

## ANDERSON-HYNSE DISMEMBERED PYELOPLASTY IN THE MANAGEMENT OF URETERO-PELVIC JUNCTION OBSTRUCTION [EFFICIENCY AND POPULARITY]

**HOSSAM .H. BAKKAR**  
Faculty of Medicine  
University of Benghazi, Libya  
dr.hossamhatem@yahoo.com

**ABDULRAOF ELKWAFI**  
Faculty of Medicine  
University of Benghazi, Libya  
raoufkawafi@gmail.com

**ALI .A. ELOBIDI**  
Faculty of Medicine  
University of Benghazi, Libya  
Ali.bokhish77@gmail.com

### Abstract

**Objective:** to evaluate the efficiency, popularity and safety of Anderson-Hynse dismembered pyeloplasty in the management of UPJO, also to collect and analyze certain important data and criteria such as: side of UPJ obstruction, sex, age at presentation, diagnostic measure, operative finding, variety of surgical intervention and hospital stay.

**Patients and methods:** A retrospective and prospective study in urology center of Benghazi from January 2010 to December 2018 consists of 71 cases.

**Results:** The study established that 64 patients (90 % of the cases) underwent surgical management of whom; 62 patients [87.3%] underwent pyeloplasty of whom; 60 patients underwent Anderson Hynse dismembered pyeloplasty 96.7% (out of the 62 patients whom underwent pyeloplasty).

Males are more often affected than females, in this study; the right side is more often affected than the left side. Most of cases came at late age (11—30).The study also established that more than 85 % of the cases were symptomatic at presentation.

### Conclusion:

1. The classical Anderson-Hynes Dismembered Pyeloplasty is the procedure of preference in our center.
2. There is a need for mandatory antenatal screening for early diagnosis and management.

**Key words:** Anderson-Hynse pyeloplasty, Ureteropelvic junction obstruction, DJ stent, Hydronephrosis.

## الملخص

**الهدف:** تقييم كفاءة وشعبية وسلامة جراحة رأب الحويضة باستخدام عملية ( انديرسون هاينز).  
**المرضى والطرق:** دراسة بأثر رجعي ومستقبلي في مركز المسالك البولية ببنغازي من يناير 2010 الى ديسمبر 2018 تـضـمـنت الـدراسـة 71 حالـة.  
**النتائج:** توصلت الدراسة إلى أن 64 مريضاً ( 90%) من الحالات قد خضعوا للعلاج الجراحي, 62 مريض خضع لعملية رأب الحويضة 87.3% ومن بينهم 60 من اجمالي 62 مريض اجريت له عملية الرأب باستخدام طريقة انديرسون هاينس (موضوع الدراسة) اي ما يعادل % 96.7 . الاستنتاج : عملية رأب الحويضة المقطعة بأندرسون هاينز الكلاسيكية هي الإجراء المفضل في مركزنا والاكثر سلامة وهناك حاجة للفحص الإلزامي قبل الولادة للتشخيص والعلاج المبكر .

## Introduction:

Ureteropelvic junction obstruction is by far the most common cause of neonatal hydronephrosis, occurring in 1 per 1000-2000 birth.

The wide spread use of antenatal ultrasonography and the advent of modern imaging techniques have resulted in earlier and more common diagnosis of hydronephrosis in westerean countries. Therefore, the early diagnosis and successful management of obstructed UPJ continues to challenge the urologist over the last 150 years. In the late 1800s, Trendelenburg performed the first reconstruction of an obstructed kidney rather than simple nephrectomy.

In 1891, kuster successfully repaired a UPJ obstruction by ligating the renal pelvis below the obstruction and transposing the upper ureter to the renal pelvis with a side-to-side anastomosis. In 1936, Foley described the results of 20 pyeloplasties using YV repair.

In 1946, Anderson and Hynes published their experience with an operation that included the complete transaction of the upper ureter, subsequent spatulation of the ureter, and trimming of the redundant pelvis. This highly successful technique has become the criterion standard of surgical repair used today. (Anderson and Hynes, 1949).

