyeloplasties in our cases:

- Transrenal ureteral stenting (29.0 %)
- Ureter splinting with filiform catheter (18.6 %)
- Double-J catheter (3.4 %)
- Nephrostomy only (2.8 %)
- Splinting with "endless thread" (2.1 %)
- Nephrostomy and transrenal stenting (0.7 %)
- No stents (43.4 %)

Generally, stenting and nephrostomies were used more frequently in the infants. The respective catheters remained in situ for 12 to 18 days.

Postoperative complications related to drainage procedures

1. In patients with transrenal ureteral stenting, and those with nephrostomies and a filiform catheter a

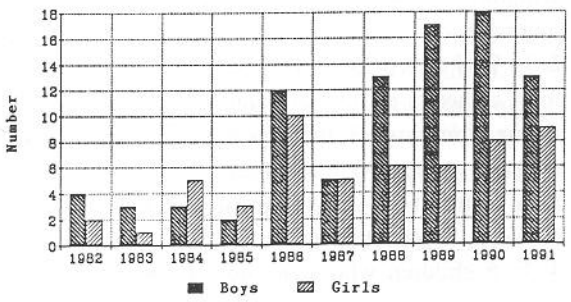

Figure 1. Number of Anderson-Hynes pyeloplasties from 1982-1991.

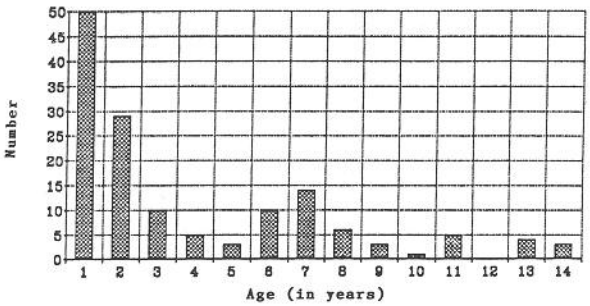

Figure 2. Number of pediatric patients with PUJ-plasty.

Table 2. Causes for PUJ-obstructions found at 145 Anderson-Hynes pyeloplasties

Intramural (fibrosis)	64 cases
Intramural plus adhesions	19
Aberrant vessels	15
Intramural plus high PUJ	11
Atresia plus PUJ valves	8
Aberrant vessels plus adhesions	7
High PUJ plus adhesions	6
Intramural plus aberrant vessel	3
Intramural plus malrotated kidney	3
High PUJ plus malrotated kidney	2
Atresia plus adhesions	2
High PUJ	1
Adhesions	1
Malrotated kidney plus adhesions	1
Malrotated kidney plus aberrant vessel	1
Malrotated kidney plus atresia	1

Table 3. Pathogen bacteria found in 16 of 145 pediatric patients before Anderson-Hynes pyeloplasty.

	N	10^4	10^4-10^5	>10^5
E.coli	4	3	0	1
Proteus/Enterobacter-Klebsiella-group	3	2	0	1
Pseudomonas aeruginosa	2	2	0	0
Pseudomonas/Enterococcus	2	0	0	2
Enterobacter/Klebsiella	2	1	0	1
Proteus/Enterococcus	2	1	1	0
Pseudomonas/E.coli-Enterococcus	1	0	0	1

manifest UTI occurred in 16 cases. Also, in 5 cases symptomless bacteriuria was detected. In 3 patients fragments of stents had to be removed.

2. In 9 of 27 children with nephrostomies and filiform catheters additional complications such as inflammation around the drainage site, and paranephritic abscess were observed.

3. A manifest UTI was seen in 2 of the 4 patients with only nephrostomies.

4. In 5 children who were stented with Double-J catheter bacteriuria was demonstrated in only one case.

5. Complications were much less in the pyeloplasties that were neither stented nor drained: UTI occurred in 9 cases out of 63 (14 %); asymptomatic bacteriuria was observed 14 patients.

