SKILL AND TALENT

Umbilical single-port pyelolithectomy on horseshoe kidney: A new indication

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Abstract
Introduction: Laparoscopic surgery through a single port is an evolution of laparoscopic surgery, possible after recent technological development of new access systems. It is an established minimally invasive technique, although its indications in the field of Urology are currently under development.

Materials and methods: We present the first case of incision-less pyelolithectomy, performed through a single-port placed in the umbilicus, performed in a 47-year-old male patient (38.2 BMI) with solitary 4-cm-diameter lithiasis in a horseshoe kidney. An umbilical 2.5-cm incision was used for the introduction of a prototype of the reusable Richard Wolf single-port system, without any ancillary elements.

Results: After placement of left double-J stent proximal left ureter and renal pelvis, pyelolithectomy and pyelorraphy were performed with DuoRotate-Instruments \textcopyright (Richard Wolf). Water-tightness was demonstrated with methylene blue intravesical instillation and no drain was placed. The procedure lasted for 280 min and bleeding was 30 cm$^3$. The patient was discharged 24 h later without pain.

Conclusion: Incision-less pyelolithectomy is a feasible and resolutive option to treat pelvic lithiasis. It can be considered the most beneficial option in esthetical terms in experienced centers, especially in peculiar cases like horseshoe kidney.

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Introduction

The experience with laparoendoscopy through single port in Urology started with renal surgery, probably due to familiarity with the laparoscopic tranperitoneal approach for this type of surgery, particularly tumor and subsequently partial nephrectomy and prostatectomy. The shortage of studies comparing laparoscopy through single port and conventional laparoscopic surgery makes real comparison between both techniques difficult. However, the yet more recent addition of robotics to single-port surgery has led to increased popularity for this type of approach, but the reality is that very few highly specialized centers have this technique in its portfolio of services, because it needs great training, even for experienced laparoscopists, and also important instrumental resources.

The single-port reusable prototype developed by Richard Wolf has significant advantages, since it can be used on multiple occasions, and the incision required is significantly smaller than in other elements of similar approach. Moreover, it does not require any external fixation and the instruments with double rotation (DuoRotate-Instruments™) used allow for very precise movements. Its totally umbilical placement can even perform surgery ‘without visible incision’.

Many procedures are being developed at present with this type of single-port devices, although many surgeries require the placement of fine accessory ports of 2–3.5 mm caliber. There is no doubt that surgery through a single port is assuming a technology upgrade challenge, still under development. The first descriptions of its application in Urology were flank incision nephrectomy and transumbilical ureterolithectomy. Transumbilical nephrectomy and pyeloplasty were then described. Gradually, most urologic procedures have been developed using single port: adrenalectomy, nephroureterectomy, living donor nephrectomy, ureteral replacement, ureteral reimplantation, augmentation enterocystoplasty, radical cystectomy, and radical prostatectomy. We describe the first case of pyelolithectomy ‘without incision’ through single port on a horseshoe kidney with large lithiasis.

Casuistry

We report a 47-year-old male with horseshoe kidney and left renal pelvis lithiasis of 4 cm in diameter. The patient had a body mass index (BMI) of 38.2 kg/m² and complained about abdominal pain accompanied by occasional hematuria. The study by abdominal CT scan showed the presence of solitary renal lithiasis (Fig. 1). We proposed the performance of single-port transumbilical pyelolithectomy, to which the patient agreed. Six months earlier, he had received conventional laparoscopic cholecystectomy.

Surgical technique

Under general anesthesia, it was placed in lithotomy for left double-J ureteral catheter placement. Subsequently, the patient was placed in right lateral decubitus. A 25-mm incision was performed at the umbilical level reaching the fascia. No radial cut was necessary to increase the length of the incision or enlargement of the fascial incision, introducing Richard Wolf™ single-port by rotating maneuver that fits an incision of this size, getting excellent fastening to the abdominal wall without requiring accessory suture (Fig. 2).

