

Transumbilical Laparoscopic Bilateral Nephrectomy

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ABSTRACT

Introduction: Traditionally, the laparoscopic surgeries use several trocars (three to six) introduced by transperitoneal or retroperitoneal access, depending on the type and the complexity of the procedure. Thus, the optimum triangulation is reached. That triangulation has been considered an essential pre requisite for the complex surgical procedures that need precise dissections and suturing techniques. Lately some authors have attempted to reduce even more the morbidity of the laparoscopy carrying mini-laparoscopy surgeries through natural orifices and transumbilical access. The intention of this article is to describe a case of bilateral nephrectomy for instrumental laparoscopic transumbilical access using of conventional laparoscopic surgery. **Case report:** 60-year-old female patient, who underwent renal transplant with graft in the right iliac fossa, was directed to our group by the nephrology service due to repetition urinary tract infection and bilateral renal atrophy. An evaluation of the possibility of proceeding bilateral laparoscopic nephrectomy was carried out, and based on this pre-surgery evaluation, the indicated procedure was through transumbilical access. After the confection of the pneumoperitoneum, three trocars had been located within the periumbilical region and the surgery was successfully carried through without the use of any articulated laparoscopic instrument. The operative time was 100 minutes, with an estimated 100 ml blood loss. The patient got discharged from the hospital on the second day of the postoperative period. **Conclusion:** The accomplishment of bilateral nephrectomy through transumbilical laparoscopic access is feasible and this access can be considered an alternative to the traditional laparoscopy, even when special articulated laparoscopic instruments are not available.

Key words: Transumbilical surgery, Single port, Single incision, Laparoscopy, E NOTES.

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INTRODUCTION

In the past few years, the minimum invasive surgery dramatically changed the surgical conception. Some complex procedures performed exclusively through open surgery today are currently approached through laparoscopy in excellence centers. The advantages of the minimum invasive overture include little postoperative pain, lesser in-hospital time, faster recovery and superior esthetic effect¹.

Traditionally, the laparoscopic surgeries use several trocars (three to six) introduced through transperitoneal or retroperitoneal access², depending on the type and the complexity of procedimento³. In this, the optimum triangulation, which has been considered an essential pre requisite for the complex surgical procedures that need precise dissections and suturing techniques, is reached⁴.

More recently, researches have been directed towards the development of strategies to reduce the morbidity in these surgeries even more, and to improve

the esthetic results⁴. This includes the reduction of the size of the portals (mini-laparoscopy)⁵, the use of the surgery through natural orifices (NOTES, *natural orifice transluminal endoscopic surgery*)⁶⁻¹¹ and of the access transumbilical^{2,4-11-25}. In the latter, it is assumed that the umbilicus is an embryonic natural orifice (e) that can be used as a point of access to the abdominal cavity for surgical procedures, since it is considered a scar. Gill et al¹² had proposed the term E NOTES (*embryonic natural orifice transumbilical endoscopic surgery*) for this via. Other terms which have already been used to describe this technique are TUES (*transumbilical endoscopic surgery*), NOTES (*natural orifices transumbilical surgery*), and also *single port*, *single access*, *single incision* or *keyhole* surgery, all based on the principle of an only abdominal incision inserting articulated laparoscopic instruments^{15,26,27}.

The possibility of using the transumbilical access to carry through surgical procedures was initially demonstrated in a swine experimental model

by PARK et al²⁸ and confirmed by various authors in human beings^{2-4,12-25}. Many devices have been developed to allow the introduction of some laparoscopic instruments through a single incision on the skin² (R port^{2,12}, Uni X Single Port Access Laparoscopic System³, Gelport²⁰ and SITRACC²⁹), but they are still onerous, which might restrict their use in developing countries. RAMAN et al¹⁵ were the first ones to report about nephrectomy through a single umbilical incision using 3 conventional trocars located separately as well as special articulated instruments, as an alternative to the use of the *single port* equipment. Since many services do not make use of articulated instrument, some authors have described the accomplishment of successful transumbilical surgeries using trocars and conventional instruments of laparoscopy¹⁴.

