CLINICAL SCIENCE

LAPAROSCOPIC DISMEMBERED PYELOPLASTY IN 47 CASES

Anuar Ibrahim Mitre, Artur Henrique Brito, Miguel Srougi

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PURPOSE: To evaluate the results of a sequence of 47 laparoscopic Anderson-Hynes pyeloplasties for the treatment of patients with ureteropelvic junction obstruction, independently of the etiology.

MATERIALS AND METHODS: Twenty male and 27 female patients diagnosed with ureteropelvic junction obstruction were treated by Anderson-Hynes transperitoneal laparoscopic dismembered pyeloplasty from April 2002 to January 2006. The age of the patients ranged from four to 75 years, with a mean age of 32.3 years. The follow-up ranged between six and 30 months, with a mean follow-up time of 24 months. The outcomes were evaluated through the assessment of symptoms and imaging studies.

RESULTS: In 44 (93.6%) of the 47 patients, resolution of the pain and a reduction in ureteropelvic dilation were observed. The mean operative time was 157 minutes (ranging from 90 to 270 minutes). Neither blood transfusion nor conversion to open surgery was required. The mean hospital stay was 2.2 days. The presence of crossing vessels over the ureteropelvic junction was verified in 26 patients (55%), and vessel transposition in relation to the urinary tract was performed in 25 of these cases. In one patient, the crossing vessel was mobilized out of the ureteropelvic junction with a perivascular suture to the renal capsule associated with the pyeloplasty.

CONCLUSIONS: The outcome of transperitoneal Anderson-Hynes laparoscopic pyeloplasty used for different causes of pyeloureteral obstruction presented a success rate similar to a previously-published open procedure, with the advantage of being less invasive. This procedure may be considered the first option for the treatment of ureteropelvic junction obstruction**.**

KEYWORDS: Laparoscopy, ureteral obstruction; Hydronephrosis; Urinary tract anomalies; Ureteropelvic junction obstruction.

INTRODUCTION

Ureteropelvic junction obstructions may be attributed to functional or anatomical abnormalities, or there may even be an association between them.[1] Additionally, secondary ureteropelvic junction obstructions may occur after endoscopic or open urinary tract procedures. Independently of determining its origin, urologists have been seeking the optimal surgical treatment for ureteropelvic junction obstruction by emphasizing two aspects: better outcomes and less-invasive procedures. The open Anderson-Hynes pyeloplasty described in 1949 remains the gold standard technique, to which any new technique should be compared.[2] The long-term success rate of open pyeloplasty is higher than 90%.[3] In 1983, Wickham and Kellet described the antegrade endopyelotomy, and this technique gained some popularity.[4] Several other procedures were further described: balloon dilatation, retrograde endopyelotomy, and endopyelotomy with the Acucise catheter. The success rate of these minimally-invasive procedures has been 15% to 30% lower than that of open pyeloplasty.[5] Laparoscopic pyeloplasty was proposed within the last decade, but only recently has it been performed more frequently and its results compared to those of open pyeloplasty.[6] The aim of this paper is to report the experience of one of the largest published Brazilian series of laparoscopic pyeloplasties for the treatment of ureteropelvic junction obstruction.

Division of Urology, Faculdade de Medicina da Universidade de São Paulo - São Paulo/SP, Brazil.
Phone: 55 11 3159.8700
Email: arturbrito@uol.com.br
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MATERIALS AND METHODS

A sequence of 47 patients with ureteropelvic junction obstruction were treated by transperitoneal laparoscopic Anderson-Hynes dismembered pyeloplasty from April 2002 to January 2006. Of the 47 patients, 20 were male and 27 were female. Ages ranged from 4 to 75 years, with a mean age of 32.3 years. In 27 patients, the ureteropelvic obstruction was on the right side, and in 20 patients, it was on the left. The cause of obstruction was primary in 34 patients and secondary in 13. The etiologies of the secondary obstructions were: endopyelotomy with Acucise catheter in eight, open pyeloplasty in three, laparoscopic pyeloplasty in one, and retrograde laser endopyelotomy in one. In all cases, an intravenous pyelogram or a contrast-enhanced computed tomography had been previously performed. A diuretic radioisotope renography was performed for the assessment of the obstruction as well as for renal function.

