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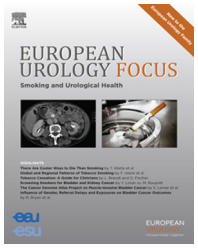

Surgery in Motion

Minilaparoendoscopic Single-site Pyeloplasty: The Best Compromise Between Surgeon's Ergonomy and Patient's Cosmesis (IDEAL Phase 2a)

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Abstract

Background: Laparoendoscopic single-site (LESS) surgery and minilaparoscopy (ML) represent the evolution of laparoscopy for the treatment of urologic diseases.
Objective: To describe the technique and report the surgical outcomes of minilaparoendoscopic single-site dismembered pyeloplasty (MILESS-DP), a new technique overcoming the technical limitations of LESS and ML, and equally combining the advantages of both these surgical procedures.
Design, setting, and participants: Twenty consecutive patients underwent MILESS-DP for ureteropelvic junction obstruction.
Surgical procedure: The SILS port was inserted through a transumbilical incision and two 3-mm trocars were inserted in the ipsilateral midclavicular line. The sequence of steps of MILESS-DP is comparable to standard laparoscopic dismembered pyeloplasty.
Measurements: The end points of this study were: (1) feasibility; (2) safety; (3) efficacy; and (4) cosmesis, evaluated using a body image questionnaire.
Results and limitations: All patients were symptomatic (100%) and three (15%) had concomitant kidney stones. (1) Feasibility: a conversion to either standard laparoscopic technique or open technique did not occur in any case. Median operative time was 147.3 min (interquartile range [IQR]: 110–195 min); (2) safety: no intraoperative complications were reported. Only in two patients (10%), a urinoma was postoperatively identified and conservatively treated with an ureteral stent. The median difference in post- and preoperative creatinine and haemoglobin was +0.55 mg/dl and -0.76 mg/dl (IQR: -0.20/-1.20 mg/dl); (3) efficacy: the median postoperative hospital stay was 4.4 d (IQR: 4–9 d). The overall success rate was 95% at the follow-up; (4) cosmesis: all patients were enthusiastic with the appearance of the scars; the median body image score and the median cosmesis score were 19.95 (IQR 19–20) and 23.95 (IQR 23–24), respectively. The limitations of this study are the limited series and short follow-up.
Conclusions: Our phase 2a studies demonstrate that MILESS-DP is a safe and reproducible procedure with excellent cosmetic outcomes and short-term clinical outcomes in the hands of a surgical team with experience in laparoscopy.
Patient summary: Minilaparoscopy using 3-mm instruments and laparoendoscopic single-site using a single abdominal incision, still present several technical drawbacks which limit their reproducibility in urology. In order to overcome these technical limitations and equally combining the advantages of both these surgical procedures, we ideated a hybrid technique which we defined minilaparoendoscopic single-site. This study aims to demonstrate that minilaparoendoscopic single-site pyeloplasty is a safe and reproducible procedure with excellent cosmetic outcomes and short-term clinical outcomes in the hands of a surgical team with experience in mini-invasive surgery.

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1. Introduction

The idea of performing surgical procedures with no scar has gained attention in the urological community over the last 5 yr [1]. Typically, major laparoscopic surgery involves the use of several (three to five) ports inserted through transperitoneal or retroperitoneal access [2]. Recent developments in laparoscopy have been directed towards further reducing morbidity and improving the cosmetic outcomes. These include the use of mini-laparoscopic instruments [3], use of natural orifices [4], and use of transumbilical access [5–7].

The idea of performing a laparoscopic procedure through a single abdominal incision was developed with the aim of minimising postoperative pain and expediting postoperative recovery [4]. Laparoendoscopic single-site surgery (LESS) has significantly evolved over the last few years, with a wide range of surgical procedures successfully performed applying this novel technique [8,9].

Nevertheless, its actual role in the field of minimally invasive urologic surgery remains to be determined because peculiar features of LESS represent significant challenges for the surgeon compared with standard laparoscopy [10]. Actually, the chief technical problems associated with this technique pertained to the lack of triangulation of the instruments, with their management in a parallel fashion, internal and external instrument collision, and absence of retraction [6]. Some authors tried to reproduce the triangulation during LESS surgery, by hiding the incisions in strategic less visible area (small strategic laparoscopic incision placement) [11] or by placing the trocars through a single umbilical incision (single-incision triangulated umbilical surgery) [12]. Nevertheless, the surgical application of both these surgical procedures has been limited in literature.

