„CAROL DAVILA" UNIVERSITY OF MEDICINE AND PHARMACY, BUCHAREST

DOCTORAL SCHOOL

FIELD OF STUDY: MEDICINE

COMPARATIVE STUDY OF THERAPEUTIC METHODS IN PRIMARY OBSTRUCTIVE MEGAURETER

PhD THESIS ABSTRACT

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INTRODUCTION

Primary obstructive megaureter is part of the spectrum of congenital anomalies of the kidney and urinary tract (CAKUT), defined by ureteral dilation in the absence of vesicoureteral reflux or extrinsic obstruction. This is usually caused by the presence of a distal aperistaltic segment, which secondarily affects urinary drainage and is responsible for a significant proportion of pediatric chronic kidney disease cases.

The antenatal diagnosis of hydronephrosis has led to early identification of primary obstructive megaureter, allowing close monitoring and therapeutic interventions before the onset of complications. However, selecting cases that require active treatment remains challenging, as a significant proportion of patients experience spontaneous resolution. Current criteria for surgical treatment include reduced renal function below 40%, worsening ureterohydronephrosis on serial evaluations, and recurrent urinary tract infections.

This study addresses the clear need to objectively compare the three main therapeutic options for primary obstructive megaureter, conservative treatment, endourological treatment, and ureterovesical reimplantation, based on efficacy, safety, and long-term clinical outcomes. The research hypothesis supports that endourological treatment, particularly high-pressure endoscopic balloon dilation, may serve as a viable alternative to classical reimplantation, preserving renal function and reducing surgical risks, especially in young pediatric patients.

The methodology combined both retrospective and prospective approaches, with a comparative analysis of patients treated in two leading university centers in Romania. Clinical, paraclinical, and imaging data were collected and analyzed, integrating relevant variables for therapeutic decision-making such as ureteral diameter, degree of hydronephrosis, age at diagnosis, symptom presence, natural disease progression, treatment response, and postoperative complications. The evaluation focused on preserving renal function, reducing symptoms, and preventing postoperative complications, aiming to identify the most effective and safest treatment path for each patient profile.

The paper highlights the importance of identifying predictive factors for spontaneous resolution to support the selection of patients who may benefit from

conservative management. It also demonstrates that minimally invasive treatments can significantly reduce hospitalization duration, the risk of severe postoperative complications, and the stress associated with classical surgical interventions. The study proposes a clinical decision algorithm based on objective and reproducible criteria, designed to guide therapeutic conduct according to disease severity, anatomical particularities, and renal functional evolution.

I. GENERAL SECTION

The etiopathogenesis of primary obstructive megaureter typically involves the presence of a distal aperistaltic ureteral segment, which causes functional obstruction of urinary flow toward the bladder. Histologically, the obstructive segment may exhibit muscular dysplasia, collagen infiltration, and structural changes that impair peristalsis. These alterations manifest as ureteral dysrhythmias and dilation of the segment proximal to the affected area.

The diagnosis can be suspected antenatally, when hydronephrosis is detected. Ultrasonographic classification systems such as SFU and UTD allow for risk stratification and prediction of disease progression. Postnatally, imaging investigations include renal ultrasound, voiding cystourethrography, contrast-enhanced urosonography, computed tomography, and magnetic resonance urography. Diuretic renal scintigraphy remains essential for assessing differential renal function and the degree of obstruction. Urodynamic studies provide additional information regarding associated bladder dysfunctions and assist in determining the optimal therapeutic approach.

The differential diagnosis is complex and requires the exclusion of other causes of ureterohydronephrosis, such as vesicoureteral reflux, infravesical obstructions, neurogenic and non-neurogenic voiding dysfunctions, or duplications of the pyelocaliceal system. A thorough evaluation of clinical symptoms, correlated with clinical and paraclinical data, is crucial for confirming the diagnosis, determining surgical indication, and selecting the optimal timing for intervention when needed.

Given the variability in clinical progression, from spontaneously resolving forms to cases requiring early surgical intervention, individualized monitoring is essential.

Developing a therapeutic strategy must be based on the assessment of renal function, the degree of ureteral obstruction, and the presence of symptoms.The therapeutic approach is guided by the principle of tailoring the intervention to the severity of the disease and the individual risks of the patient, with the goal of preserving renal function and avoiding severe complications.

Postnatal evaluation of a child diagnosed antenatally with hydronephrosis requires risk stratification according to the UTD classification system and the application of a differentiated protocol based on severity.

The conservative strategy is particularly applicable to asymptomatic children or those with mild to moderate obstructions, supported by the potential for spontaneous resolution as the distal ureter matures postnatally. Literature reports significant remission rates, depending on the degree of hydronephrosis and the ureteral diameter. Careful monitoring through periodic imaging is essential to detect early signs of functional deterioration.

Antibiotic prophylaxis is especially indicated in severe cases to prevent recurrent urinary tract infections, with antibiotics such as amoxicillin, cephalosporins, or nitrofurantoin used based on the child's age. Although studies show conflicting results, clinical practice supports the usefulness of prophylaxis in high-risk cases.

Surgical treatment is reserved for symptomatic forms or for those who progress unfavorably under conservative management. Temporary procedures such as nephrostomies or ureterostomies are used in severe cases in infants, while definitive interventions include ureteral reimplantation or, more recently, high-pressure balloon dilation and endoureterotomy. Endoscopic balloon dilation is preferred in cases with short strictures and shows high success rates, being well tolerated even in children under one year old. Ureteral reimplantation remains the reference intervention in severe cases and can be performed via open or minimally invasive approaches, including laparoscopic or robot-assisted techniques. Surgical methods depend on the ureteral orifice position, ureteral caliber, and bladder size, aiming to restore functional anatomy and prevent recurrence. In cases of massively dilated ureters, remodeling techniques such as tapering or segmental resection may be applied.

In recurrence cases, complex reinterventions are needed, involving combined techniques and advanced reconstructive solutions. These include the Boari flap, psoas hitch technique, or ureteral substitution with an intestinal segment. The primary goal of these procedures is the preservation of renal function and restoration of physiological urinary drainage.