In this article, we describe a case of bilateral nephrectomy using the transumbilical access and conventional instruments of laparoscopic surgery.

CASE REPORT

60-year-old female patient, who underwent renal transplant with graft in the right iliac fossa, was directed to our group by the service of nephrology due to repetition urinary tract infection and bilateral renal atrophy to have evaluated the possibility of proceeding of bilateral laparoscopic nephrectomy.

After the pre-operative evaluation and confirmation of the indication of the procedure, we considered the accomplishment of bilateral laparoscopic nephrectomy through transumbilical access.

Under general anesthesia, the patient was initially positioned on left lateral decubitus to have the right nephrectomy (Figure. 1A). The Veress needle was located through the umbilicus (Figure. 1B), allowing the insufflation of carbon dioxide in the abdominal cavity. The intra-abdominal pressure was maintained between 12 and 14mmHg. A 10mm trocar was located in the periumbilical region for a 30-degree optic, followed by the positioning of 2 additional periumbilical trocars (5mm and 10mm ones) (Figure 1C). This way the surgeon worked using two portals with the instruments in parallel (Figure 1D).

The surgery steps had been the same ones carried through in the conventional laparoscopic surgery. Summing up, the ascending colon was mobilized medially after the opening of the right

parietocolic leak on Toldt white line using electric-cauterization. The kidney was gradually released from its lateral, superior, inferior and posterior adherences. The renal hilo was accessed and the main renal vases were dissected and isolated. After binding with LT 300 titanium and 10mm Hem o lok clips (Weck Closure Systems, Research Triangle Park, NC), the renal vessels were divided (Figures 2A, 2B and 2C). The ureter was dissected, bonded with a LT 300 titanium clip (Figure 2D), and later sectioned.

The patient was placed on right lateral decubitus position and the same procedure previously described was carried through for the left nephrectomy (Figures 3A, 3B, 3C and 3D).

The kidneys were placed in a bag and kept with clamps (Figure 4A). Trocars were removed and the 3 periumbilical incisions on the skin were joined. The opening of the abdominal aponeurosis was enlarged and the bag was removed of its cavity (Figure 4B). The closing of the aponeurosis and the skin was carried through with polyglactin 910 (Vycril®) and 4/0 mono nylon (Figure 4C), respectively.

The operative time was 100 minutes, with an estimated 100 ml blood loss. The post-operative analgesia was carried through with dipirone (1 gram intra vein each 6 hours) and cetoprofen (100mg intra vein each 12 hours). The patient got discharged from the hospital on the second day of the postoperative period.

The anatomic-pathological report accused renal atrophy and chronic pyelonephritis (Figure 4D).

DISCUSSION

One of the basic pre-requisites for the advanced laparoscopic surgery is the correct positioning of the portals in such a way that there is a minimum distance between them, allowing a wide range of movements and also preventing the collision of the instruments. This still enables the triangulation between the instruments and the optics, which is essential in carrying through the surgical dissection and intracorporeal suturing.

The concept of transumbilical surgery includes the positioning of a single trocar with various working channels in the umbilical region or three conventional adjacent periumbilical trocars, so that the optics and the instruments are disposed in parallel within the abdominal cavity. This parallel positioning makes the surgical procedure more difficult since there is internal