Recently, minilaparoscopy (ML) has been rediscovered in an attempt to reduce the trauma on the abdominal wall derived from standard laparoscopic access, improving cosmetic outcome and recovery. [3]. This rediscovery has been fuelled by the availability of more reliable instrumentation and by the fact that ML allows minimal abdominal scar, meanwhile preserving the key principle of triangulation [13]. Nevertheless, the main limitations of ML are represented by the difficult-to-use instruments with larger dimensions, such as a vascular stapler, and applying this technique in patients with obesity or prior abdominal surgery [3].

In order to overcome the technical limitations of LESS and ML and equally combining the advantages of both these surgical procedures, we ideated a hybrid technique which we defined mini-laparoendoscopic single-site surgery (MILESS). In the current report, we present our technique and our preliminary experience with MILESS dismembered pyeloplasty (MILESS-DP), providing a step-by-step description of the operative technique (phase 2a according to the IDEAL methodology) [14].

2. Patients and methods

Between October 2011 and April 2014, we enrolled 20 consecutive patients who underwent MILESS-DP for ureteropelvic junction obstruction (UPJO).

All patients gave written informed consent and a prospective institutional review board-approved datasheet was constructed for this study. The end points of this study were: (1) feasibility, expressed as conversion rate; (2) safety, estimated by complication rate according to Clavien-Dindo classification [15]; (3) efficacy, consisting of the functional and symptomatologic success of surgical treatment evaluated with computed tomography urography and mercaptoacetyltriglycine-3 (MAG-3) diuretic renal scan, visual analogue scale of pain [16]; and (4) cosmesis, evaluated using a body image questionnaire, an eight-item questionnaire incorporating body image and cosmetic subscales, each with a high internal consistency (Cronbach-a of 0.80 and 0.83, respectively) [17,18] (Fig. 1). The body image scale measures patients' perception and satisfaction with their bodies after surgery, and it is calculated by reverse scoring and summing the responses to questions 1 through 5; it ranges from 5 to 20 with a higher number representing greater body image perception. The cosmetic scale assesses satisfaction with surgical scars and is calculated by simply summing responses to questions 6–8, for a score range of 3–24, with a higher score indicating greater cosmetic satisfaction [17,18].

All patients were operated by one laparoscopic surgeon (F.G.), with an experience of >100 LESS and ML procedures.

Indications to surgery were based on the results of imaging techniques, MAG-3 diuretic renal scans showing evident obstruction not solved following furosemide injection (half-life >20 min), and the presence of symptoms (eg, recurrent flank pain, fever, and recurrent upper urinary tract episodes). Exclusion criteria were a body mass index (BMI) >30 kg/m^2, an extremely large renal pelvis (ie, pelvis diameter >6 cm), pelvic kidney, and horseshoe kidney.

Median follow-up was 13.45 mo (range, 6–24 mo). After removing the double-J stent, all the patients underwent an intravenous urography and sonography. 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 no radiologic evidence of obstruction at computed tomography urography, an adequate renal excretion, and preserved or improved ipsilateral renal function on MAG-3 diuretic renal scan, which was performed in all patients at 6 postoperative mo.

2.1. Surgical technique

The surgeon has been trained on dry and wet laboratories before starting the first case on humans. The sequence of steps of MILESS-DP is comparable to standard laparoscopic dismembered pyeloplasty.

2.1.1. Preoperative preparation

Prevention of thrombosis (low-molecular-weight heparin) is mandatory. Single-shot intravenous antibiosis using a cephalosporin should be administered at the beginning of the procedure.

2.1.2. Anaesthesia

MILESS-DP is performed under general anaesthesia. A recommended regimen is induction using intravenous thiopental and isoflurane as the inhalation agent. Following the induction of general anaesthesia, a nasogastric tube and transurethral catheter are placed to decompress the stomach and bladder.

2.1.3. Operative setup and patient positioning

In all patients, a double-J ureteral stent is preoperatively positioned retrograde and is removed approximately 6 wk after surgery. The patient is then placed in the semilateral decubitus position with the side of the lesion elevated at 60°. The ipsilateral arm is secured using an arm board and the contralateral arm is fixed beside the trunk and well-padded to avoid lesions of neural structures. Additional fixation is done using cloth tapes

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