



Ureteropelvic Junction Obstruction: Which Surgical Approach?

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Abstract

Context: Open pyeloplasty has been considered the referral standard of treatment for ureteropelvic junction obstruction (UPJO). Minimally invasive procedures, however, have evolved and have gradually replaced open surgery, with various success and complication rates. The ideal universal treatment for UPJO is still elusive and controversial.

Objectives: The current status of three surgical approaches to the treatment of UPJO are reviewed: laparoscopic pyeloplasty (LP), robotic-assisted pyeloplasty, and endopyelotomy.

Evidence acquisition: The interactive discussion among the expert presenters and urologists participating at the Second Congress on Controversies in Urology in Lisbon, Portugal, is summarized.

Evidence synthesis: A review of the relevant literature and the experts' opinions seem to indicate that LP, either conventional or robotic, should be considered as the treatment of choice for UPJO, because it achieves the highest success rates (90%) while still offering the patient the advantages of minimally invasive surgery. The conventional laparoscopic approach demands a high level of surgical expertise and dedicated training that can be partially obviated by the robotic system. Evidence proving clear advantages of robotic pyeloplasty over conventional laparoscopy, however, is lacking due to short follow-up. Additionally, in its current version, the robotic system is financially prohibitive for many centers worldwide.

In experienced hands, endopyelotomy performed either percutaneously or by the retrograde ureteroscopic approach can achieve long-standing satisfactory results in carefully selected patients (short strictures, minimal hydronephrosis, no crossing vessel). Additionally, endopyelotomy is the procedure of choice for failed pyeloplasty, with success rates of up to 80%.

Conclusions: It can be concluded from the presented data that, given the surgical expertise, LP should be considered the current standard of care for UPJO, with high success rates comparable to the open procedure. The advantages of the robotic system for the patient remain to be proved by scientific data. Endopyelotomy is still indicated in selected cases as a primary therapeutic option and should be considered the procedure of choice for pyeloplasty failures.

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1. Introduction

Ureteropelvic junction (UPJ) obstruction (UPJO) refers to a functionally significant impairment of the urinary passage from the renal pelvis to the ureter. Although UPJO represents one of the most frequent anomalies of the urinary tract, the etiology is incompletely elucidated and the ideal treatment remains controversial.

An intrinsic defect in the form of an aperistaltic proximal ureteral segment is most likely at the origin of congenital cases of UPJO [1]. The contribution of “aberrant” polar crossing vessels, found in up to 50% of cases, is unclear. Recent imaging studies involving computed tomography and magnetic resonance angiography with three-dimensional reconstructions seem to make it unlikely that the mechanical pressure of the crossing vessel on the UPJ is at the origin of the obstruction. These studies demonstrate that the precise location of the crossing vessel does not correspond to the location of the obstruction [2,3]. These authors hypothesize that in these cases an intrinsic defect is also at the origin of UPJO.

Historically, open pyeloplasty has been considered the referral standard for treatment. Minimally invasive procedures have evolved and have gradually replaced open surgery, with various success and complication rates. The ideal universal treatment for UPJO is still elusive and controversial.

2. Evidence acquisition

The interactive discussion among the expert presenters and urologists participating at the Second World Congress on Controversies in Urology (CURy) in Lisbon, Portugal, is summarized.

3. Evidence synthesis

3.1. Endopyelotomy

The surgical approach to the treatment of UPJO has undergone significant changes with a constant attempt to minimize the invasiveness of the procedure. In 1984, Arthur Smith performed antegrade endopyelotomy via a percutaneous approach using a cold knife [4]. This procedure, based on the concept of incising the stenotic segment at the UPJ, internal stenting and secondary healing, has gained widespread acceptance, because it offers a simple, fast, and minimally invasive alternative to open pyeloplasty, a major reconstructive open surgery. Since its introduction, the procedure has been constantly improved and performed in multiple variations by percutaneous or ureteroscopic approaches, using laser, electricity, and cold knife to cut the UPJ. The perceived advantages of reduced pain and discomfort, shortened hospital stay, and lack of wound-related complications compared to the open-surgery alternative have given this procedure a great push forward.

It soon became clear, however, that the success rates of endopyelotomy by either approach were significantly lower

compared to open dismembered pyeloplasty, and the routine use of endopyelotomy became questionable. Shalhav et al [5] reported overall success rates of 67%, slightly lower than other studies with success rates ranging between 73% and 89% [6,7]. Van Cangh et al [8] reported long-term success rates of 73% at 5-yr follow-up and mentioned that 53% of failures occurred after 1 yr. Similar follow-up data were reported by other groups, with a 67% success rate at a mean follow-up of 55 mo and 35% of failures occurring after 1 yr. These findings should be taken into account when drawing conclusions from reports providing data from only short follow-up.