II. SPECIAL SECTION
OBJECTIVES AND METHODOLOGY

The study of this pathology is particularly important due to the high risk of irreversible renal function impairment, especially in the context of persistent and undiagnosed early obstruction. Additionally, the condition can be associated with recurrent urinary tract infections and impaired somatic development in children, highlighting the need for a therapeutic approach tailored to each individual case.

Given the lack of unified treatment protocols and the variable clinical progression of cases, this research aimed to conduct a rigorous comparative analysis of the three current therapeutic approaches: conservative treatment (based on active monitoring and infection prophylaxis), endourological treatment (minimally invasive procedures such as stent insertion or balloon dilation), and surgical treatment (ureteral reimplantation). The primary objective of the study was to assess the efficacy, safety, and long-term outcomes of each method to establish an evidence-based clinical approach.

Secondary objectives included analyzing the natural course of primary megaureter in patients managed conservatively, identifying criteria justifying surgical intervention, evaluating the degree of spontaneous regression, and identifying clinical and paraclinical predictors of therapeutic success. Another key objective was to develop a robust decision-making algorithm to allow personalized treatment based on obstruction severity, renal functional status, and individual patient characteristics.

The study was conducted as a mixed observational study (retrospective and prospective) from 2015 to 2024 in two leading pediatric surgery centers in Romania: “Maria Sklodowska Curie” Hospital in Bucharest and “Louis Țurcanu” Hospital in Timișoara. Only children with a confirmed diagnosis of primary obstructive megaureter

and no prior ureterovesical junction surgeries were included. Cases with secondary megaureter, vesicoureteral reflux or incomplete medical documentation were excluded.

Collected data included demographic, clinical, imaging, and laboratory variables, analyzed using SPSS v25, Microsoft Excel, and Data Analyst - ChatGPT software. Imaging assessments included ultrasound, voiding cystourethrography, DTPA renal scintigraphy, and selectively Uro-CT or MRU. Post-therapeutic outcomes were evaluated based on symptom improvement, ureteral dilation regression, maintenance or improvement of renal function, and occurrence of complications or recurrence.

Patients were divided into three groups based on the type of treatment received: conservative, endourological, or ureterovesical reimplantation. Comparative analysis revealed significant differences in terms of success rates, complication profiles, and the need for reintervention.

The study proposes a clinical decision-making model that may contribute to standardizing therapeutic practices and reducing variability in clinical decisions between centers. The conclusions offer a solid foundation for developing national treatment guidelines in pediatric urology, tailored to Romania's realities and aligned with international standards.

STUDY I – CLINICAL, IMAGING, AND THERAPEUTIC PROFILE IN PRIMARY OBSTRUCTIVE MEGAURETER: PREDICTIVE FACTORS FOR SURGICAL INDICATION

The first study included the entire cohort of 56 cases, comprising 47 male and 9 female patients, totaling 69 renal units and 46 surgical procedures (including reinterventions) performed between 2015 and 2024. The gender distribution revealed a marked predominance of male patients, accounting for 83.9% of the cases, with a male-to-female ratio of 5.2:1. Analysis of the distribution of patients based on the location of ureterohydronephrosis showed a predominance of left-sided involvement in 59.4% of cases, while 23.2% of patients presented with bilateral involvement.

The age at diagnosis varied considerably in this study, with a mean of 3.07 ± 3.4 years and a median of 2 years (interpercentile range: 1–4.75 years). Ureterohydronephrosis was diagnosed antenatally in 44.6% of cases. Age group distribution showed a clear predominance of diagnosis during the early years of life: 44.6% of patients were diagnosed between 0–1 years, and 70% were identified by age 3. The average weight was 13.48 ± 9.34 kg, with a median of 10.75 kg (interpercentile range: 7–16.5 kg).

Table 1. Comparison of Age at First Hospitalization Based on Antenatal Diagnosis

Diagnosis	Mean ± SD	Median (IQR)	Mean Rank	p*
Absent	4.58 ± 3.98	4 (1–7)	35.31	<0.001
Present	1.32 ± 1.31	1 (1–1)	20.06	

Patients with an antenatal diagnosis were hospitalized earlier, with a median age of 1 year (IQR: 1–1), compared to 4 years (IQR: 1–7) in those without antenatal diagnosis. Regarding symptoms, the most frequently reported were urinary tract infections (44.6% of cases), followed by hematuria (10.7%) and lumbar pain (8.9%).

A thicker renal parenchyma was observed in patients with right-sided megaureter (mean 9.25 ± 2.82 mm) compared to those with left-sided involvement (mean 7.62 ± 3.06 mm). Most patients with left-sided ureterohydronephrosis exhibited calyceal ballooning or flattening (63.4%), whereas only 36% of patients with right-sided megaureter showed such changes. The mean renal pelvis diameter for left-sided cases was 16.27 ± 8.01 mm, while for right-sided cases, it was lower at 13.68 ± 7.42 mm. The mean diameter of the distal left ureter was 13.17 ± 5.09 mm, compared to 11.5 ± 3.69 mm for the right ureter. Overall, left-sided ureteral dilation was more pronounced, with a higher percentage of cases classified as “severe” and a more balanced distribution among mild and moderate grades.

