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ORIGINAL ARTICLE

Laparoscopic dismembered pyeloplasty: technique and results in 105 patients

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Abstract
Purpose To evaluate the postoperative and functional results of the laparoscopic dismembered pyeloplasty (LDP).
Patients and methods Between May 2000 and April 2008, we performed in our department 105 LDP. All patients presented an ureteropelvic junction obstruction with dilatation of renal calyx system with an enlarged renal pelvis. Demographic data (age, gender), perioperative and postoperative parameters, including operating time, estimated blood loss, complications, length of hospital stay, functional outcome were collected and evaluated.
Results The mean operative time for LDP was 150 min (range 120–180 min) and the mean estimated blood loss was negligible in all patients. The mean hospital stay was 4 days (4–8). No conversion to open surgery occurred. In the follow-up, we noted a successful rate in 96.2% of the patients.
Conclusion Laparoscopic dismembered pyeloplasty, if performed by expert surgeons in high-volume centres, presents results that are comparable with open surgery, with a lower surgical trauma for the patients.

Keywords Ureteropelvic junction obstruction · Pyeloplasty · Laparoscopy · Outcomes

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Introduction

Since the early 1990s, laparoscopic techniques have undergone a dramatic development in urology and other surgical disciplines. Today, euphoria is giving way to a more sober approach to a concrete evaluation of the benefits for the patient. The idea behind the application of a minimally invasive technique such as laparoscopy is to achieve the same result with the same safety for the patient and less traumatization when compared to open surgical procedures [1]. Since first described by Schuessler et al. in 1993, laparoscopic pyeloplasty has emerged as a valid technique to correct ureteropelvic junction obstruction (UPJO), with a success rate of more than 90% [2]. In this study, we describe our technique and report our results in 105 patients who underwent a laparoscopic dismembered pyeloplasty (LDP) for UPJO.

Patients and methods

Between May 2000 and April 2008, we performed in our department 105 LDP. All patients presented an UPJO with dilatation of renal calyx system with an enlarged renal pelvis. The preoperative diagnosis included a detailed anamnesis with particular attention to the nature of pain, sonography, excretory urography, renal scintigraphy and retrograde pyelography with placement of a double-J stent just before the operation. Demographic data (age, gender), perioperative and postoperative parameters, including operating time, estimated blood loss, complications, length of hospital stay, functional outcome were collected and evaluated. Data were expressed as mean ± standard deviation (SD) and statistical significance was accepted at $p < 0.05$. Statistical analysis was performed using SigmaPlot® software

version 13.0 (SPSS Inc., Chicago, IL, USA) and Graphpad Prism 5 (Graphpad Software, CA, USA).

All surgical procedures were performed by two surgeons (P.F., F.G.) who had completed at least 40 LDP each before the beginning of the study, thus reducing the learning-curve effect.

Patients with previous abdominal surgeries were excluded from this study.

Surgical technique

Following the induction of general anaesthesia, a cystoscopy and retrograde pyelography were performed in each patient and a 7 F double-J stent was placed. A nasogastric tube and transurethral catheter were inserted to decompress the stomach and bladder. The patients were secured to the operating table in a full flank position. In all patients, a transperitoneal approach was used. A Veress needle was inserted periumbilically to establish the pneumoperitoneum using carbon dioxide. With an initial intra-abdominal pressure of 12–15 mmHg, a 12-mm trocar was placed supraumbilically after removal of the Veress needle. The endoscopic 0° camera is introduced and after inspection of the abdominal cavity three other trocars were inserted under direct vision: two 12-mm trocars in the ipsilateral mid-clavicular line and a 10-mm trocar were placed just between the xyphoid and the first port. Occasionally, a fifth trocar (5-mm) was used in the anterior axillary line below the umbilicus. Then, the intra-abdominal pressure was lowered to 10–12 mmHg and maintained at this level. The peritoneum was incised along the Toldt's line using electrosurgical scissors and grasping forceps. After mobilization of the colon, the ureter was identified above its cross over the iliac vessels. The proximal ureter and the renal pelvis were completely mobilized (Fig. 1). The renal pelvis was dismembered with the proximal ureter and the stenotic segment was resected. Then the ureter was medially spatulated (Fig. 2). The renal pelvis was reduced, removing the enlarged segment. If crossing vessels were presented, the ureter and the renal pelvis were transposed ventrally. Then the anastomosis was performed with interrupted 4-0 vicryl sutures, starting from the deepest point of the spatulated ureter and from both flap corners of its end with the corresponding sites of the renal pelvis. After completing the posterior wall, the 7 F stent was replaced in the pelvis and the anterior wall of the anastomosis was completed (Fig. 3). At the end, a 15 F Robinson drain was placed though the trocar into the pararenal space. The trocars were removed under laparoscopic visualization and the fasciae of the trocars' sites were closed with interrupted absorbable sutures. The skin was approximated with clips.