The challenge remains in the early diagnosis for the early management and therefore the good outcome will be expected. UPJ obstruction implies the blockage of the ureter at the junction with the renal pelvis resulting in restriction of urine flow. Also defined as impaired urine flow from the pelvis into the proximal ureter with subsequent dilatation of the collecting system and the potential to damage the kidney. Although most UPJ obstruction is congenital in origin, the condition may become clinically apparent in later life (O'Reilly, 1989) (as our study will prove that fact).

The etiology of UPJ obstruction may be due to intrinsic abnormality, extrinsic abnormality or less commonly acquired condition as inflammatory stricture.

### **Intrinsic abnormalities:**

Although the true narrowing is not a main pathologic change in UPJ obstruction, as during exploration the catheter usually passed to renal pelvis with no resistance. Some claimed the presence of remnant valvular mucosal folds, while others postulate abundance of longitudinal muscles as the cause of this condition. The most attractive theory is that the obstruction is secondary to muscular discontinuity, which disrupts the coordinated motion of smooth muscle cells and may result in impeded transport of urine and blockage of the downward transmission of ureteral peristalsis (Thomas, 1998). This disorientation of smooth muscle fibers at UPJ is clearly evident on electron microscope evaluation with the findings of hypertrophy of the smooth muscle and its replacement with excessive collagen.

### **Extrinsic abnormalities:**

Secondary to bands, kinks, and aberrant vessels also are commonly encountered. Patients with UPJ obstruction due to extrinsic abnormality are often present rather late in childhood.

Horse shoe or pelvic kidney, duplex collecting systems, and other rotational abnormalities also may cause UPJ obstruction. Cases of the so-called high inserted ureter-to-renal pelvis exist, generally thought to be a secondary phenomenon. The cases of UPJ obstruction may presented antenatally or immediate postnatally as detected by ultrasonography, or late in childhood or even later with different gender, symptoms or accidental finding (asymptomatic). The study will concentrate on these different parameters, in regard to the patients and the surgeon as well.

### **Patients and method:**

The study is a retrospective analysis done at Alhawari Urological Center in Benghazi. The total number of cases is 71 patients from January 2010 to December 2018. The patients are of different age group ranges from (10 days old up to 45 years). Both males and females are included in the study. All the patients included in the study were admitted in urology center and are booked cases. The presentation of each case and the diagnostic measures are also included in this study. The study concentrated on certain criteria and valuable data and parameters in regard to the patients and also in regard to the surgeon. The type of operation, intraoperative findings and the hospital stay are all included in this study. The diagnosis of UPJ obstruction is based up on a combination of clinical manifestation, as the patients came to urology center as symptomatic candidates; total number of symptomatic patients was 61 patients (85.9%), and most of them were complaining of loin pain. On other hand; 8 patients (11.2%) were asymptomatic and are diagnosed accidentally during routine investigation and unfortunately; only 2(2.8%) patients were diagnosed antenatally as the study will prove that shocking fact.

The number of patients, gender, and age, side of UPJ obstruction, presenting symptoms, diagnostic tool, and type of operation, intraoperative findings, and hospital stay are all included in details in this study. Also the operative technique and the use of nephrostomy tube, DJ stent, and tube drain are included in this study as well as the use of postoperative prophylactic antibiotics.

### **Results:**

The total number of patients in this study is 71 patients, studied retrospectively and prospectively in Alhawari-Urology Center of Benghazi over a period of 8 years from January 2010 up to December 2018.

Out of 71 patients with UPJ obstruction, the right side UPJ obstruction was noticed in 40 patients in this series which is approximately 56 % of the patients, while the left side UPJ obstruction was noticed in 31 patients which is approximately 44 % of the patients. And there are no bilateral cases of UPJ obstruction in this series.

Unlike the fact that UPJ obstruction is more common on the left side, in this study the right side UPJ obstruction is more common than the left side (table 1).