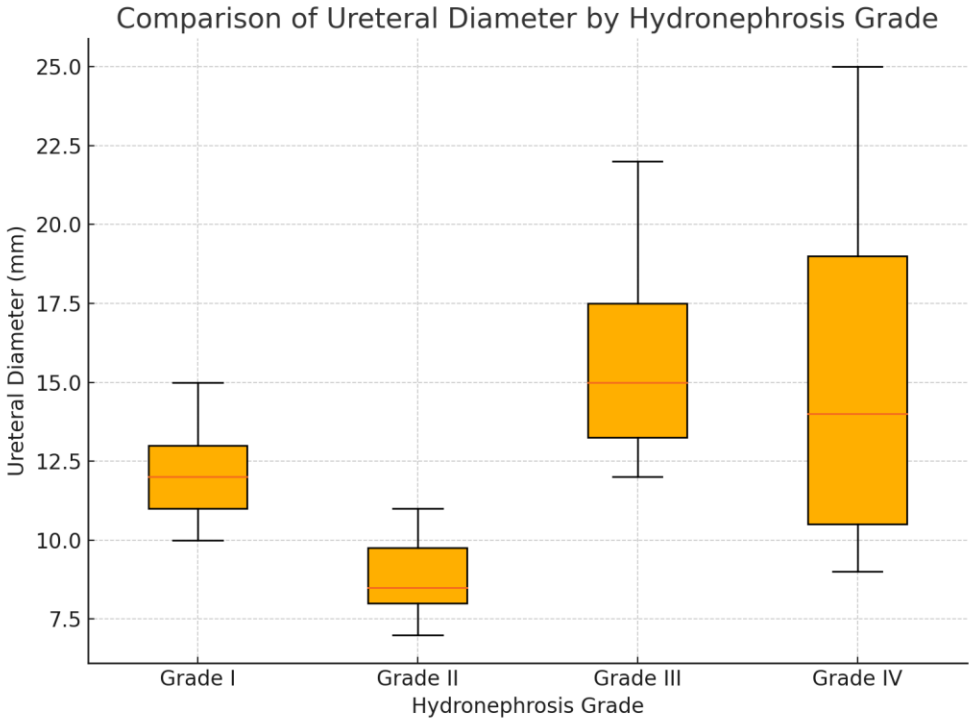
The distribution of patients according to the grade of hydronephrosis revealed a predominance of moderate to severe forms, with grade III being the most common (33.9%), followed by grades IV and II (each accounting for 28.6%). The mildest form, grade I, was rare, present in only 8.9% of cases.

DTPA renal scintigraphy was performed in 73.9% of patients receiving conservative treatment, 77.2% of those undergoing ureterovesical reimplantation, and

45.4% of endourologically treated cases, representing 70% of the total cohort. The distribution of differential renal function was symmetrical around the reference value of 50%. The mean glomerular filtration rate for the left kidney was 69.94 ± 25.9 ml/min/1.73m², while for the right kidney, it was higher at 81.73 ± 43.96 ml/min/1.73m².

Table 2. Comparison of Ureteral Diameter by Hydronephrosis Grade

Hydronephrosis Grade	Mean ± SD	Median (IQR)	Mean Rank	p*
Grade I (p=0.726**)	11.67 ± 4.04	11 (9.5–13.5)	18.67	0.006
Grade II (p=0.003**)	9 ± 2.82	8 (7–10)	10.05	
Grade III (p=0.003**)	14.13 ± 4.06	12.5 (12–16.5)	25.38	
Grade IV (p=0.269**)	15.54 ± 6.07	16 (10–20)	26.19	



Fugure 1. Ureter Diameter vs. Hydronephrosis Grade

In terms of the correlation between ureteral diameter and hydronephrosis grade, patients with grade II ureterohydronephrosis had a significantly smaller left ureter diameter (median = 8 mm, IQR = 7–10) compared to those with grade III (median = 12.5 mm, IQR

= 12–16.5; p = 0.011) or grade IV (median = 16 mm, IQR = 10–20; p = 0.010). However, differential renal function did not show significant differences in relation to the hydronephrosis grade or ureteral diameter.

In the studied cohort, 41.1% of cases were managed conservatively, while 58.9% underwent surgical intervention. Among the operated patients, 22 (66.7%) were treated through ureterovesical reimplantation, and 11 (33.3%) underwent endourological procedures.

Table 3. Distribution of Patients by Age Group and Treatment Type

Age Group	Conservative N	Conservative %	Surgical N	Surgical %	p*
0–1 years	14	60.9%	11	33.3%	0.001
1–3 years	0	0%	14	42.4%	
3–6 years	5	21.7%	3	9.1%	
6–12 years	3	13%	4	12.1%	
12–18 years	1	4.3%	1	3%	

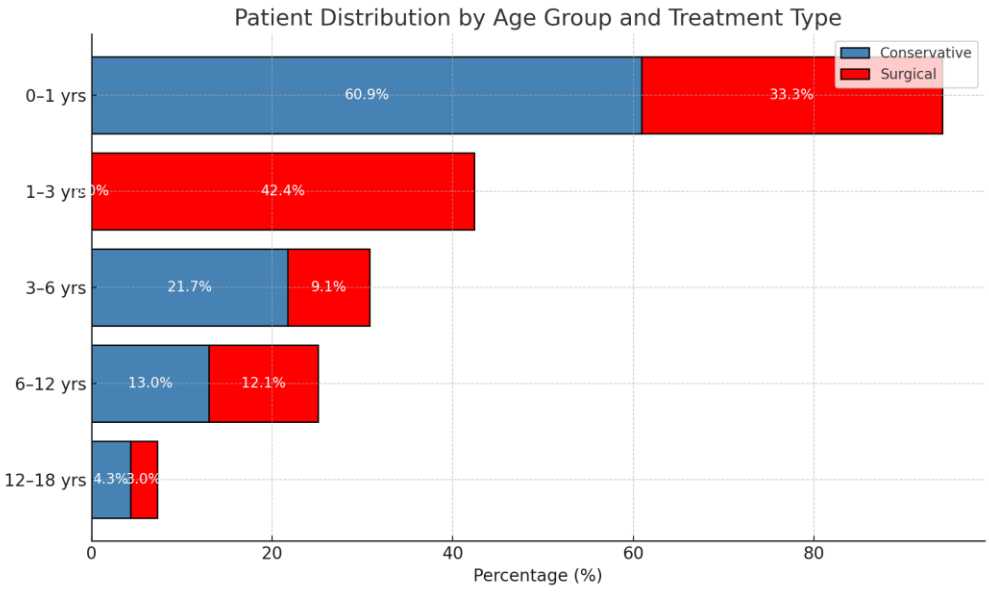


Figure 2. Patient Distribution by Age Group and Treatment Type

It was observed that the therapeutic decision was strongly influenced by patient age: children under 1 year were significantly more likely to receive conservative treatment, whereas patients aged 1–3 years more frequently underwent surgical intervention.