Surgical procedure – The preoperative preparation consisted of a liquid diet for the last meal followed by an eight-hour fast. Prophylactic cephalothin at the usual doses was administered endovenously one hour prior to the procedure. The patients underwent general anesthesia that was sometimes associated with epidural anesthesia, at the discretion of the anesthetist. An orogastric or nasogastric tube and a Foley bladder catheter were inserted prior to the procedure. The Foley catheter was kept closed until double J intra-operative antegrade introduction. The patient was positioned in a lateral decubitus, 45º in relation to the horizontal plane, and was supported by cushions and fixed to the surgical table with a wide adhesive tape. Surgical time was defined as the period from the first skin incision for insertion of the first trocar to the last stitch in the skin following all procedures. After insertion of a Veress needle into the abdominal cavity at the upper border of the umbilicus, pneumoperitoneum was established at 15 mmHg pressure. The first 10 mm trocar for a 30º optical system was then inserted. The second and third 5 mm trocars were placed at the midclavicular line - one in the subcostal region and the other on a horizontal line slightly below the umbilicus at the same side of the obstruction (Figure 1). When necessary, the insertion of the fourth trocar was performed at a different site, depending on the side. On the left side, it was placed below the xiphoid process, and on the right, it was placed at the intersection of the anterior axillary line with a horizontal line at the level of the umbilicus. The paracolic sulcus was incised

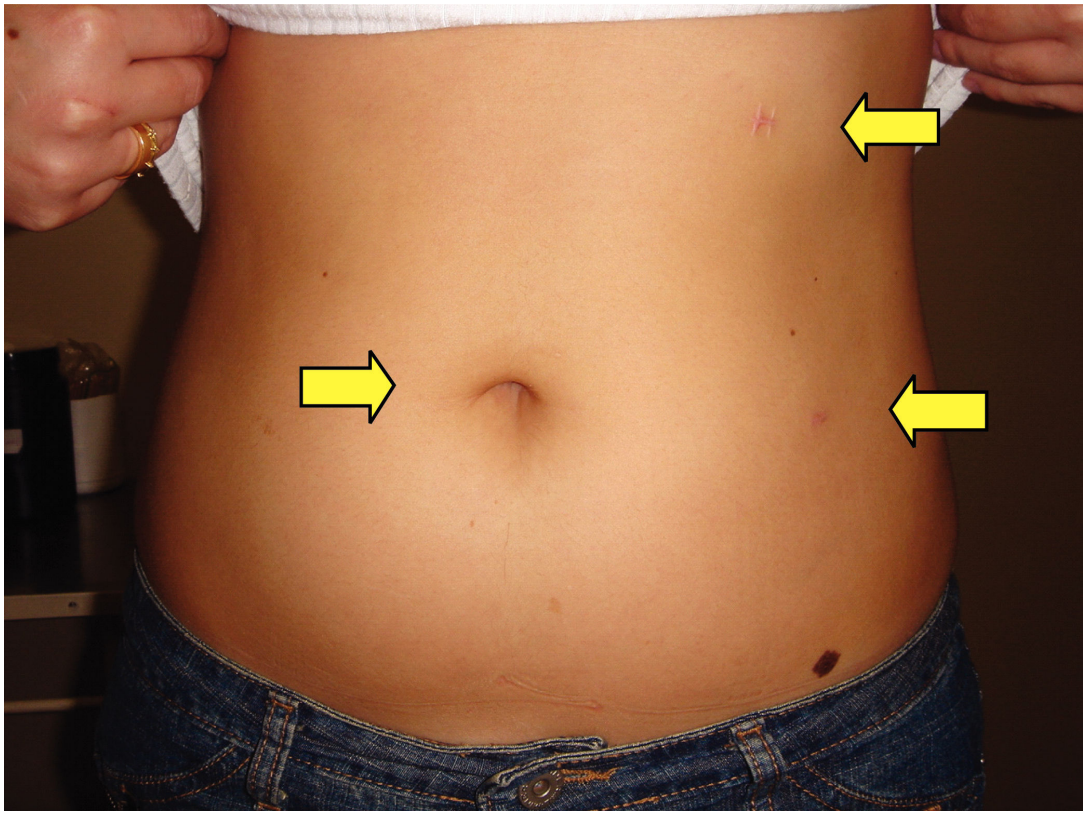

Figure 1 - Port sites demonstrated as surgical scars after left side laparoscopic pyeloplasty