(Table 1) The side of UPJ obstruction

Side of UPJ obstruction	number of patients	Percentage %
Right side UPJ obstruction	40	56
Left side UPJ obstruction	31	44
Bilateral	0	0

In this study, 42 patients with UPJO are males (59 %), while 29 patients are females (41 %). This is correlated well with the fact that males are more often affected than females (table2).

(Table 2) gender of patients diagnosed with UPJ obstruction.

Gender	Number of patients	Percentage %
Males	42	59
Females	29	41

The age of the 71 patients in this series are variable, ranging from 10 days old to 45 years old (table 3).

(Table 3) shows the age group of UPJ obstruction patients

Age group	Number of patients	Percentage %
Birth---1 year	5	7
1 year---10 years	6	8.4
11 years---20 years	25	35
21 years---30 years	28	39
31 years---40 years	5	7
More than 41 years	2	2.8

Only 5 patients out of the 71 patients (7 %) are diagnosed below the age of one year which is not optimistic percentage since the UPJ obstruction is the most common cause of neonatal hydronephrosis. and 6 patients between the ages of 1 year to 10 years that constitutes 8.4 % of patients, and 25 patients are between the ages of 11 to 20 years old which constitutes about 35 % of the patients in this series, Out of 71 patients, 28 patients are between the ages of 21 to 30 years old which constitutes about 39 % of the patients, and in 5 patients; the age range from 31

to 40 years old ( 7 % ).lastly, Only 2 patients above the age of 41 years 2.8 %. So that UPJ obstruction is common among the first, second and third decades (from 11 years to 30 years). Out of 71 patients diagnosed with UPJ obstruction, 61 patients (85.9 %) are symptomatic and more than 80 % of them were complain of loin pain at the side of UPJ obstruction. And 8 patients (11.2 %) were asymptomatic and the diagnosis was discovered accidentally during routine investigation or during medical work up for other complains. And only 2 patients (2.8%) were diagnosed antenatally and referred from pediatric hospital (table 4).

(Table 4) presentation of UPJ obstruction

Presentation	Number of patients	Percentage %
Symptomatic	61	85.9
Asymptomatic	8	11.2
Antenatal diagnosis	2	2.8

(Table 5) percentage of presenting symptoms form symptomatic patients (61)

Presenting symptoms	Number of patients	Percentage %
Loin pain	30	49.1
Recurrent UTI	20	32.7
Nausea, vomiting, fever	8	13.1
Haematuria	3	4.9

Regardless the type of Pyeloplasty; Out of the 71 patients with UPJ obstruction, 62 patients underwent Pyeloplasty, 7 patients are missed during investigations, and 2 patients underwent nephrectomy as the kidney was non-function at the time of presentation (table 6).

(Table 6) showing the type of surgical intervention

Operation	Number of patients	Percentage %
Pyeloplasty	62	87.3
No operation	7	9.8
Nephrectomy	2	2.8

In the study, as the last table showed that 62 patients are underwent Pyeloplasty. Out of them, 60 patients underwent Anderson-Hynes Dismembered Pyeloplasty 96.7 %, where only 2 patients underwent VY Foley Pyeloplasty 3.3 % (table 7).

(Table 7) type of Pyeloplasty

Type of Pyeloplasty	Number of patients	Percentage %
Anderson-Hynes Dismembered Pyeloplasty	60	96.7
VY Foley Pyeloplasty	2	3.3

Anderson-Hynes Dismembered Pyeloplasty is an operation that included the complete transaction of the upper ureter, subsequent spatulation of the ureter, and trimming of the redundant pelvis. This highly successful technique is the standard of surgical repair used in our center. There is no specific guidelines exist for the use of stent (DJ stent) and nephrostomy tubes. In this study out of the 62 patients whom underwent Pyeloplasty, the DJ stent was applied for 54 patients (87 %), and the nephrostomy tube was applied for only 2 patients in this series (3.2 %) and in 6 patients neither DJ stent nor nephrostomy tube used (9.6 %)(Table 8).