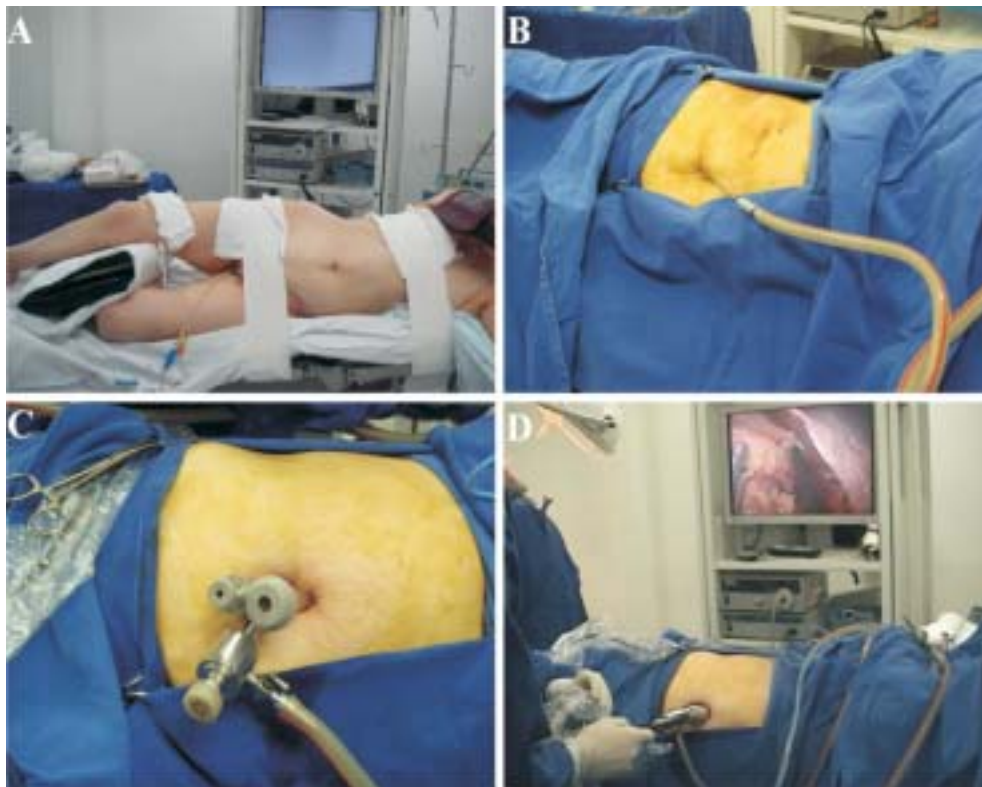


Figure 1 - (A) Patient placed on left lateral decubitus position. (B) Creation of pneumoperitoneum with a transumbilical Veress needle. (C) Placement of the transumbilical trocars. (D) External manipulation of the forceps.