Table 4. Distribution of Patients by Hydronephrosis Severity and Treatment

Hydronephrosis Grade	Conservative N	Conservative %	Surgical N	Surgical %	p*
UHN I/II	17	73.9%	4	12.1%	<0.001
UHN III/IV	6	26.1%	29	87.9%	

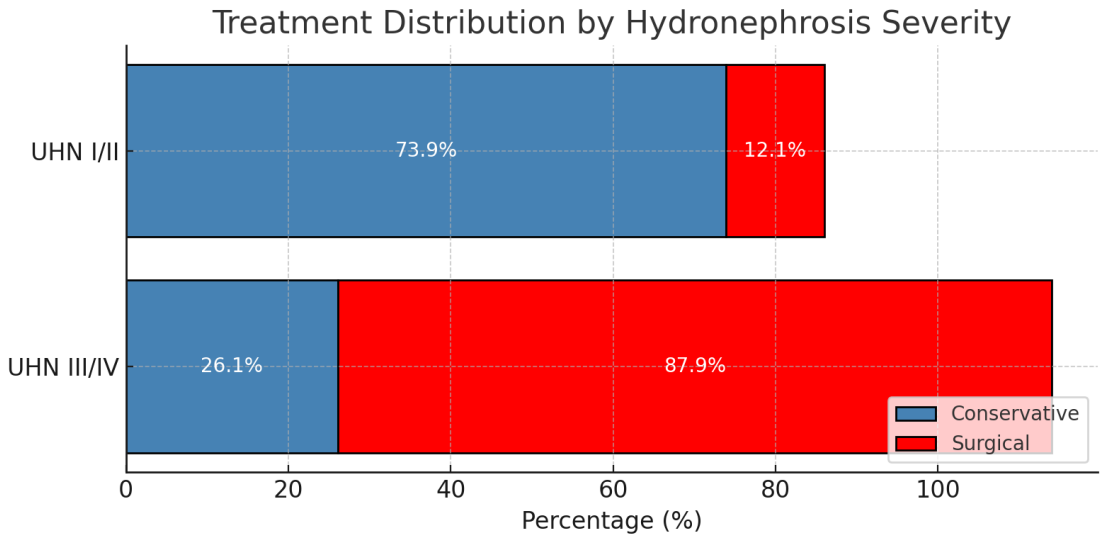


Figure 3. Treatment Distribution by Hydronephrosis Severity

The severity of ureterohydronephrosis also had a substantial impact on the treatment decision. Patients with grade III/IV hydronephrosis were significantly more often treated surgically (87.9%) compared to those without advanced dilation. This highlights the importance of SFU grading as a key decision-making factor in therapeutic management.

Table 5. Analysis of Anteroposterior Renal Pelvis Diameter by Treatment Type

Treatment	Mean ± SD	Median (IQR)	p*
Conservative (p=0.124**)	11.75 ± 6.03	10.5 (8–14)	0.003
Surgical (p=0.509**)	19.05 ± 7.89	17.75 (14.75–23.25)	

Table 6. ROC Analysis for Predicting Surgical Intervention Using Anteroposterior Renal Pelvis Diameter

Parameter	AUC (95% CI)	Standard Error	p	Cut-off	Sensitivity	Specificity
Renal Pelvis	0.796 (0.650–0.941)	0.074	0.001	14.5	76.9%	81.2%

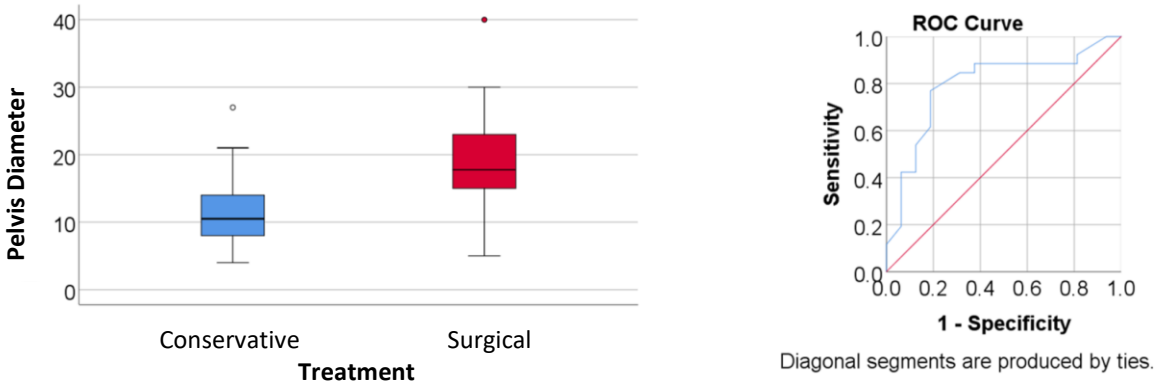


Figure 4. ROC Analysis for Predicting Surgical Intervention Using Anteroposterior Renal Pelvis Diameter

The identified threshold value was 14.5 mm; patients with an anteroposterior renal pelvis diameter ≥14.5 mm had a sensitivity of 76.9% and a specificity of 81.2% in accurately predicting the need for surgical intervention.

Table 7. Comparison of Renal Parenchymal Thickness by Treatment Type

Treatment	Mean ± SD	Median (IQR)	Mean Rank	p*
Conservative (p=0.081**)	10 ± 2.5	11 (9–12)	30.59	<0.001
Surgical (p=0.008**)	6.15 ± 2.39	6 (4–7.25)	15.90	

Table 8. ROC Analysis for Predicting Surgical Intervention Using Renal Parenchymal Thickness