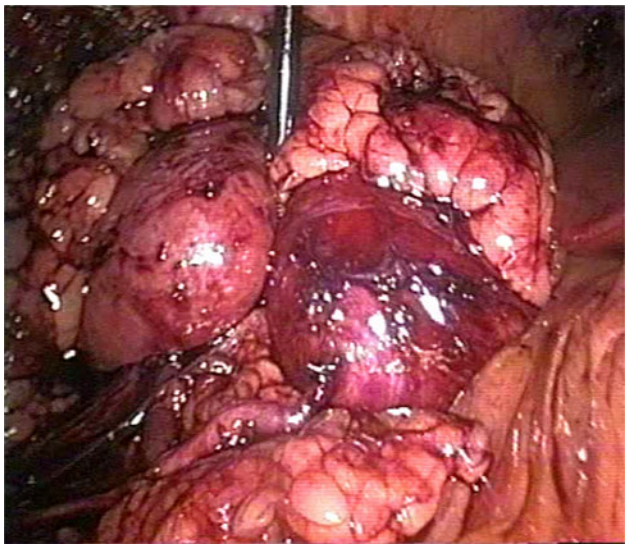

Fig. 1 Preparation of proximal ureter and the renal pelvis

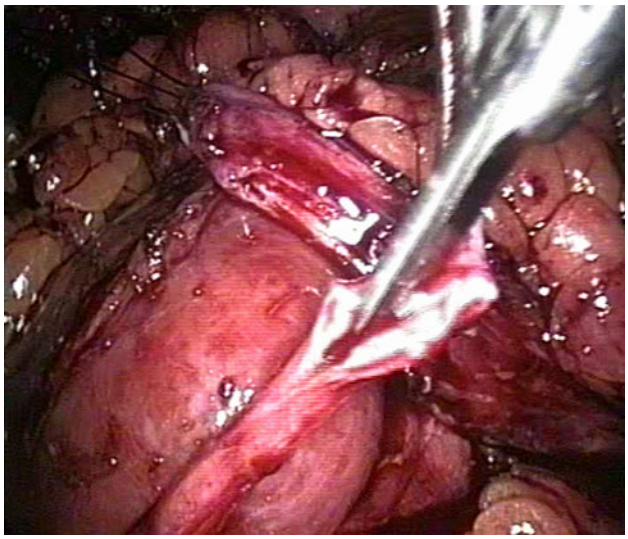

Fig. 2 Medial spatulation of the ureter

Results

Mean age in patients who underwent LDP was 38 years (20–56). Of these patients, 48 were male and 57 women and the mean body mass index was 26.8 kg/m^2.

The mean operative time for LDP was 150 min (range 120–180 min) and the mean estimated blood loss was negligible in all patients. The mean hospital stay was 4 days (4–8).

No conversion to open surgery occurred.

In 57% of the patients, crossing vessels with an anterior course to the ureteropelvic junction were identified. The bladder catheter was removed 3 days after the operation while the ureteral stents were removed after

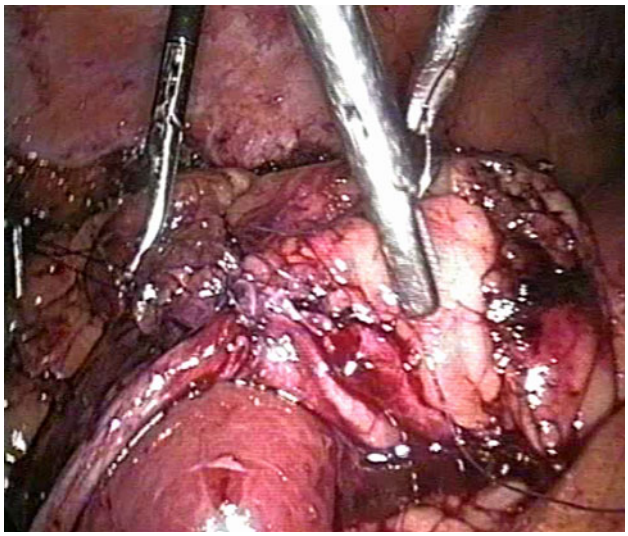

Fig. 3 Completion of the anastomosis

Table 1 Intraoperative and postoperative data ($p < 0.05$)