(Table 8) the use of DJ stent and nephrostomy tubes

Stent/Nephrostomy tube	Number of patients	Percentage %
The use of DJ stent Only	54	87
No DJ stent/ No nephrostomy tube	6	9.6
The use of nephrostomy tube	2	3.2

In this study; 64 patients underwent surgical intervention; the intra operative finding was as follow ; Ballooning of renal pelvis & narrowing at UPJ [Adynamic segment] seen in 60 patients, ballooning of renal pelvis & crossing vessels at UPJ seen in 2 patients and hydronephrotic sac seen in 2 patients .see table (9):

(Table 9) shows the intra operative findings in the64 patients whom underwent surgical intervention:

Findings	Number of patients	Percentage %
.Ballooning of renal pelvis. .Narrowing at UPJ [Adynamic segment].	60	93.7
.Ballooning of renal pelvis. .Crossing vessels at UPJ	2	3.1
Hydronephrotic sac	2	3.1

The hospital stay ranges from 5 days up to 18 days, the median hospital stay was 10 days. All the patients in this series whom underwent surgical intervention received post-operative prophylaxis antibiotics. All the patients in this study are of normal renal function tests.

And all patients are underwent an active surveillance and follow up period; at 3<sup>rd</sup> month post-operative; we performed an ultrasound scan for abdomen and pelvis and at 6<sup>th</sup> month post-operative; we performed IVU study that showed an adequate drainage of renal pelvis with no signs of obstruction or recurrence with 100 % success rate after pyeloplasty.

### **Discussion and Literature review:**

UPJ obstruction is by far the most common cause of pediatric hydronephrosis. As antenatal ultrasonography has become more popular, fetal and neonatal hydronephrosis and UPJ obstruction are found more frequently, and therefore the management of pediatric UPJ obstruction remains more important (Rosens 2008). Dilatation of the upper urinary tract still presents a significant clinical challenge in determining which patient gain benefit by therapy. Choosing an optimal therapeutic regimen is difficult, due to the high variability in function, degree of obstruction, extent of damage, and potential for regeneration in growing kidneys (Reddy and Mandell 1998). Obstruction occurs more commonly in boys than girls, especially in the newborn period, when the ratio exceeds 2:1, left-sided lesions predominant, particularly in the neonate. While in this study the right side is predominant.

The bilateral cases are observed in 10-40 % of cases, however, fewer than 5 % of patients require bilateral repair. This propensity of bilateral occurrence may explain the frequent coexistence of UPJ obstruction and multicystic dysplasia. One theory attributes multicystic dysplasia to complete obstruction of the upper ureter, and kidneys that are affected simply have UPJ obstruction with total occlusion of the upper ureter. In this series there are no bilateral cases of UPJ obstruction. That is why in this study we do concentrate on those parameters.

In children, the etiology of most UPJ obstruction is congenital due to (1) an intrinsic narrowing secondary to aberrant development of ureteral muscle, renal pelvis muscle, abnormal collagen, or ureteral polyp. Here the obstruction is caused by short stenotic segment at UPJ. However, in some cases the stenosis may extend distally from the UPJ to involve a more extensive segment of the proximal ureter. Or due to (2) extrinsic causes, by compression of the UPJ by



aberrant or crossing lower vessels are found in more than 30 % of older children undergoing to Pyeloplasty. Other cause of UPJ obstruction is the ureteral folds, in these cases the UPJ is of normal caliber but the proximal ureter is tortuous and kinked (self-limiting obstruction) which resolves as the proximal ureter straightens with growth. High insertion of UPJ is another cause that may cause obstruction; in this case, the UPJ is sited high on the dilated renal pelvis rather than at its most dependent part. May be primary abnormality, but generally thought to be a secondary phenomenon resulting from upwards displacement of UPJ by the dilated pelvis, i.e. an effect rather than a cause of the obstruction. Variants of the UPJ obstruction include; horseshoe kidney, reterocaval ureteral obstruction, intraluminal obstruction, idiopathic (functional) obstruction, and in grade 4-5 vesicoureteral reflux, which coexists in 25 % of the cases of UPJ obstruction, but in this study among the 51 patients of UPJ obstruction, there is no coexistence of vesicoureteral reflux. Presentation of UPJ obstruction variables, as the condition is discovered during prenatal and early postnatal ultrasonography, infant may present with abdominal mass, UTI, hematuria, older children present with flank or abdominal pain exacerbated by diuresis, UTI, nausea and vomiting, and hematuria following minor trauma.

