

Endoscopic Treatment for Congenital and Acquired Hydronephrosis - The Role of Endopyelotomy

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Abstract

Introduction and Objectives. The ureteropelvic junction (UPJ) dysfunction, having as consequence hydronephrosis, was traditionally treated surgically by pyeloplasty, the rate of success being 71-98%. Failure was followed by one of the following interventions: repeating pyeloplasty, replacement with ileum, ureterocalicostomy, renal autotransplantation and, lastly, nephrectomy. We evaluate the role of endopyelotomy in the management of ureteropelvic junction obstruction.

Materials and Methods. In a period of 27 years (1987-2014), we performed a total of 833 endopyelotomies. In our study (1987-2002), we retrospectively identified 303 patients who underwent endopyelotomy for ureteropelvic junction obstruction, who came for regular check-ups. Patient demographics, operative information, complications and success rates were reviewed for 187 patients, who could be properly assessed, with a mean age of 51 years and mean follow-up of 44 months. Treatment success was defined as the absence of symptom recurrence and improved radiographic features on ultrasound, intravenous pyelography at most recent follow-up.

Results. Endopyelotomy data were analyzed in 187 patients. The success rate was 83.9%. Treatment failure occurred in 30 (16%) patients. There were 20 (10.69%) cases of ureteral hypoplasia with less favorable results. Four patients (2.13%) with renal-ureteral duplication had surgical failure at 6 to 12 months reevaluation. Four patients (2.13%) were found with renal ptosis and two patients (1.06%) with horseshoe kidney in which endopyelotomy failed.

Conclusions. Antegrade endopyelotomy is a minimally aggressive surgical intervention in both children adults and the elderly. The endoscopic percutaneous approach of ureteropelvic junction allows solving of associated disorders, such as renal lithiasis. Laparoscopic and robotic assisted pyeloplasty are emerging as the gold standard of treatment for ureteropelvic junction obstruction, endopyelotomy it is the treatment of choice for failed open or laparoscopic pyeloplasty and concomitant renal calculi.

Key-words: ureteropelvic junction obstruction, endoscopy, endopyelotomy

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Introduction and Objectives

The ureteropelvic junction (UPJ) dysfunction, having as consequence hydronephrosis, was traditionally treated surgically by pyeloplasty, the rate of success being 71-98%^[1, 2, 3, 4]. Failure was followed by one of the following interventions: repeating pyeloplasty, replacement with ileum, ureterocalicostomy, renal auto-transplantation and, lastly, nephrectomy. Park outlined the difficulty of interventions after failed pyeloplasties, due to the extended retroperitoneal fibrosis. Similar to many endourology techniques, endopyelotomy (EPT) appeared following the failure of the conventional treatment.

Besides solving the ureteropelvic junction dysfunction, the percutaneous approach solves any concomitant renal lithiasis [4]. EPT is less expensive, the hospitalisation is shorter, the convalescence is reduced, and the endoscopic intervention can be repeated in case of failure.

EPT passed the time test by efficiency, and it can be, without any problems, the first therapeutic option for the correction of UPJ dysfunction, due to the minimal aggressive character^[5].

Materials and Methods

Between 1987 and 2014, 833 EPTs have been performed on the same number of patients with congenital (684) or acquired (149) hydronephrosis after failed pyelolithotomy / pyeloplasty. Out of the total of 487 patients included in the study for a 15 year period (1987-2002) 303 patients (62.61%) responded to our call for control investigations. We had 227/303 (75%) patients with congenital hydronephrosis and 76/303 (25%) with acquired hydronephrosis. The age of the patients from the studied group was between 4 and 82 years, with maximum incidence in the 20-40 year range (mean age of 51 years). The post-intervention control was performed within 6-113 months (mean follow-up 44 months).