Parameter	AUC (95% CI)	Standard Error	p	Cut-off	Sensitivity	Specificity

Renal Parenchyma	0.850 (0.722–0.977)	0.065	<0.001	8.5	88.5%	81.2%

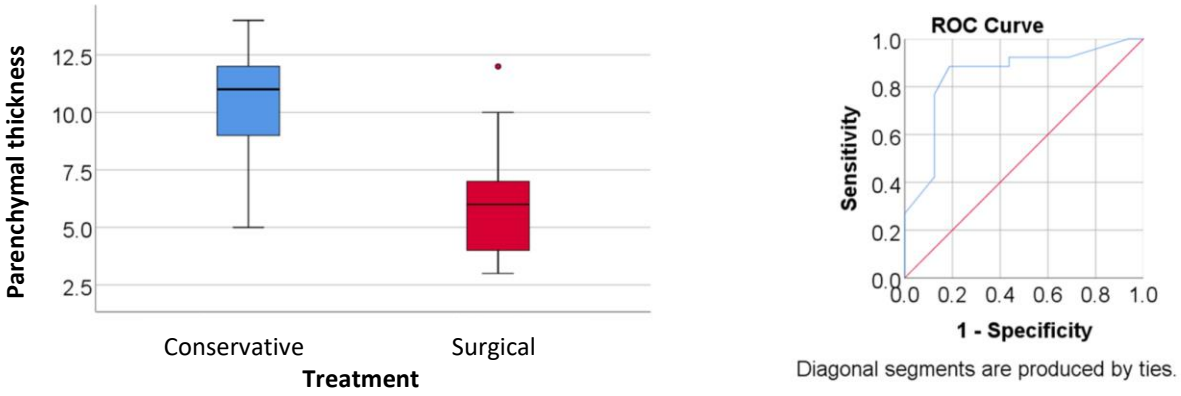


Figure 5. Relationship Between Parenchymal Thickness and Surgical Indication

A parenchymal thickness value of ≤8.5 mm demonstrated a sensitivity of 88.5% and a specificity of 81.2% in accurately predicting the need for surgery.

Table 9. Ureteral Diameter by Treatment Type

Treatment	Mean ± SD	Median (IQR)	Mean Rank	p*
Conservative (p=0.072**)	10.75 ± 3.37	10.5 (8–13)	—	0.007
Surgical (p=0.086**)	14.65 ± 5.44	13 (10–20)	—	

Table 10. ROC Analysis for Predicting Surgery Using Ureteral Diameter

Parameter	AUC (95% CI)	Standard Error	p	Cut-off	Sensitivity	Specificity
Left Ureter	0.713 (0.556–0.870)	0.080	0.022	9	88.5%	43.7%

Regarding the predictive value of ureteral diameter, the optimal threshold identified was 9 mm. Patients with a ureteral diameter ≥9 mm demonstrated a sensitivity of 88.5% and a specificity of 43.7% in accurately predicting the need for surgery. Therefore, while

ureteral diameter can serve as a guiding parameter, its predictive value is limited in terms of specificity.

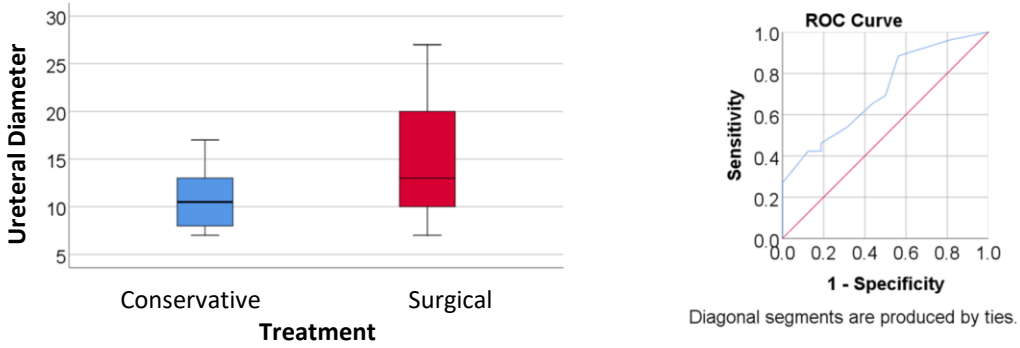


Figure 6. ROC Analysis for Predicting Surgery Using Ureteral Diameter

Table 11. Relationship Between Calyceal Changes and Therapeutic Approach

Calyceal aspect/Treatmentt		Conservative		Surgical		p*
		Nr.	Percent	Nr.	Percent	
Left	Normal	10	66.7%	5	19.2%	0.006
	Modified	5	33.3%	21	80.8%	
Right	Normal	12	92.3%	4	33.3%	0.004
	Modified	1	7.7%	8	66.7%	

Patients who exhibited calyceal flattening or ballooning required surgical treatment significantly more often compared to those without such changes.

Table 12. Univariate and Multivariate Logistic Regression Models Used in Predicting the Need for Surgical Intervention

Parameter	Univariate OR (95% C.I.)	Univariate p	Multivariate OR (95% C.I.)	Multivariate p
Age > 1 year	3.111 (1.029–9.410)	0.044	-	-
UHN III/IV	20.542 (5.067–83.272)	<0.001	8.305 (1.031–66.9)	0.047
Renal pelvis ≥ 14.5 mm	14.444 (3.060–68.182)	0.001	-	-
Parenchyma ≤ 8.5 mm	33.222 (5.838–189.055)	<0.001	14.19 (2.1–95.74)	0.006
Ureter ≥ 9 mm	5.963 (1.257–28.281)	0.025	-	-
Left calyx modified	8.4 (1.970–35.824)	0.004	-	-

STUDY II – URETEROVESICAL REIMPLANTATION VERSUS ENDOUROLOGICAL TREATMENT IN PRIMARY OBSTRUCTIVE MEGAURETER

The second study included 33 patients (30 boys and 3 girls), encompassing 38 affected renal units (25 on the left side and 13 on the right), and a total of 46 procedures performed, including reinterventions.