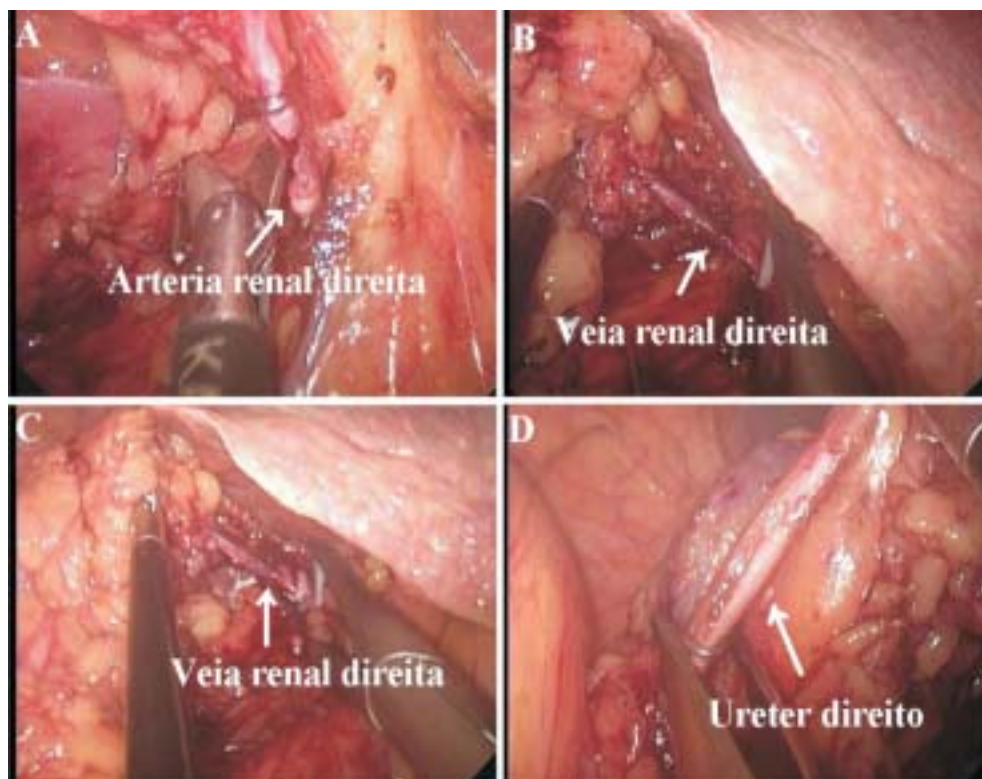


Figure 2 - (A) Ligation and sectioning of the right renal artery. (B and C) Ligation of the right renal vein with Hem-o-lok clips. (D) Ligation the right ureter.

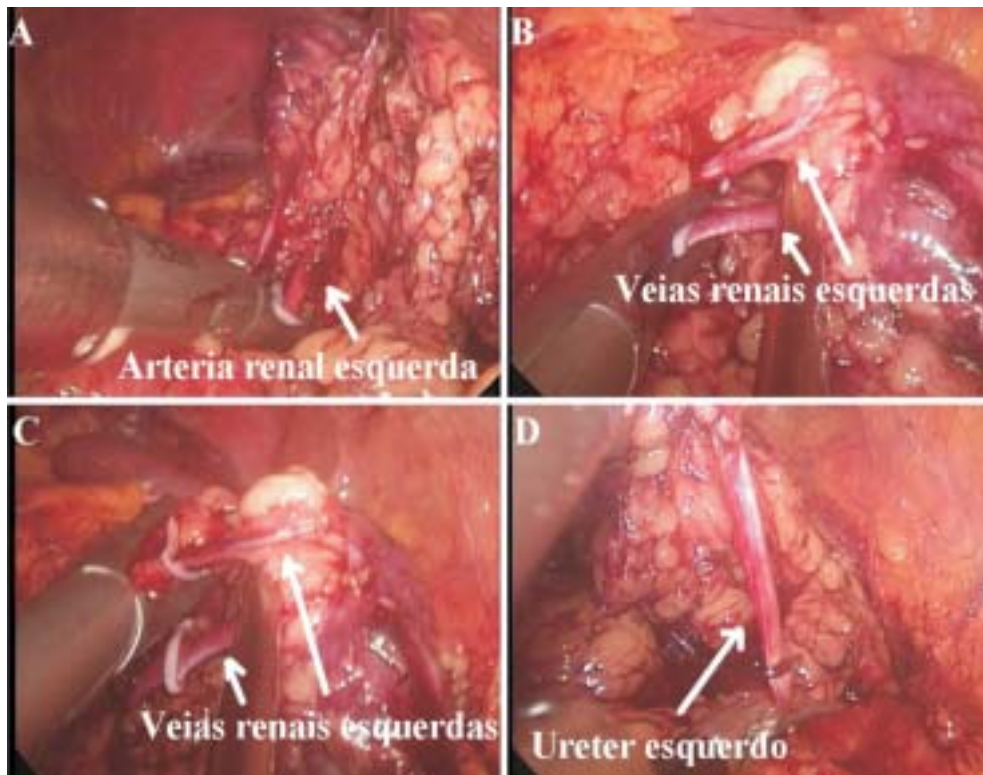


Figure 3 - (A) Ligature of the left renal artery with Hem-o-lok clips. (B and C) Ligature of the left renal veins with Hem-o-lok clips. (D) Ligature of the left ureter.