In our study, only 2 patients were diagnosed antenatally or early postnatally that constitutes (5 %) of patients, 8 patients were asymptomatic and diagnosed during routine investigation (15 %), while the majority of the patients in the study were symptomatic (41 patients out of 51 patients) that constitutes (80 %) of the cases. The natural history of the disease is variable, whereas the obstruction resolves spontaneously, in some cases the obstruction remains stable for many years with little or no impact on renal function, as our study showed that all the patients are of normal renal function tests.

### **Diagnosis and work up:**

#### Prenatal work up:

Wide spread use of antenatal ultrasonography has opened the new field of perinatal urology, however, even the most modern ultrasonographic techniques only demonstrate the dilatation of renal pelvis and ureter and cannot accurately differentiate the true obstruction from harmless physiologic dilatation.

The initial study usually performed between 16 and 20 weeks' gestation; amniotic fluid volume to rule out oligohydramnios, bladder volume, kidney size, antero-posterior diameter of the renal pelvis and any associated abnormalities should be investigated during the initial study (Solari et al 2003).

Functionally significant hydronephrosis can be determined when the antero-posterior diameter of the renal pelvis is more than 10mm, the ratio of the renal pelvis –to – the antero-posterior renal cortex is more than 0.5, or evidence of caliectasis is present after 24 weeks of gestation. Following fetal hydronephrosis also is important to monitor possible progression.

A recent meta-analysis of 7 studies of isolated antenatal hydronephrosis showed that 98% of patients with society of fetal urology (SFU) grade 1-2 hydronephrosis ((anterior- posterior pelvic diameter APPD < 12mm)) resolves, stabilized, or improved during follow up (Canes et al 2008).

#### Postnatal work up:

After the presumptive diagnosis of UPJ obstruction is made, the neonate should undergo ultrasonographic evaluation on the second or third day of life. Before this date, results may be false negative because of neonatal dehydration and physiologic oliguria. Approximately 20% of neonatal hydronephrosis are not found on postnatal ultra-sonogram. At the same time, ultrasonographic evaluation on the contra lateral kidney, bladder, and ureter is performed. VCUG also is done to rule out vesicoureteral reflux.

The renal scan and scintigraphy (diuretic renogram) is the most widely used technique in the presence of hydronephrosis to assess function and obstruction (Dukett 1993).

The rate at which tracer leaves the renal pelvis following diuretic injection, reflected in the slope of the drainage curve and often reported as T 1/2 :( the time required for 50 % of the isotope to exit ), is generally viewed as an accurate reflection of the patency of the UPJ.

Rapid drainage (low T 1/2) indicates no obstruction, while impaired drainage or slow or no washout (T1/2 > 20 min) indicates obstruction.

The current radiopharmaceutical agent most widely used is technetium 99m diethylen triamine pent acetic acid (99m Tc-DTPA). Another much more expensive agent is 99m Tc-

mercaptoacetyl trigycine (MAG3), which offers better anatomical resolution and can be used in case of decreased renal function.

Variables include the use of intravenous hydration, the dosage and the timing of administration of diuretic, the requirement for bladder catheterization, the degree of pelvic dilatation, the severity of out flow obstruction, and the method of calculating the clearance after administration of diuretic.

The most useful measure in diuretic renography is the estimate of differential renal function. This is considered significant when it is less than 40%. This percentage usually is well correlated with the half-life ( $T_{1/2}$ ) wash out curve. Lastly, the wide spread use of modern imaging techniques has not led to an increase in the number of pyeloplasties that are performed.