From a clinical and prognostic point of view, the appreciation of the grade of hydronephrosis is important in order to adopt an adequate therapy. From the multiple methods of hydronephrosis classifications, we used the radiological one in 5 degrees as follows^[6]:

Degree I Dilated pelvis but with normal calyces

Degree II Dilation of pelvis and of caliceal pole, but with normal caliceal papilla

Degree III Pyelocaliceal dilation, aplatization of caliceal papilla

Degree IV Advanced pyelocaliceal dilation, caliceal papilla with convexity towards the kidney periphery, reduced renal parenchyma

Degree V Voluminous pyelocaliceal dilation, with atrophy of the renal parenchyma. Hypofunctional kidney or lack of kidney function

As of the indications and contraindications of the procedure, we took into account the the presence of obstructive symptomatology, pain in the loin accompanied by nausea, vomiting, sometimes associated with a febrile status; progressive alteration of the renal function; occurrence of certain complications such as: recurrent urinary tract infections, chronic pyelonephritis, and urinary lithiasis at the level of the affected kidney. Depending on the symptomatology, A.D. Smith proposes the following indications: symptomatic patients with UPJ dysfunction are operated; symptomatic patients with small degree hydronephrosis (I, II) - periodic follow-up and reassessment; asymptomatic patients, but with UPJ dysfunction must be operated; asymptomatic patients, but with dilated pyelocaliceal system (PCS) must also be observed. The differentiation between a kidney with dilated PCS, but without UPJ dysfunction is difficult, even in the presence of symptomatology. These patients require additional investigations for a correct surgical indication. There are also special EPT indications: hydronephrosis on one congenital or acquired kidney, on malrotated, ptotic, double kidney, etc.; hydronephrosis cases in children and elderly. In bilateral hydronephrosis EPT is performed, usually, on the better functional kidney^[7, 8, 9, 10].

Certain contraindications for the procedure can be regarded as absolute (coagulation disorders due to lack of various coagulation factors, latent fibrinolytic conditions can trigger acute fibrinolysis followed by serious haemorrhages, through the consumption of coagulation factors, uncooperative patient (e.g. psychiatric disorders), pregnancy in the first 3 months, excessive obesity) while others are considered as relative contraindications (disorders requiring extended treatment with anticoagulants, untreated urinary tract infections, chronic hepatitis and hepatic cirrhosis (deficiency in the synthesis of prothrombin)^[5, 11, 12], untreated high blood pressure, with systolic values over 180 mmHg, kidney position, conformation and rotation anomalies, bone anomalies leading to kidney location, rotation changes and even the interposition of certain organs (liver, spleen, colon, lung)^[13, 14, 15, 16].

The method used by our clinic is the antegrade one, described below. After the percutaneous puncture and dilation of the tract, through the middle or upper calyx to some kidney (low lumbar ectopic kidney), horseshoe kidney, in order to have a trajectory as rectilinear as possible, an incision is performed on to the UPJ, pelvis and the proximal ureter. From this point of view, the term proposed by Van Changh (Endoureteropyelotomy)^[17] is more accurate than the endopyelotomy proposed by A.D. Smith^[18].

In case of associated renal lithiasis, the antegrade approach is an optimum choice. As regards the solving

order, first the lithiasis is approached and then the EPT, which can be performed during the same session or during another session, maintaining the percutaneous nephrostomy. The incision of the pyelic wall and of the ureter intersects the entire length of the stenotic segment up to the peripelvic fat. The incision is always performed on the posteroexternal face of the pelvis and ureter, considered as avascular zones^[4, 12, 19, 21, 39].

The incision of the entire stenotic zone is protected by a 14/7 Ch or 12/6 Ch endopyelotomy stent; when the stent is missing, a usual 7/9 Ch regular stent can be used.

Over time, a series of technical artifices have been imagined in order to avoid the lesion of an aberrant artery that crosses the UPJ. The Gelet technique, for example, consists in the UPJ invagination in the pelvis where it is incised, avoiding the lesion of an aberrant artery in relation to UPJ^[20, 21].

Results

The surgeon's experience and technological advancements in the EPT field allows a successful and safe procedure.