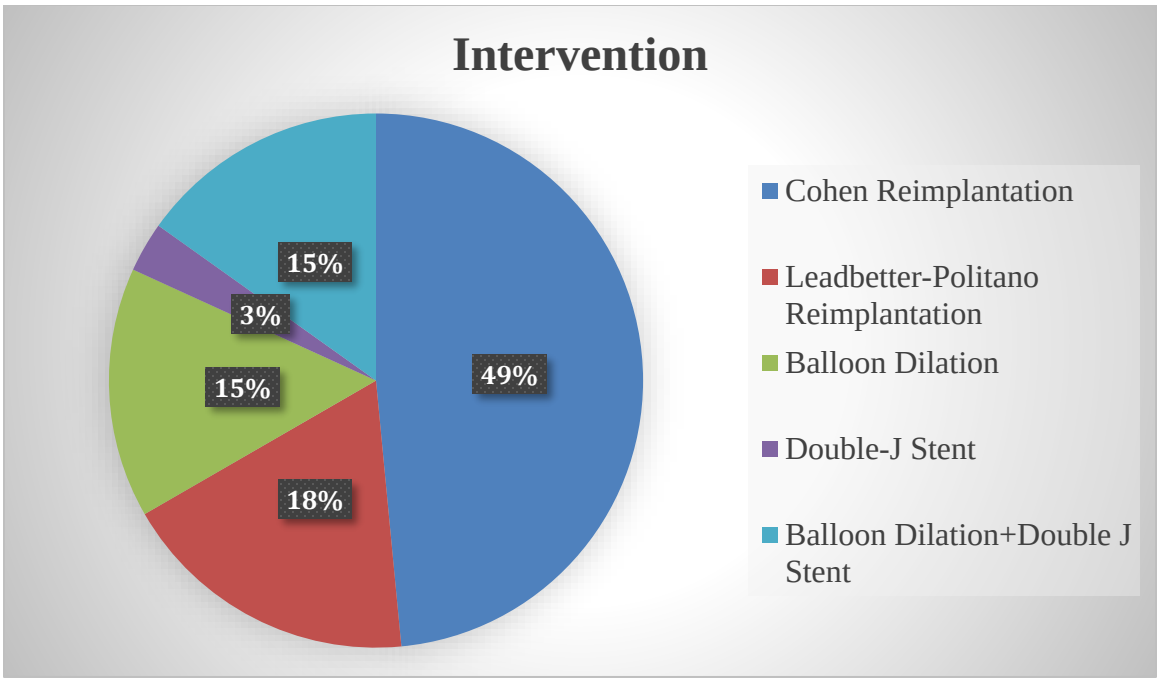


Figure 7. Distribution of Operated Patients by Type of Intervention

Out of the entire operated cohort, 66.7% of the patients underwent ureterovesical reimplantation procedures. Among them, 6 patients (27.27% of the reimplantation group) underwent cystoureteroneostomy using the Leadbetter-Politano technique, while 16 patients (72.72% of the reimplantation group) were treated using the Cohen technique. The remaining 33.3% of patients benefited from endourological interventions: 1 patient (9.1% of the endourological group) underwent high-pressure balloon dilation, 5 patients (45.5% of the endourological group) received a double-J ureteral stent, and 5 patients (45.5% of the endourological group) underwent a combined procedure of endoscopic balloon dilation and stent placement.

No significant differences were identified between the two study groups regarding age, weight at the time of the first intervention, imaging or functional parameters, or number of hospitalizations, with a uniform distribution of patients. The success rate was also comparable: 77.3% in the reimplantation group and 72.7% in the endourological treatment group.

Table 13. Comparison of Age at First Intervention Based on Antenatal Diagnosis

Antenatal Diagnosis	Mean ± SD	Median (IQR)	Mean Rank	p*
Absent (p=0.010**)	4.06 ± 3.89	2 (1–6)	22.82	<0.001
Present (p<0.001**)	0.56 ± 0.72	0 (0–1)	10.81	

A total of 16 patients, representing 48.4% of the studied population, were diagnosed antenatally (11 cases in the reimplantation group and 5 cases in the endourological group). Patients with an antenatal diagnosis had a significantly lower age at the time of first intervention (median = 0; IQR = 0–1) compared to those without an antenatal diagnosis (median = 2; IQR = 1–6).

Table 14. Comparison of Surgery Duration by Procedure Type

Procedure	Mean ± SD (hours)	Median (IQR)	Mean Rank	p*
Reimplantation (p=0.008**)	3.66 ± 0.47	3.5 (3.5–4)	22.50	<0.001
Endourological (p=0.058**)	0.8 ± 0.31	0.75 (0.5–1)	6.00	

For patients who underwent endourological surgery, the intervention duration was significantly shorter (median = 0.75 hours, IQR = 0.5–1) compared to those who underwent reimplantation (median = 3.5 hours, IQR = 3.5–4).

Table 15. Comparison of Hospital Stay Duration by Type of Intervention

Procedure	Mean ± SD (days)	Median (IQR)	Mean Rank	p*
Reimplantation (p=0.002**)	10.36 ± 3.52	9.5 (8–12.25)	22.48	<0.001
Endourological (p=0.014**)	2.45 ± 1.81	2 (1–4)	6.05	

Additionally, the length of hospital stay was significantly shorter for the endourologically treated group (median = 2 days, IQR = 1–4) compared to patients who underwent ureterovesical reimplantation (median = 9.5 days, IQR = 8–12.25).

Table 16. Comparison of Stent Duration by Type of Intervention

Procedure	Mean ± SD (months)	Median (IQR)	Mean Rank	p*
Reimplantation (p<0.001**)	0.42 ± 0.61	0 (0–1)	12.39	<0.001
Endourological (p=0.017**)	3.59 ± 3.19	2 (1.8–6)	26.23	

The results revealed a statistically significant difference between the groups ($p < 0.001$), with patients treated endourologically having a significantly longer median stent duration (median = 2 months, IQR = 1.8–6 months) compared to those who underwent reimplantation.

Table 17. Comparison of ICU Stay Duration by Type of Intervention

Procedure	Mean ± SD (months)	Median (IQR)	Mean Rank	p*
Reimplantation (p<0.001**)	1.82 ± 0.58	2 (1–2)	22.36	<0.001
Endourological (p<0.001**)	0.09 ± 0.3	0 (0–0)	6.27	

Patients who underwent reimplantation had a significantly longer ICU stay (median = 2 days, IQR = 1–2) compared to those who underwent endourological surgery (median = 0 days, IQR = 0–0). Age at the time of diagnosis or the presence of an antenatal diagnosis did not significantly influence the healing rate among surgically treated patients.

Table 18. Postoperative Urinary Tract Infections by Type of Intervention

UTI Status	Reimplantation N	Reimplantation %	Endourologic N	Endourologic %
Absent	18	81.8%	5	45.5%
Present	4	18.2%	6	54.5%

Regarding the occurrence of postoperative urinary tract infections in relation to the type of surgical intervention, statistical analysis revealed a significant difference between groups ($p = 0.049$), with postoperative UTIs being significantly more frequently associated with endourological procedures (54.5%) compared to surgical reimplantation (18.2%). Although an apparent trend of increased UTI frequency was observed among patients with a ureteral stent, the differences were not statistically significant.