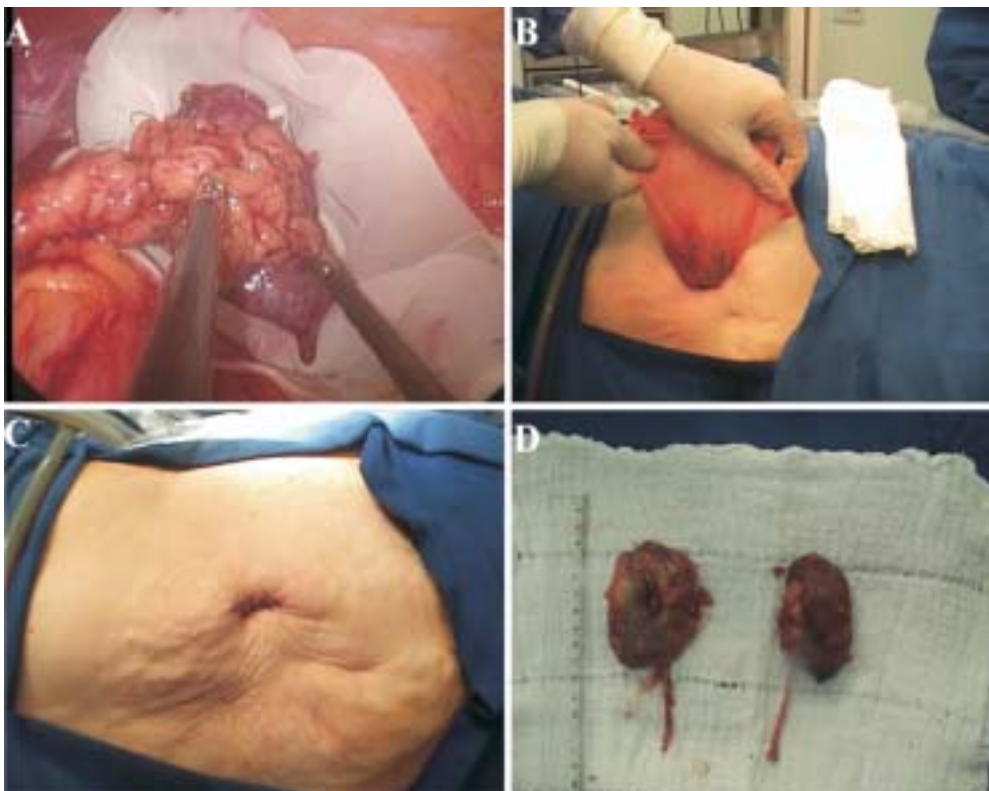


Figure 4 - (A) Placing the kidneys in an extraction bag. (B) Taking kidneys out of the abdominal cavity. (C) Final aspect of the abdomen. (D) Surgical specimens.

Table 1 - Transumbilical urologic procedures.

First author	Year	Cases	Procedure	Comments
Raman et al ¹⁵	2007	3	Nephrectomy	3 adjacent trocars; single umbilical incision; additional 3mm portal to move the liver away
Desai et al ²	2008	2	Pyeloplasty	Single transumbilical trocar (R port);
Kaouk et al ³	2008	10	Nephrectomy	2mm mini-laparoscopy clamp
			Renal cryotherapy	Uni X Single Site Laparoscopic System through retroperitoneal or transperitoneal access
Desai et al ⁴	2008	6	Kidney biopsy	
			Nephrectomy	
Desai et al ⁴	2008	6	Sacrocolpopexy	
			Pyeloplasty	Single transumbilical portal; 2mm mini laparoscopy clamp
Gill et al ¹²	2008	4	Ileal Ureter	
			Ureteroneocystostomy with <i>psoas hitch</i>	
Gill et al ¹²	2008	4	Nephrectomy in living donor	Single transumbilical portal; 2mm mini laparoscopy clamp
			Nephrectomy	3 adjacent periumbilical incisions; conventional laparoscopic instruments
Branco et al ¹⁴	2008	1	Nephrectomy	
Kaouk et al ¹⁶	2008	3	Pediatric Varicocelectomy	
Kaouk et al ¹⁷	2008	4	Radical prostatectomy	Uni X Single Site Laparoscopic System Transperitoneal access; trocar with various channels (Uni X)
Kaouk et al ¹⁸	2008	3	Radical prostatectomy	
			Dismembered Pyeloplasty	Single transumbilical trocar (R port);
Walz and Alesina ¹⁹	2008	5	Radical Nephrectomy	Da Vinci robot
			Adrenalectomy	
Ponsky et al ²⁰	2008	1	Nephrectomy	Retroperitoneoscopy; 2 adjacent trocars
Castellucci et al ²¹	2008	1	Adrenalectomia	Gelpport; 3 portals; conventional laparoscopic instruments
Goel et al ²²	2008	6	Renal cryotherapy	Three 5mm trocars; articulated instruments
Raman et al ²³	2008	11	Nephrectomy	Uni X Single Site Laparoscopic System
Desai et al ²⁴	2008	3	Transvesical simple prostatectomy	Three adjacent trocars; articulated instruments
				Single transumbilical trocar (R port)
Rané et al ¹³	2008	5	Nephrectomy	Single transumbilical trocar (R port)
			Orquidopexy	
Aron et al ²⁵	2008	5	Orquidectomy	
			Ureterolitotomy	
Aron et al ²⁵	2008	5	Partial Nephrectomy	R port; 2mm mini-laparoscopy; it was needed 2mm and a 5mm trocar of 5mm