Postoperative urinanalysis

Regardless of stenting or nephrostomy there was bacteriuria in 67 (46 %), pyuria in 47 (32 %), slight proteinuria in 32 (22 %), and microscopic hematuria in 17 (12 %) of the patients.

In the pyeloplasties without stents or nephrostomies a UTI occurred in 9 cases (14.3 %).

The postoperative clinical and laboratory findings relative to the mode of drainage are summarized in Table 4.

Discussion

A literature review has proven that many authors were in favor of early intervention in the UPJ obstruction [7,8,15]. The majority of patients in our series were, in fact, diagnosed early and could have been operated without delay. The Anderson-Hynes pyeloplasty is the operative method of choice, and has stood the test of time as Eckstein and others have pointed out [4,5,10,11]. In the light of our experience with this technique we shall attempt to answer the three questions we posed at the beginning of this study:

1. Can the results of treatment be improved by early diagnosis and surgery?

Reviewing aspects of anatomy, infection and surgical technique, the answer to this question should be positive. Aliabadi [1], Bernstein [2], Eckstein [4], and others [8,9] have all argued that the first three months of life provide the highest changes of functional recovery for the kidney affected by a UPJ obstruction. Clearly there is an indication for surgery in this period. Williams' [14] experience was such that the postoperative complication rate tended to increase after three months, and thus supporting early surgery as well. Our findings are not in agreement with this supposition: complications occurred more frequently among neonates and infants below the age of three months in our series. We attribute

Table 4. Synopsis of UTI, bacteriuria and postoperative complications after 145 PUJ-plasties

Drainage/stent	Op. N.	uncomplic. course	UTI	Bacteriuria	Others
without s/n	63	34	9	11	14
transrenal-s	42	17	16	5	5
n/filiform	27	6	13	3	9
double-J catheter	5	0	0	1	0
nephrostomy	4	1	2	0	0
splint	3	2	0	1	0
n/transrenal-s	1	0	0	0	1

s: stent, n: nephrostomy tube, n/filiform: nephrostomy tube with filiform process, splint: ureteral tube with pull-out thread (a. m. Biewald), UTI: urinary tract infection.

Table 5. Bacterial growth and pyuria after PUJ-plasty without drainage

		Leucocyte count per mm³		
		<100	100-200	>200
Pseudomonas aeruginosa	<10⁵	1	-	-
Proteus/Enterobacter/ Klebsiella	<10⁵	1	-	-
Proteus	>10⁵	1	-	1
Escherichia coli	>10⁵	1	-	1
Pseudomonas/Enterococcus	>10⁵	1	-	1
Enterobacter/Klebsiella	>10⁵	-	1	0

Table 6. Bacterial growth and pyuria after PUJ-plasty with transrenal splinting

		Leucocyte count per mm³		
		<100	100-200	>200
Pseudomonas aeruginosa	<10⁵	1	4	0
Escherichia coli	<10⁵	0	0	1
Pseudomonas/E.coli	<10⁵	1	0	0
Pseudomonas aeruginosa	>10⁵	1	1	2
Escherichia coli	>10⁵	0	0	2
E.coli/Enterococcus	>10⁵	0	0	1
Pseudomonas/Klebsiella	>10⁵	1	0	0
E.coli/Enterococcus/Klebsiella	>10⁵	1	0	0

Table 7. Bacterial growth and pyuria after PUJ-plasty with nephrostomy tube with filiform process

		Leucocyte count per mm³		
		<100	100-200	>200
Pseudomonas/Enterococcus	<10⁵	0	0	1
E.coli/Enterococcus	<10⁵	0	1	0
Enterococcus	<10⁵	1	0	0
Escherichia coli	>10⁵	2	1	1
Pseudomonas aeruginosa	>10⁵	0	2	1
Enterococcus	>10⁵	0	0	1
Pseudomonas/Enterococcus	>10⁵	1	1	0

this result to the drainage systems employed in this age group, which obviously was a technical misconception.

Josephson [7] maintains that particularly among the neonates and infants there is a risk of severe postoperative UTI. He does not, however, detail the methods of drainage in his study group.

