

The Feasibility of Percutaneous Externally Assembled Laparoscopic Nephrectomy: a New Surgical System

Benjamin West, Jerry Thomas, Mohamed Keheila, Nazih Khater, Samuel Abourbih, Salim Cheriyan, Matthew Pierce, Duane D. Baldwin, Jim Shen

INTRODUCTION

Laparoendoscopic single-site (LESS) nephrectomy provides excellent cosmetic outcomes, but is technically challenging due to loss of triangulation and increased instrument collision. A novel Percutaneous Externally Assembled Laparoscopic (PEAL) surgical system was developed to simplify minimally invasive surgery while providing a nearly scarless outcome. In this study, the feasibility of the PEAL system for nephrectomy was determined.

MATERIAL AND METHODS

Three LESS nephrectomies performed with the addition of the PEAL surgical instruments were retrospectively reviewed. The prototype instruments were manufactured by Teleflex Surgical (Wayne, PA, USA). The PEAL instrument is composed of a reusable handpiece, a disposable 2.96 mm shaft, and interchangeable 5 mm instrument tips. These instruments are inserted without a trocar, minimizing their cosmetic impact. Initially a multi-access port was placed at the umbilicus. Under direct visualization through the multi-access port, a 2.96 mm shaft was then introduced directly through the skin at the desired auxiliary instrument site using a special introducer tip. The tip was then brought out

through the multi-access port, switched to the desired 5 mm grasper tip, and pulled back into the abdomen for use during the procedure.

RESULTS

One female (age 69) and 2 males (age 47 and 54) underwent right PEAL nephrectomy for either a non-functioning duplicated giant hydronephrotic kidney (n=1) or a renal mass (n=2). The operative times were 310, 166, and 123 minutes and estimated blood loss was 100, 15, and 50 cc, respectively. All patients tolerated the procedure well without perioperative complications. Mean hospital stay was 1.3 days. The median total IV morphine equivalent dose per 24-hour period was low at 4 mg. Pathology revealed chronic inflammatory changes without malignancy, clear cell renal carcinoma, and oncocytoma, respectively. Postoperative cosmesis was excellent. The 2.96 mm instruments established triangulation and allowed the successful removal of the massively dilated nonfunctioning kidney and 2 mass-containing kidneys.

CONCLUSION

This is the first reported application of the PEAL surgical system to 3 LESS nephrectomies. By using instruments that are externally assembled, PEAL nephrectomy reestablished triangulation, minimized instrument collision, simplified LESS nephrectomy, and provided excellent cosmesis. This is a promising option to reduce the invasiveness of laparoscopic surgery and potentially expand the indications for LESS surgery.

From Loma Linda University Medical Center (B.W., J.T., M.K., N.K., S.A., S.C., M.P., D.D.B., J.S.)

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Send correspondence to: bwest@llu.edu