and external collision of the instruments during their manipulation. The development of optics and 5mm flexible instruments partially helped overcome this technical difficulty, even though the instruments are introduced adjacent and parallel to one another through a single portal.

Some urologic procedures through transumbilical access have been described with encouraging results (Table 1). Special trocars with some articulated working channels (R-port^{2,12}, Uni X Single Port Access Laparoscopic System³, Gelpport²⁰ and SITRACC²⁹) and laparoscopic instruments have

been developed not only to make possible but also to facilitate the laparoscopic surgery using only one incision; however, they are still expensive and impracticable for many surgery groups in developing countries.

The advantages of the transumbilical surgery are: (1) the technique is similar to the traditional laparoscopy²⁷, (2) the orientation is easily controlled by the assistant, thus, the surgeon can get better images, similarly to the conventional laparoscopy²⁶, (3) the technique minimizes the morbidity related to the skin incisions (muscular pain and spasms in the incision, prevents lesions of epigastric vessels), (4) incision can be hidden inside the umbilicus (better esthetic effect)^{3,23,30}, (5) the method allows that the surgeon converts the procedure to a conventional laparoscopic surgery at any time, if necessary, adding one or more conventional laparoscopic trocars^{3,25}, (6) the procedure is simpler and safer than the NOTES techniques²⁶.

The disadvantages are: (1) the parallel positioning and close to the instruments enough tending to result in the collision between the optics and the instruments^{2,12,30}, requiring a significant coordination between surgeon and camera^{3,30}, (2) dissection through a single trocar is more difficult than that in the conventional laparoscopy with various trocars^{2,30} due to the lack of triangulation of the instruments, and (3) the costs of the single ports and the articulated instruments.

In this article we report a case of bilateral transumbilical laparoscopic nephrectomy using instruments of conventional laparoscopic surgery and 3 adjacent periumbilical punctures. The surgery exposure was adequate and the steps for the conventional laparoscopy could be reproduced within the transumbilical technique. No great difficulty was observed during the procedure. As all the trocars were placed in the periumbilical region, at the end of the surgery incisions were easily joined in order to remove the surgical specimen.

We found the same problems previously mentioned by RAMAN et al¹⁵ in relation to the intra and extra abdominal collision of the instruments; however, we could prove that it is feasible to carry through the same procedure without articulated laparoscopic instruments. The coordination between surgeon and assistant is essential to minimize the internal and external collisions of the instrument. The renal vessels ligation were easily performed with

10mm Hem o lok and LT – 300 titanium clips, sparing the use of vascular endo staplers.

We believe that the transumbilical access is a potential alternative for the traditional laparoscopy, with a better esthetic effect since there is only one umbilical incision and a reduction of the complications related to incisions on the skin. The learning curve exists, but it is significantly lower than that in NOTES. We expect prospective and random studies to really evaluate the effectiveness, the indications and the benefits of the transumbilical surgery compared to the traditional laparoscopy.