The pneumoperitoneum was achieved through one of the holes that the port designed for that purpose has.
During the operation, we used a long optical of 30° and 5 mm in diameter, and two specific DuoRotate-Instruments® (double rotation pre-curved elements) combined with the Eragon® system (Richard Wolf) (Fig. 2), both for dissection and pyelotomy, lithiasis extraction, and subsequent pyelorrhaphy (Fig. 3). These elements were used alternately with the suction pipe and hemostasis system Forcetriad® (Covidien Surgical) of 5 mm. It was very important to occasionally perform clear gel application (Cathejell®, Teleflex Medical) outside the outer sheath of the elements for proper lubrication, without specifying any other specific maneuver.

The lithiasis (Fig. 4) was extracted in a bag applying a slight pressure without need for extending the umbilical incision, which was closed with intradermal suture. The final incision was invisible thanks to its small size and fully endoumbilical placement.

**Results**

The total surgical time was 280 min and bleeding 30 cm³. The patient was discharged after 24 h without any pain, referring less discomfort than in the postoperative period of the prior laparoscopic cholecystectomy, both at the level of the abdominal muscles and the initial ambulation maneuvers. The double-J catheter was removed after three weeks. On the third day, the patient had recovered his working life.

**Comment**

The therapeutic options for renal calculi on horseshoe kidneys are complex. It is generally considered that percutaneous nephrolithotomy presents in these cases better results than extracorporeal lithotripsy, although not without complications such as bleeding. Recently, the performance of retrograde intrarenal surgery has been favored in these
cases, although there is an obvious limitation related to the size of the lithiasis.\textsuperscript{11,12}

Laparoscopic or robotic pyelolithotomy is an indication of recent introduction in this type of patients.\textsuperscript{13-15} Even laparoscopic pyelolithotomy is a possible indication, although it has not been described previously. Our experience shows that the performance of pyelolithotomy 'without incision' with single port is feasible, even in a patient with BMI > 30, in very competitive times, and it leads to excellent, both functional and esthetic, recovery. Of course, this technique is not intended to replace other minimally invasive techniques to treat kidney lithiasis, but it can be an excellent complement to them.

Laparoscopic single-port surgery is the concentration through a single point of trocar insertion and extraction of the specimen (in this case the lithiasis), so that with a very small incision, it is possible to perform a complete laparoscopic procedure. It meets the requirements for inclusion in the surgery called 'scarless'\textsuperscript{6,10}, or at least surgery without 'visible' scar. From a technical point of view, single-port pyelolithotomy is similar to performing a single-port pyeloplasty.\textsuperscript{1,16,17} Extensive practice is recommended for safe performance in experimental models, such as suture simulators and cystorrhaphies or pyelorrhapsies in suidae model. It also requires knowledge of the working material for single port, so the pure transumbilical completion of the procedure must be completely feasible. The placement of a double-J on the tract makes it possible to check the water-tightness of the suture without leaving any abdominal drainage. The required comparison of the instruments and the loss of laterality perception are problems that are solved with experimental exercise.

In summary, the prototype of Richard Wolf\textsuperscript{6} single-port with dual rotating instruments (DuoRotate-Instruments\textsuperscript{9}), which use double rotating maneuver, is a practical and economical alternative to be able to perform high-precision surgeries with exquisite results, not only anatomical and functional but esthetic as well. This system makes it possible to recover effective triangulation and the sensation of depth, avoiding the collision of instruments and improving the capacity of organ retraction, without any need to fold the hands of the surgeon. It can also be used with tissue sealing systems without room conflict and without need to work with auxiliary ports in selected cases.

Conflict of interest

Drs. P.M. Cabrera, F. Cáceres, A. García-Tello, and J.C. Angulo declare that they have no conflict of interest.

Mr. J. Arconada works for the Grupo Taper (Spain).

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