Our non-randomised, retrospective study, includes 303 patients on whom 309 antegrade EPTs were performed. The difference between the number of patients (303) and the one of EPTs (309) is explained by performing EPTs on 2 patients who had bilateral hydronephrosis; on 4 patients, we performed the second EPT after the failure of the first intervention.

On large age groups we had 47/303 children (15.71%); 227/303 adults (74.91%) and elderly 29/303 (9.57%). We have met UPJ dysfunction with a similar incidence in both genders: 161/303 women (53.13%) and 142/303 (46.86%) men.

EPT was performed according to antegrade technique of A.D. Smith who has the advantage of making the incision of the UPJ in sight with respect to the length and depth of the incision, on 249/303 (82.47%) patients; the M. Gallucci method on 47/303 (15.51%) patients, antegrade method with Nicolescu endopyelotomy on 7/303 (2.31%). We performed only 3/303 (0.99%) EPT's without ureteric stent or a protective guide. On these patients, we could not protect the incised UPJ. Nephrostomy was suppressed on the fourth or fifth day postsurgery; the stent was suppressed in cases of 300 patients, usually after 6 weeks.

We had a global rate of success of 253/303 (83.49%) patients, taking into account that we have included in the study all patients, starting with the first EPTs performed in 1987. The rate of success for acquired hydronephrosis was 85% while for the congenital one, it was 83%.

We mention that out of the 303 patients included in the study in the 1987-2002 period, early and late EPT re-

sults were correctly evaluated only for a total number of 187 patients who responded to our requests to return for a check-up after 6-116 months following the EPT.

Concerning our results, we took into account the good result after EPT, as being the situations when the patient became asymptomatic, has normal urine exam, with sterile urine culture, with improved or no symptoms. Also the ureter and UPJ is well visualised at the intravenous urography and PCS dilations have disappeared [4] or are well improved on the ultrasound.

In 83.9% of the cases our results fulfilled the above mentioned criteria, 12-116 months after the EPT.

In 30/187 (16%) cases the results were unfavourable; EPT has had a high degree of difficulty due to an abnormality associated with the UPJ dysfunction with the patients remaining symptomatic, the urine exam and the urine culture did not return to normal, PCS dilations were maintained or even progressed, and on the IVU (intravenous urography), the UPJ was not identified.

In our study, we diagnosed ureteral hypoplasia in 20/187 patients (10.69%), with high grade of obstruction. Kidneys obstructed during the first half of fetal life tend to be dysplastic, while late obstructions result in simple hydronephrosis.^[20] We have performed EPT for the UPJ dysfunction with ureteral hypoplasia with unfavourable results.

In cases of renoureteral duplication, (4/187 (2.13%) patients), we have performed antegrade EPT on the lower hemikidney. The results after 6 to 12 months from the procedure were unfavourable.

Renal ptosis was associated to hydronephrosis in 4 cases (2.13%), due to its exaggerated mobilisation, ureteral kinking, makes it difficult to approach this kidney, and impossible to pass the ureteric stent into the pelvis, which contraindicates the endoscopic intervention. The lateral approach can affect and injure the ascending or descending colon from that part. The post-operative results were unfavourable.

The results in case of horseshoe kidney (2/187 (1.06%) patients) were unfavourable after 6 months, on both patients, and revealed a slightly improvement after 12 month when the degree of the initial hydronephrosis showed a reduction to degree II/III and the urine exam result was normal. The urine culture remained positive in one of the patients.

In the series of 303 patients we had several complications. 2/303 (0.66%) patients with pleural lesions required pleurotomy, evacuation and suction drainage, healed in 7 to 10 days. In 3/303 (0.99%) patients with congenital hydronephrosis we encountered aberrant arteries which have been sectioned. 1/303 patients (0.33%) required open surgery for evacuation of lumbar hematoma and haemostasis on the 2 ends of the

sectioned artery, followed by lumbar drainage. In 2 cases (0.66%) with aberrant arteries, probably of small calibre, the haemostasis occurred spontaneously, with no need of lumbotomy, but with careful follow-up and administration of plasma and blood. No deaths had occurred in our study group.