and the colon was displaced medially. The upper ureter was identified laterally to the gonadal vein and dissected cranially to the renal pelvis. When crossing vessels over the ureteropelvic junction were present, they were dissected and separated from the urinary tract. The obstructed ureteropelvic junction was then excised and the renal pelvis was anteriorly transposed in relation to the vessels. The ureter was spatulated laterally to increase the perimeter of the anastomosis. The anastomosis between the ureter and the renal pelvis was performed with a 4-0 Vicryl running suture with an atraumatic needle. After the conclusion of the posterior suture, a double J catheter was antegradely inserted into the ureter up to be bladder via the subcostal trocar, and its cranial extremity was placed in the renal pelvis. The smooth catheter progression indicated that the double J catheter was well positioned. The remaining anterior half of the anastomosis was then completed. The peritoneal cavity was drained with a thin Penrose drain for 24 hours. The nasogastric tube was removed at the end of the surgical procedure and the Foley catheter was left in place for 48 hours. The double J catheter was removed after 4 weeks. The outcomes were evaluated with a minimum 4-month postoperative follow-up. We considered it a good outcome when subjective and objective data demonstrated a significant improvement of the pyeloureteral drainage and improvement of the symptoms; a poor outcome was recorded when the pain or the renal dilatation and/or function remained unchanged or worsened. The mean follow-up was 24 months. Considering the primary cases, the follow-ups ranged between 12 and 48 months, with a mean of 26.4 months. For the secondary cases, the follow-up ranged between 16 and 36 months, with a mean of 22.4 months.

RESULTS

The results of the transperitoneal laparoscopic Anderson-Hynes pyeloplasties performed sequentially on 47 patients with pyeloureteral junction obstruction, independently of the etiology, was successful in 93.6% (44 of 47 patients), with a minimum follow-up period of 12 months. The 6.4% (3 of 47) of patients with poor results had the following evolution: one patient was re-operated by open surgery. The symptoms and the same level of dilatation of the urinary tract persisted, and this patient will need additional treatment. The second patient developed a urinary tract infection and several stones that could not be removed, and was thus lost from the study at follow-up. The third patient had been previously treated by Acucise endopyelotomy and had crossing vessels. Thus, the anastomosis was very difficult. This patient's pain persists along with a urinary tract infection, but he refused additional surgical treatment. In only one of the cases (2.0%) we failed to insert the double J catheter, and a pyelostomy was used to drain the urinary tract. Conversion to open surgery was not required for any of the patients. The mean surgical time in the cases with primary ureteropelvic junction obstruction was 149 minutes and 195 minutes in the cases with secondary obstruction. The overall mean surgical time was 157 minutes. The mean hospital stay was 2.2 days (ranging from 2 to 5 days). Significant bleeding was not observed in any of the patients, and therefore no blood transfusions were necessary. No patient presented urinary extravasation in the postoperative period. When the cases of primary and secondary obstruction were considered separately, success rates were 94.1% (32 out of 34 patients), and 92.3% (12 out of 13 patients), respectively. There were no statistically significant differences between the results in patients with primary and secondary obstruction determined by Fisher's exact test ($P > 0.999$). In patients with an association of ureteropelvic obstruction and no renal obstructive calculus, the stones were completely retrieved by flexible nephroscope in 3 of 5 patients (60% of cases).

DISCUSSION

The Anderson-Hynes open pyeloplasty remains the gold standard treatment for ureteropelvic junction obstruction. Endoscopic incisions of the ureteropelvic junction performed in different ways, whether via an antegrade or retrograde approach, have been used as a minimally invasive treatment alternative. Under ideal conditions, success rates of endopyelotomies have been 15% to 30% lower than those of Anderson-Hynes dismembered pyeloplasties. In marked hydronephrosis and decreased renal function, when the extent of stenosis is greater than 2 cm, in the presence of a crossing vessel, the results of endopyelotomies are worse.[7, 8] Poor renal function and marked hydronephrosis may be detected in the preoperative evaluation. However, the confirmation of the existence of crossing vessels as the cause of the obstruction would require an arteriography, helical computed tomography, magnetic resonance angiography, color Doppler ultrasonography, or endoluminal ultrasonography.[9,10] None the less, in addition to the inconvenience of invasiveness and costs, crossing vessels may be not detected using these tests, and they may be the ultimate cause of the endopyelotomy failure. The laparoscopic pyeloplasty reproduces all steps of open pyeloplasty, such as dissection, excision of the ureteropelvic junction, ureteral spatulation and anastomosis. From the beginning, laparoscopic pyeloplasty has provided similar results to open surgery, with the advantages of