In a multi-institutional study that investigated the total number of pyeloplasties performed in a well-defined region, it was found that the number of operations has remained constant since the late 1970s. In other words, the degree of hydronephrosis, impaired isotope wash out, or even reduced differential renal function neither helps to define significant obstruction nor predicts deterioration.

The renogram curves which shows the characteristics of the uptake and drainage curve as defined by O' REILLY and associates falls into 4 patterns:

**Type 1:** normal uptake with prompt washout.

**Type 2:** rising uptake curve, no response to diuretics (Obstruction).

**Type 3a:** Initially rising curve that falls rapidly in response to diuretics (non obstructive dilatation).

**Type 3b:** Initially rising curve which neither falls promptly nor continues to rise.

The excretory urography (IVP) is a functional study has been used to evaluate UPJ obstruction. But IVP may not provide adequate information to determine the true obstruction, and it is especially difficult to interpret in children.

IVP provides information about the obstruction and contralateral side and especially facilitates operative planning. IVP accurately visualizes kidney, renal pelvis, ureter, and the exact point of obstruction, also allows for clear visualization of malrotated renal units.

Voiding cystourethrogram (VCUG) is another diagnostic tool in the diagnosis and work up, which establishes the presence of primary or important associated factors that must be detected include; vesicoureteral reflux, posterior urethral valves, ureterocele, diverticuli, or neurogenic bladder.

CT scan has been used to diagnose UPJ obstruction in children, especially in association with abdominal trauma. The development of Doppler sonography has become another useful diagnostic modality in the assessment of kidneys with UPJ obstruction. With duplex Doppler sonography, intrarenal vasculature can be assessed to determine the resistive index. Normal kidneys reliably demonstrate resistive indices less than 0.7, and obstructed kidneys show higher values.

Other diagnostic tests like the ante grade pressure flow study was introduced by Whitaker, which records the response of the renal pelvis to distension, but does not truly define obstruction and this test does not provide conclusive evidence in the complex cases. The retrograde pyelogram can be used in the operating room to confirm the absence of coexisting lower ureteral obstruction. In the prenatal management, counseling the parents is one of the most important aspects of care. The prognosis of hydronephrotic kidney even if severely affected is hopeful that my still capable of providing meaning renal function. Whereas a severely hypoplastic and dysplastic kidney has a hopeless outlook. It is important to explain to the parents the timing and the accuracy of establishing the definitive diagnosis for their child.

The timing of surgical correction of hydronephrosis suggestive of UPJ obstruction in newborn is highly controversial (Koff 1987). Those who support delayed management contend that most newborn with relatively preserved differential renal function ( $> 35\%$  of differential renal function), hydronephrosis is relatively benign disease without proof of progression. Renal function does not deteriorate; thus, immediate surgery is not necessary.

In the early 1980s, sonographic identification of obstruction in many infants resulting in dramatic increase in the number of neonatal pyeloplasties performed (Hosgor et al 2005).

Initially, newborn Pyeloplasty has a reported reoperation rate of 20% which improved with the experience. The relative ease and safety of newborn Pyeloplasty stimulated discussion about the necessity of intervention.

When the diagnosis of UPJ obstruction has been made, Prompt intervention is appropriate to prevent or minimize renal damage. First, prophylactic antibiotic therapy is warranted in cases of moderate to severe dilatation because any UTI, especially in neonatal period, dramatically increases the chance of fibrosis and parenchymal damage.

The conventional surgical technique is by complete ureteral transaction followed by reanastomosis to renal pelvis was first described in the management of a reterocaval ureter, but it was easily adapted for reconstructing the UPJ obstruction. Many different approaches have been tried, such as lumbotomy, flank, or anterior extra peritoneal incision, but the essence of repair consists of excision of the narrowed segment, spatulation, and anastomosis to the most dependent portion of renal pelvis (Rosens 2008).