Discussions

Although the antegrade EPT do not achieve a success rate of 95% or higher, as it is in the case of open or laparoscopic pyeloplasty [22, 23, 24], the low morbidity rate, reduced duration of hospitalisation and short-term convalescence are clear benefits of this procedure. Based on our experience we can formulate the following: first degree hydronephrosis should not be operated; second and third degree hydronephrosis is operated with good results; in case of fourth degree hydronephrosis - surgical indication has an optional character with results inferior to the previous categories; Fifth degree hydronephrosis requires nephrectomy, endoscopic intervention is usually illusory.

The overall clinical success rate ranges between 80 and 86% [24, 25, 26], lower than the one after open pyeloplasty. The main responsible factors are polar arteries, hypoplastic ureteral fluid, and high degree hydronephrosis.

We ascertained a significant correlation between the degree of the hydronephrosis and the EPT failure. In the literature, it is mentioned that the highest rate of relapses after antegrade EPT appears in less than one year after the EPT [27, 28, 29].

When the hydronephrotic kidney function is seriously affected, the incidence of the failure after EPT is increased; if the hydronephrotic kidney function is lower than 20% of the global renal function, nephrectomy is preferred [26].

Ureteral hypoplasia is a sign of alarm, meaning that a renal dysplasia associated to UPJ dysfunction is a bad sign for the EPT results. In these cases, no endoscopic, laparoscopic or open surgical technique is followed by good results.

Avascular UPJ stenosis, longer than 2 cm, associated with a severe retroperitoneal fibrosis, is a contraindication for EPT [12, 30].

Failed previous open interventions (pyeloplasties, pyelolithotomies) do not have a bad effect on the EPT result. According to some statistics, patients with secondary UPJ obstructions (after these interventions) have better results than the patients with primary obstructions [31, 32].

A controversial issue is the one of the ureteric stent. In general, we used 7/9 Ch calibre stents, with very good results.

Fuchs, based on a rich personal experience with all therapeutic methods of solving the UPJ obstruction,

adopts the antegrade EPT, under direct visual control. The author concludes that antegrade and retrograde EPT are two good procedures, slightly equal, with low rate of complications [24].

In our retrospective study, we identified 30 cases of failure with nine patients having aberrant arteries, eight patients with altered renal function and 13 patients with fourth degree hydronephrosis.

However, failed EPT can be solved by repeating it or by pyeloplasty [31, 32]. Singh found that EPT is associated with less operative time and similar success as nondismembered laparoscopy for patients with low volume pelvis [33]. Szydelko article found a higher success rate for laparoscopy than EPT concluding that laparoscopy should be the procedure of choice for such patients [34]. Laparoscopic and robotic assisted pyeloplasty are emerging as the gold standard of treatment for ureteropelvic junction obstruction, endopyelotomy will still continue to have a well-defined role in the management of ureteropelvic junction [35].

Endopyelotomy remains an effective alternative first-line treatment for certain patients with primary ureteropelvic junction obstruction [36], performed by urologists without laparoscopic training. Endopyelotomy is the treatment of choice for failed open or laparoscopic pyeloplasty and concomitant renal calculi [37]. In recent years Ho:YAG laser endopyelotomy proved to be a safe, minimally invasive approach effective in primary and secondary ureteropelvic junction obstruction treatments [38].

Conclusions

We know that hydronephrosis following UPS dysfunction is met at all ages, the maximum incidence being between 31 and 40 years old. The frequency is slightly equal in both genders, with a slight preponderance in women (53%) than men (47%). Clinical suspicion of the obstruction is confirmed by ultrasound or IVU. Anterograde endopyelotomy is a minimally aggressive surgical intervention in both children and adults and the elderly over 70 years. The endoscopic percutaneous approach of UPJ allows solving of associated disorders, among which renal lithiasis occupies the first place. Although EPT is a minimally aggressive technique in the treatment of UPJ dysfunction, laparoscopic, robotic assisted technique and the use of laser endopyelotomy are having their proven role in management of ureteropelvic junction obstruction.

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