being a minimally invasive surgery. At our institution, the laparoscopic Anderson-Hynes dismembered pyeloplasty has become the first option in the treatment of ureteropelvic junction obstruction. However, since it is a reconstructive surgery, it requires training in careful dissection of the structures and significant experience in laparoscopic intracorporeal suturing and knotting techniques.[11,12] Good outcomes have been obtained in more than 90% of the cases of laparoscopic pyeloplasty at a follow-up of at least one year.[13,14] The literature shows that the performance of pyeloplasty in cases of secondary ureteropelvic junction obstruction may be useful even in the presence of fibrosis and adhesions in the previously-operated region. The degree of fibrosis may be highly variable, and it may be directly related to the patient's healing factors, as well as to the amount of urine extravasation from the previous surgery.[12] In our series, although secondary stenosis presented with greater surgical difficulties, the outcomes were similar to those of primary obstruction (92.3% and 94.1% good outcomes, respectively). The bladder catheter was left in for two days, with the purpose of ensuring low intravesical and renal pressures, thereby avoiding double J urinary reflux during micturation. Laparoscopic pyeloplasty may be performed via a retroperitoneal or transperitoneal approach with similar results.[15] The choice depends mainly on surgeon preference. The transperitoneal approach provides more space for working, which is very important in reconstructive laparoscopic procedures.[14] In retroperitoneoscopy, the incidence of crossing vessels as well as vessel transposition is lower than in the transperitoneal approach, likely because the vessels are located anteriorly to the ureteropelvic junction. Thus, the transposition facilitates the anastomosis in the transperitoneal approach and makes it more difficult in the retroperitoneoscopic approach.[16] The incidence of crossing vessels is variable, but in the adult population, it is approximately 50%.[16] We found crossing vessels over the ureteropelvic junction in 26 (55.3%) patients. However, the possibility of a concurrent intrinsic obstructive factor required us to perform a laparoscopic Anderson-Hynes dismembered pyeloplasty in all patients. In one patient, the transposition of the renal pelvis remained under tension and we decided to leave the crossing vessels in front of the urinary tract and suture the perivascular tissue to the renal capsule, thereby obtaining its cranial mobilization without overlapping with the pyeloureteral anastomosis. Laparoscopic ligation and transection of crossing vessels as unique treatment of pyeloureteral obstruction was reported, but it certainly led to ischemia to part of the renal parenchyma.[17] Some authors proposed the mobilization of crossing vessels as an easier type of treatment, associated with an endopyelotomy or a Fenger plasty.[18-20] These authors also recommended laparoscopic ligation and sectioning of the vein and upward relocation of the artery of crossing vessels. The authors verified that 54.5% of cases of crossing vessels caused a concomitant intrinsic obstruction of the pyeloureteral junction (12 of 22 patients). Thus, in 45.5% of patients, crossing vessels were the only cause of pyeloureteral obstruction and there was no need to cut the urinary tract. Subjective intraoperative impression or an objective intraoperative Whitaker test may be used to decide whether or not pyeloplasty may be avoided.[22] It is our preference to perform a dismembered pyeloplasty instead of compromising segmental vascularization of the kidney or to leave behind a concomitant intrinsic obstruction of the pyeloureteral junction. In cases of pyeloureteral junction obstruction and stones of the junction, some authors retrieved all renal stones in 90% (18 of 20) of patients.[23] We left only 60% (3 of 5) of the patients free of stones. The maximum number of stones we removed in one patient was 27. The flexible nephroscope was introduced via the upper 5 mm trocar after the posterior half of continuous anastomosis had been completed. It is difficult to manipulate the flexible nephroscope in a dilated kidney and it is necessary to have a nitinol tipless basket and nitinol trident graspers available. The previous insertion of a double J catheter by means of cystoscopy did not seem interesting to us because it increases the surgical time, it may hinder the identification of the extent of the stenosis, and it may make it difficult to perform the posterior part of the anastomosis. In only one of the cases (2.0%) we failed to insert the double J catheter, and a pyelostomy was used to drain the urinary tract. Another possibility in such cases would be to insert the double J catheter by cystoscopy after the end of the laparoscopic procedure. The minimum follow-up period to confirm that the results are persistent is 12 months, according to some authors.[24,25] Other studies with a mean follow-up of 2.2 years did not observe any recurrence after one year.[13] In our recent series, the mean follow-up was 24 months. However, longer follow-up is necessary to confirm our initial results. At the beginning of the study, the procedure was always performed using four laparoscopic ports. After the twentieth case, we started performing the procedure with three punctures.[26] In the last 20 cases, 80% of our surgeries were performed using three trocars. The fourth puncture was only performed when the surgical conditions required it. In total, four ports were used in 26 patients and three ports were used in the remaining 24 patients. Despite being a little more invasive than endopyelotomies, the laparoscopic pyeloplasty reproduces open surgery along with its results and positive outcomes. On the other hand, it carries with it the well known advantages of laparoscopic surgeries (less pain, shorter hospital stays, shorter convalescence and less

scarring) and it allows patients to resume their daily activities earlier.[27]

CONCLUSIONS

Laparoscopic Anderson-Hynes pyeloplasty is an effective surgery for correcting all types of ureteropelvic junction obstructions. If late results are possible to confirm, it may be considered the first option for the treatment of ureteropelvic junction obstructions based on its efficacy related to the low rate of complications and the advantages of a minimally-invasive procedure.

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