Overall the technique used in the treatment of UPJ obstruction in this series has yielded good or satisfactory results. This is supported by ultrasound follow-up and a low rate of nephrectomies (2.76 %) after pyeloplasties. A comparison of long-term functional results between the patients operated as newborns and infants, and children that were operated at an older age in this series has not shown a clear margin of difference. This similarity may be a reflection of the regeneration capacity in this age group.

In conclusion, it may be stated that the early diagnosis of the UPJ obstruction is significant for the initiation of management, but the morbidity itself is not life threatening, and this should allow for the timing of the intervention. In view of the postoperative complications it is advisable to take individual decisions regarding when to operate. Microsurgical techniques enable us to perform the pyeloplasties in the smallest babies, but in our experience perfect results are achieved after the first year of life. The results of treatment in babies operated in the first three months are not significantly superior to those who underwent surgery between 3 to 12 months.

2. What is the significance of accompanying UTI on the outcome of Anderson-Hynes pyeloplasty?

Infection is a risk factor in the success of this operation. Although the urinary tracts of the majority of the patients were free of bacteria at the time of operation, 7 children demonstrated a bacteriuria which could not be identified. The identified microorganisms included Pseudomonas aeruginosa, Proteus, E coli and Enterococci. An antibiotic prophylaxis is not necessary with sterile urine [4,5]. In the postoperative period, however we have had to treat 40 of our 145 patients for symptoms of UTI. The bacteria identified in these UTI generally corresponded to the bacteria found preoperatively. According to our investigations Pseudomonas aeruginosa was the only infective agent in 13 patients, and

was found in mixed infections in another 8 patients.

The drainage systems employed were held responsible for the dominant presence of the bacteria, because manifest UTIs were most frequent in cases with transrenal stenting and nephrostomies with filiform catheters. Therefore, it can be stated that accompanying UTI is highly significant and constitutes a substantial threat to the success of the pyeloplasty. A precise knowledge of the microbial spectrum present preoperatively will permit specific coverage after surgery. Where possible the urinary tract should be cleared before the intervention. Drainage encourages and prolonges infection.

3. Evaluation of drainage systems in Anderson-Hynes pyeloplasty - to stent or not to stent?

It is inconceivable to offer a universally valid answer to this question. The literature attests this positon: Hohenfellner [6] believes that in obstructive uropathies the urine will remain sterile as long as the urinary tract is not drained. A stab incision beyond the suture line, instead, should counter any rise of pressure within the system. With an appropriate suturing technique drainage from the pararenal bed will not continue beyond 24-48 hours. His advice is to use ureteric stents and nephrostomy in infected hydronephroses, solitary kidneys, in cases of excessive bleeding from mucosal edges, and secondary surgery.

Eckstein [4,5] and Sigel [12] consider a nephrostomy to be indicated when the collecting system can not be sutured satisfactorily, and if hemostasis is uncertain, especially in grossly infected kidneys which for some reason must be preserved. Vihma [13], on the other hand, proposes a stent and nephrostomy for all pyeloplasties.

Our opinion is to avoid the use of stents and nephrostomy as long as the individual case permits under the given condition of the pathology. In older children drainage can be avoided completely if there is no particular need. A local drain is always maintained. In the majority of neonatal and infant patients, however, ureteric stenting and nephrostomy appear to be indicated. Unfortunately, our follow up results have shown that drainage systems are rather poorly tolerated: postoperative complications occurred most frequently in this group of patients. We believe the drainage systems employed are responsible for this outcome.

In summary, operative techniques have been perfected to the extent that pyeloplasties can be performed with confidence in the smallest babies. The indication for stenting basically depends on the presence or absence of infection within the urinary system. Even in infectious conditions stenting can be avoided with meticulous surgical technique. In our experience, the Double-J catheter has proven to be the most suitable drainage system. The well established notion that drainage systems promote infection in the Anderson-Hynes pyeloplasty as been substantiated by this study, and Pseudomonas aeruginosa remains the primary agent involved.

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