	Laparoscopic dismembered pyeloplasty ($n = 105$)
Mean operating time (min)	150 (120–180)
Mean estimated blood loss (ml)	20 (10–30)
Mean catheterization time (days)	3 (3–6)
Hospital stay (days)	4 (4–8)
Recurrence needing a secondary operation (%)	3.8
Postoperative haematoma (%)	5.7
Postoperative urinoma (%)	6.6
With laparoscopic re-operation	1.9
With conservative therapy	4.7

6 weeks. After removing of the double-J stent, all the patients underwent an intravenous urography and sonography. The mean follow-up was 51 months (range 6–96). Follow-up was calculated from the date of surgery to the date of the most recent documented examination. No patient was lost to follow-up. Clinical successful outcome was defined as complete resolution of preoperative flank pain and radiographic successful outcome was defined as adequate renal excretion ($T_{1/2}$, 20 min) and preserved or improved ipsilateral renal function on MAG-3 diuretic renal scan.

Four patients (3.8%) presented a recurrence of UPJO 6, 9, 11 and 16 months after surgery and they underwent successfully open surgery. In two patients (1.9%), there was an injury of the renal artery of lower pole. In the following renal Doppler sonography and renal scintigraphy, a reduction of renal function of 4 and 7% in each patient was noted, but in both patients no stricture formation after the surgery was reported. After 2 years, both patients presented a normal renal function (creatinine: 92 and 86 μmol/l).

Six patients (5.7%) developed a postoperative haematoma; nevertheless, in no case, a surgical revision was necessary.

An urinoma was identified in seven patients (6.6%), and a mono-J stent was postoperatively placed under radiologic guide; in two patients, a laparoscopic re-operation with suturing of the insufficiently closed anastomosis was necessary; in the other patients, the urinoma solved spontaneously and a new double-J stent was replaced and left in situ for 8 weeks.

Intra- and postoperative data are summarized in Table 1.

In the follow-up, we noted a successful rate in 96.2% of the patients, who did not present any flank pain.

Discussion

The ideal treatment for UPJO would be minimally invasive with a low complication and failure rate. Therapy of UPJ stenosis has been significantly influenced by various minimally invasive techniques, including percutaneous and ureteroscopic endopyelotomy, cutting transvesical balloon dilatation as well as laparoscopic pyeloplasty. All of these procedures were introduced with the goal to meet the standard of open dismembered pyeloplasty providing long-term success rates between 93 and 97%, with a lower surgical trauma for the patients [2].

Laparoscopic pyeloplasty is a minimally invasive alternative in the treatment of UPJ obstruction and was developed in the early 1990s and after an initial period of development, actually it can duplicate the high success rates achieved with open pyeloplasty, if performed by expert surgeons in centres with high laparoscopic expertise [3, 4].

Nowadays, the overall complication rates for open and laparoscopic pyeloplasty were similar, with a trend towards fewer chest complications in the laparoscopic group, which did not reach significance [4, 5].

The success rates after LDP are 73–100% in literature [2–20].

Already at the begin of the development of laparoscopic pyeloplasty, Türk et al. [3] reported a success rate in 97.7% of the patients, value that perfectly reflects the results obtained after open surgery, with an incidence of complications of 2%.

In 2006, Eden [16] published a review about the results associated with the minimal invasive treatment of UPJO. In the laparoscopic series, he reported no significant differences between the retroperitoneal and transperitoneal approach, noting that with a transperitoneal technique there

is the advantage to have a better visualization of anatomy and greater workspace to suture. Moreover, he pointed that in contrast with the 3–11% transfusion rate following endourologic UPJO incision, transfusion following laparoscopic pyeloplasty is rare.

In our study, 105 patients underwent a LDP for UPJO. The mean operation time of 150 min is in accordance with literature [2–20].

The mean estimated blood loss was negligible in all patients and no conversion to open surgery occurred.

The mean follow-up was 51 months. Postoperative evaluation included retrograde pyelography at the time of stent removal, clinical history, excretory urography (6–8 weeks postoperatively and then every 3 months) and ultrasonography. In 96.2% of patients, a complete successful rate was registered.

Conclusion

Laparoscopic pyeloplasty is a technically demanding procedure, which requires a great laparoscopic experience. Nevertheless, if performed by expert surgeons in high-volume centres, it presents results that are comparable with open surgery, with a lower surgical trauma for the patients.

Conflict of interest statement There is no conflict of interest.

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