Does endopyelotomy still have a place in the treatment algorithm of UPJO? As correctly pointed out by Geavlete in his presentation at CURy, most of the literature presented includes procedures performed more than a decade ago, without necessarily selecting patients and in some cases before widespread use of modern flexible ureteroscopic instrumentation. It is conceivable that patient selection according to contemporary accepted criteria (mild hydronephrosis, no evidence of crossing vessel, low insertion of ureter into the renal pelvis) together with the modern ureteroscopic and laser systems might achieve significantly higher success rates.

Butani and Esghi [9] reported that in selected patients (stenosis <2 cm, no massive hydronephrosis, and renal function >25%), success rates of 96% with primary endopyelotomies and 85% with secondary endopyelotomies have been achieved using cold-knife incision (mean follow-up: 60 mo).

It appears that endopyelotomy is still indicated for a selected subgroup of patients. Modern imaging studies that can identify the presence of a crossing vessel should be considered in order to counsel patients in an informed manner about the available options and success rates.

3.2. Laparoscopic and robotic pyeloplasty

Laparoscopic pyeloplasty (LP) has become the main challenge to endopyelotomy.

Since its introduction in 1993 [10], LP has gained increasing acceptance, and it has become the procedure of choice at centers of expertise because of high success rates that equal those of the open procedure [10–12]. Because the actual reconstructive procedure is performed on a very limited and well-defined area of 3–4 cm², it is an excellent example of surgery in which the morbidity of access is greater than the morbidity of the operation itself. Therefore, the laparoscopic approach makes even more sense because it virtually eliminates the morbidity of access to the operated area.

Dimarco et al [13] have reported long-term success of 211 patients after LP compared to 225 patients undergoing endopyelotomy. Success was defined as complete resolution of symptoms and resolution or significant improvement of radiographic obstruction. The LP group achieved an 88% success rate at mean follow-up of 3.9 yr versus 61% in the endopyelotomy group.

Yanke et al [14] reviewed 145 retrograde endopyelotomies, 120 LPs, and 29 robotic-assisted LPs with median follow-ups of 20 mo, 20 mo, and 19 mo, respectively. The overall success rate was 60.2% for the endopyelotomy group and 88.8% for the LP group, with the majority of failures occurring in the first 2 yr; however, a number of patients recorded failures at longer follow-up. Interestingly, for the LP group, the only statistically significant differences on univariate analysis were the presence of a crossing vessel and/or high insertion. These authors conclude that anticipated rates of success for LP are consistently higher compared to endopyelotomy but are lower than previously reported, seemingly due to unreported late failures.

As noted during the CURy session, the LP technique has undergone several changes. The number and size of the ports can be reduced to three 5-mm ports or one 3-mm and two 5-mm ports, making LP even more minimally invasive. Antegrade stent insertion and spatulation of the dismembered ureter can be performed easily in the majority of cases by externalization of the ureteral end to skin level at the lower port in a desufflated abdomen [15]. Finally, the anastomosis can be performed comfortably with two running sutures reducing the need for extensive intracorporeal knotting.

The main impediment to adopting LP as a routine procedure is the level of technical difficulty and the challenges of the learning curve. This complex laparoscopic procedure necessitates dedicated advanced laparoscopic training and a steady number of cases to maintain performance. To overcome these technical challenges, more minimal procedures have been suggested, namely, Fenger plasty and the vascular hitch [16,17]. The success rates have been variable, inconsistent and are not sustained by scientific data; therefore, these procedures are generally considered as surgical compromises “for the sake of laparoscopy”.

More recently, the robotic system has been used for pyeloplasty, with several authors reporting satisfactory results [18–20]. The robotic system significantly facilitates intracorporeal suturing, and some surgeons found the tridimensional view to be helpful. In a meta-analysis reviewing robotic LP versus conventional LP, Braga et al [20] showed that robotic-assisted pyeloplasty is associated with a 10-min reduction in operative time, a slightly shorter hospital stay, and similar complication and success rates. Do these marginal advantages compensate for the formidable costs of the robotic system? Randomized clinical studies comparing these two methods are needed to provide evidence of whether the future belongs to humans or to robots.

4. Conclusions

In conclusion, the old paradigm of careful patient selection and choice of the correct surgical modality on a per-case basis remains true for the management of UPJO.

Conflicts of interest

The authors have nothing to disclose.

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