Table 19 – Distribution of Patients by Reintervention Requirement and Type of Initial Surgery

Reintervention	Reimplantation n	Reimplantation %	Endourological n	Endourological %
Absent	19	86.4%	2	18.2%
Present	3	13.6%	9	81.8%

*p<0.001

Patients who underwent endourological surgery required reintervention for ureterovesical junction recalibration significantly more often (81.8% vs. 13.6%).

Table 20. Comparison of Patient Weight at First Surgery and Postoperative Complications

Recovery Status	Mean ± SD (kg)	Median (IQR)	Mean Rank	p*
Not Healed (p<0.001**)	16.97 ± 10.91	12 (10.5–19.5)	20.76	0.021
Healed (p<0.001**)	11.57 ± 7	10 (7.77–11.75)	13.00	

Patients with a body weight less than or equal to 10.75 kg demonstrated a sensitivity of 68.8% and a specificity of 76.5% in accurately predicting postoperative complications.

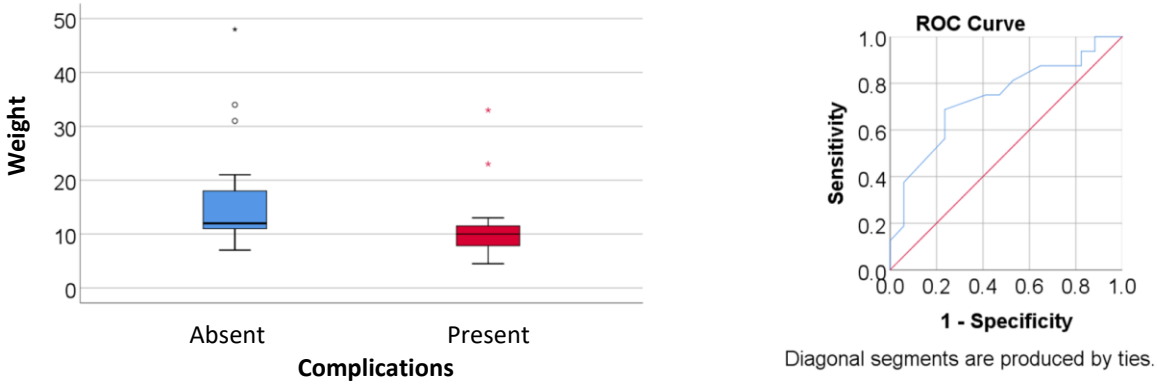


Figure 8. ROC Analysis for Predicting Postoperative Complications Using Weight at First Surgery

Table 21. DRF Analysis by Postoperative UTI Status (Cystoureteroneostomy Cases)

Postoperative UTI	Mean ± SD	Median (IQR)	Mean Rank	p*
Absent (p=0.172**)	51.07 ± 9.29	49 (47.5–58.5)	10.00	0.015
Present (p=–**)	29 ± 4.24	29 (26–32)	1.50	

Patients with postoperative urinary tract infections (UTIs) had significantly lower DRF values (median = 29, IQR = 26–32) compared to those without UTIs (median = 49, IQR = 47.5–58.5).

Table 22. Renal Pelvis AP Diameter at 3–6 Months Postoperative by Healing Status (Endourological Cases)

Healing Status	Mean ± SD	Median (IQR)	p*
Absent	20.67 ± 7.02	20.5 (15.5–28)	
Present	8.29 ± 2.56	8 (6.5–10.5)	

Patients who achieved healing had a significantly smaller anteroposterior renal pelvis diameter (8.29 ± 2.56 mm) compared to those who did not heal (20.67 ± 7.02 mm) at the 3–6 month postoperative evaluation. The identified threshold value was 12.5 mm.

Table 23**.** Renal Parenchymal Thickness at 3–6 Months Postoperative by Healing Status (Endourological Cases)

Healing Status	Mean ± SD	Median (IQR)	p*
Absent (p<0.001**)	5.67 ± 2.31	7 (5–7)	0.017
Present (p=0.591**)	10.3 ± 1.49	10 (9.5–11.5)	

Patients who achieved healing had a significantly greater renal parenchymal thickness at 3–6 months postoperatively (median = 10 mm, IQR = 9.5–11.5 mm) compared to those who did not heal (median = 7 mm, IQR = 5–7 mm). The identified threshold value was 7.5 mm.

Table 24. Ureteral Diameter at 3–6 Months Postoperative by Healing Status (Endourological Cases)

Healing Status	Mean ± SD	Median (IQR)	p*
Absent (p=0.363**)	13 ± 2.64	12 (11.5–14)	<0.001
Present (p=0.580**)	5.67 ± 1.1	5.7 (5–6.5)	

Patients who experienced healing had a significantly smaller ureteral diameter at 3–6 months postoperatively (5.67 ± 1.1 mm) compared to those who did not heal (13 ± 2.64 mm). The identified threshold value was 9 mm.

STUDY III – PREDICTIVE FACTORS FOR SPONTANEOUS RESOLUTION

The third study included 23 pediatric patients diagnosed with primary obstructive megaureter, treated conservatively, totaling 31 affected renal units. The median age at diagnosis was 1 month (IQR: 0–45 months; range: 0–83 months), while the median age at first hospitalization was 11 months (IQR: 2.2–51.3; range: 0.3–16.9 years). The study group was predominantly male (n = 17, 73.9%), with six female patients (26%). Antenatal diagnosis was established in 9 cases (39.1%), while the remaining 12 patients (60.8%) were

diagnosed postnatally—either based on clinical symptoms (60%) or incidentally through imaging (40%). The median weight at first hospitalization was 11.3 kg (range: 3.6–27 kg).

From a clinical standpoint, 8 patients (34.7%) had at least one urinary tract infection during follow-up, 5 patients (21.7%) presented with hematuria, 3 patients (13%) experienced lumbar pain, while the remaining patients were asymptomatic. In total, 11 patients (47.8%) received antibiotic prophylaxis during monitoring. The average number of hospitalizations per patient was 5.3.