Foley YV-Pasty, a nondismembered type of repair, is useful in the repair of a kidney with high ureteral insertion and most cases of horseshoe kidneys; however, the Anderson-Hynes Pyeloplasty, the most commonly used type of repair, has a high success rate with few complications in most cases.

Endourologic methods applied on UPJ obstruction include balloon dilatations, percutaneous antegrade endopyelotomy, and retrograde ureteroscopic endopyelotomy (Olsen et al 2007). A large series of endopyelotomies in adult was reported with fairly good short- and long-term success rates of 70-80 %. If an initial attempt of endopyelotomy fails, subsequent open Pyeloplasty is still a viable option with a high success rate.

Postoperative follow up is performed by renal scan or excretory Pyelography at 2-3 months. A further evaluation with ultrasonography is recommended at 12-24 months, but, beyond that, late problems are uncommon in the absence of symptoms. A successful outcome does not always mean an improvement in the differential renal function as measured by renography.

In most cases, the dismembered Pyeloplasty improves the degree of hydronephrosis and washout on the renogram. The symptoms of pain, infection, and hematuria, if present before surgery, resolve along with the improvement of hydronephrosis.

## Conclusion:

1. In spite of great advances and modern techniques regarding the management of UPJ obstruction such as Endo-pyelotomy and Laparoscopic Pyeloplasty, open surgery is still the gold standard with high success rate.
2. The classical Anderson-Hynes Dismembered Pyeloplasty is the procedure of preference in our center and remains the gold standard with very high success rate and fewer complications.
3. Ureteropelvic junction obstruction is symptomatic disease, and loin pain is the most common presenting symptom of UPJ obstruction.
4. There is a need for mandatory antenatal screening for early diagnosis and management of UPJ obstruction.

**Author's contribution:** The authors participated substantially to this work to qualify for authorship and they all reviewed and approved the final version. **Conflict of interest:** None of the authors declared any potential conflict of interest that may potentially jeopardize the credibility of this work. **Funding:** The study was carried on in Governmental institutions, therefore the funding was internal.

## References:

- Anderson JC, Hynes W. Reterocaval ureter, a case diagnosed preoperatively and treated successfully by a plastic operation. Br J Urol, sep 1949; 12(3):209-14.(Medline).
- O'Reilly PH. Functional outcome of Pyeloplasty for Ureteropelvic junction obstruction: prospective study on 30 consecutive cases. Urol, 1989; 142:173-6.
- Thomas DF. Prenatally detected uropathy: epidemiological considerations. Br J Urol 1998 April; B1 (Suppl 2):8-12.
- Rosens, Peter CA, Chevalier RL, Huang WY. The kidney in congenital Ureteropelvic junction obstruction: a spectrum from normal to nephrectomy. J Urol. Apr 2008; 179 (4): 1257-63 (Medline).
- Reddy PP, Mandell J. Prenatal diagnosis. Therapeutic implications. Urol Clin North AM 1998 May; 25(25): 171-80.

- Solari V, Piotrowska, Purip. Altered expression the of interstitial cells of cajal in congenital Ureteropelvic junction obstruction. J Urol. Dec 2003; 170(6 pt 1): 2420-2. (Medline).
- Canes D, Berger A, Gettman MT, Desai MM. Minimally invasive approaches to Ureteropelvic junction obstruction. Urol Clin North AM. Aug 2008; 35(3): 425-39(Medline).
- Dukett JW Jr. When to operate on neonatal hydronephrosis.Urology.Dec 1993; 42(6) 617-9 (Medline).
- Koff SA. Problematic Ureteropelvic junction obstruction. J Urol 1987 Aug; 138(2):390.
- Hosgor M, Karaca 1, Ulukus C, Structural changes of smooth muscle in congenital Ureteropelvic junction obstruction. J pediatric surgery.Oct 2005; 40 (10): 1632-6. (Medline).
- Olsen LH, Rawshdeh YF, Jorgensen TM. Pediatric robot assisted reteroperitoneoscopic Pyeloplasty: a 5 years' experience. J Urol 2007 Nov; 178(5): 2137-41; discussion 2141.