The condition showed a slight predominance on the left side, identified in 16 cases (51.6% of total affected renal units), although the overall distribution was relatively balanced. Bilateral involvement was observed in 8 patients (34.7%). According to the Society for Fetal Urology (SFU) classification, hydronephrosis severity was distributed as follows:

- Grades I–II (mild to moderate hydronephrosis) — 17 patients (73.9%)
- Grades III–IV (severe hydronephrosis) — 6 patients (26%)

The median distal ureteral diameter was 11 mm on the left (IQR: 8–13; range: 7–17 mm), and 10 mm on the right (IQR: 9–15; range: 7–21 mm).

The median anteroposterior (AP) diameter of the renal pelvis was 11 mm on the left (IQR: 8–14; range: 4–27 mm), and 12 mm on the right (IQR: 9–16; range: 3–28 mm).
Renal function was assessed using DTPA renal scans in 17 cases (73.9%). The median glomerular filtration rate (GFR) was:

- Left affected kidney — 63 mL/min/1.73 m² (IQR: 49–76; range: 36–108)
- Right affected kidney — 55 mL/min/1.73 m² (IQR: 47–78; range: 9–115)

Five patients (21.7%) showed prolonged drainage time (T½ > 20 minutes), indicating significant obstruction. Only one case had a differential renal function (DRF) below 40%.

The median follow-up duration was 60 months (IQR: 24–84; range: 6–114 months). Spontaneous resolution was observed in 14 patients (60.8%), confirmed through serial imaging demonstrating ureteral dilation reduced below 7 mm and stable renal function. The mean age at resolution was 54.36 ± 53.84 months.

Persistent or worsening obstruction was identified in 9 patients (39%), with a median ureteral diameter of 15 mm. Of these, 5 patients (21.7%) remained under active

surveillance with a stable course and no clinical or functional deterioration, and 4 patients (17.3%) required surgery due to progressive ureteral dilation or worsening renal function.

Variables such as hydronephrosis grade, ureteral diameter, age at diagnosis, sex, side of involvement, or presence of UTI did not significantly influence the time to resolution in the studied sample.

Table 25. Distribution of Conservatively Treated Patients by Hydronephrosis Grade and Resolution. **p=0.038*

Hydronephrosis Grade	Resolution Absent n	Resolution Absent %	Resolution Present n	Resolution Present %
Grade I	2	22.2%	3	21.4%
Grade II	2	22.2%	10	71.4%
Grade III	4	44.4%	1	7.1%
Grade IV	1	11.1%	0	0%

Patients with grade II ureterohydronephrosis had a significantly higher healing rate (71.4% vs. 22.2%).

Table 26. Distribution by Severe Hydronephrosis and Spontaneous Resolution. **p=0.018*

UHN Grade	Resolution Absent - n	Resolution Absent - %	Resolution Present - n	Resolution Present - %
UHN I/II	4	44.4%	13	92.9%
UHN III/IV	5	55.6%	1	7.1%

Patients with grade III/IV hydronephrosis showed a significantly lower association with healing compared to those without severe involvement (55.6% vs. 7.1%). No statistically significant associations were found between spontaneous resolution and DRF values, serum creatinine levels, patient sex, or lesion laterality.

Additionally, the occurrence of urinary tract infections could not be correlated with the degree of dilation or patient sex.

Table 27. Univariate Regression Model Predicting Resolution Based on Hydronephrosis Grade

Parameter	OR (95% C.I.)	p
UHN III/IV	0.062 (0.005-0.693)	0.024

Patients with grade III or IV ureterohydronephrosis had a 16.12 times lower likelihood of healing (95% CI: 1.443–200, $p = 0.024$).

CONCLUSIONS

The study revealed a clear predominance of the male sex (ratio 5.2:1), with a mean age at diagnosis of 3 years and early detection in 70% of cases. Antenatal diagnosis, present in approximately 50% of cases, allowed for earlier hospitalization but did not significantly influence the healing rate. Anatomically, the condition was more frequently and severely observed on the left side, and grade III ureterohydronephrosis was the most commonly encountered. Imaging parameters—renal pelvis diameter, parenchymal thickness, and ureteral diameter—guided therapeutic decisions, though they did not directly correlate with differential renal function.

Conservative treatment was primarily applied to infants under one year and those with mild forms (UHN grades I–II), while surgical intervention was required in patients with UHN grade III/IV or significant morphological changes. Three imaging markers with high predictive value for surgical indication were identified:

- Renal pelvis diameter ≥ 14.5 mm – sensitivity 76.9%, specificity 81.2%
- Parenchymal thickness ≤ 8.5 mm – sensitivity 88.5%, specificity 81.2%

- Ureteral diameter ≥ 9 mm – sensitivity 88.5%, lower specificity at 43.7%

The presence of calyceal alterations (ballooning or flattening) was significantly associated with the need for surgery.

From a surgical standpoint, ureterovesical reimplantation was the preferred method (66.7% of cases), performed using classic techniques (Cohen, Leadbetter-Politano), with a success rate of 77.3%. Endourological interventions were used in 33.3% of cases, showing a 72.7% success rate. While endourological procedures offered shorter hospitalization, they were associated with a higher incidence of complications, such as UTIs, stent migration, and reintervention needs (81.8% vs. 13.6%).

The postoperative monitoring phase showed that a reduction of the renal pelvic diameter below 12.5 mm, an increase in parenchymal thickness above 7.5 mm, and a decrease in ureteral caliber below 9 mm at 3–6 months postoperatively correlate with healing. Additionally, a body weight below 10.75 kg was associated with a higher risk of postoperative complications. Age at diagnosis or time of the first intervention did not influence the healing rate, though antenatal diagnosis allowed for earlier initiation of treatment and monitoring.

Among conservatively treated patients, a spontaneous resolution rate of 60% was observed, typically occurring at an average age of 4.5 years, with a mean observation period of 18 months. The only statistically significant predictor of spontaneous resolution was ureterohydronephrosis grade: Grade II was associated with a >70% chance of resolution, while Grades III/IV carried a 16-fold lower probability of remission without surgical intervention.

Based on these data, an integrative decision-making algorithm can be proposed, useful for standardizing and personalizing the treatment of primary obstructive megaureter in children.

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