REFERENCES

1. Hemal AK, Talwar M, Wadhwa SN, Gupta NP. Retroperitoneoscopic nephrectomy for benign diseases of the kidney: prospective nonrandomized comparison with open surgical nephrectomy. *J Endourol* 1999; 13: 425-31.
2. Desai MM, Rao PP, Aron M, Pascal-Haber G, Desai MR, Mishra S, et al. Scarless single port transumbilical nephrectomy and pyeloplasty: first clinical report. *BJU Int* 2008; 101: 83-8.
3. Kaouk JH, Haber GP, Goel RK, Desai MM, Aron M, Rackley RR, et al. Single-port laparoscopic surgery in urology: initial experience. *Urology* 2008; 71: 3-6.
4. Desai MM, Stein R, Rao P, Canes D, Aron M, Rao PP, et al. Embryonic natural orifice transumbilical endoscopic surgery (E-NOTES) for advanced reconstruction: initial experience. *Urology* 2009; 73: 182-7.
5. Soble JJ, Gill IS. Needlescopic urology: incorporating 2-mm instruments in laparoscopic surgery. *Urology* 1998; 52: 187-94.
6. Gettman MT, Lotan Y, Napper CA, Cadeddu JA. Transvaginal laparoscopic nephrectomy: development and feasibility in the porcine model. *Urology* 2002; 59: 446-50.
7. Marescaux J, Dallemagne B, Perretta S, Wattiez A, Mutter D, Coumaros D. Surgery without scars: report of transluminal cholecystectomy in a human being. *Arch Surg* 2007; 142: 823-6.
8. Branco AW, Branco Filho AJ, Kondo W, Noda RW, Kawahara N, Camargo AA, et al. Hybrid transvaginal nephrectomy. *Eur Urol* 2008; 53: 1290-4.
9. Branco Filho AJ, Noda RW, Kondo W, Kawahara N, Rangel M, Branco AW. Initial experience with hybrid transvaginal cholecystectomy. *Gastrointest Endosc* 2007; 66: 1245-8.
10. Clayman RV, Box GN, Abraham JB, Lee HJ, Deane LA, Sargent ER, et al. Rapid communication: transvaginal single-port NOTES nephrectomy: initial laboratory experience. *J Endourol* 2007; 21: 640-4.
11. Kondo W, Noda RW, Branco AW, Rangel M, Filho AJ. Transvaginal endoscopic tubal sterilization: a case report. *J Laparoendosc Adv Surg Tech A* 2009. (A ser publicado).
12. Gill IS, Canes D, Aron M, Haber GP, Goldfarb DA, Flechner S, et al. Single port transumbilical (E-NOTES) donor nephrectomy. *J Urol* 2008; 180: 637-41.

13. Rané A, Rao P, Rao P. Single-port-access nephrectomy and other laparoscopic urologic procedures using a novel laparoscopic port (R-port). *Urology* 2008; 72: 260-3.
14. Branco AW, Branco Filho AJ, Noda RW, George MA, Camargo AHLA, Kondo W. New minimally invasive surgical approaches: transvaginal and transumbilical. *Bras J Video-Sur* 2008; 1: 29-36.
15. Raman JD, Bensalah K, Bagrodia A, Stern JM, Cadeddu JA. Laboratory and clinical development of single keyhole umbilical nephrectomy. *Urology* 2007; 70: 1039-42.
16. Kaouk JH, Palmer JS. Single-port laparoscopic surgery: initial experience in children for varicocelectomy. *BJU Int* 2008; 102: 97-9.
17. Kaouk JH, Goel RK, Haber GP, Crouzet S, Desai MM, Gill IS. Single-port laparoscopic radical prostatectomy. *Urology* 2008; 72: 1190-3.
18. Kaouk JH, Goel RK, Haber GP, Crouzet S, Stein RJ. Robotic single-port transumbilical surgery in humans: initial report. *BJU Int* 2009; 103 :366-9.
19. Walz MK, Alesina PF. Single access retroperitoneoscopic adrenalectomy (SARA)-one step beyond in endocrine surgery. *Langenbecks Arch Surg* 2008. (A ser publicado).
20. Ponsky LE, Cherullo EE, Sawyer M, Hartke D. Single access site laparoscopic radical nephrectomy: initial clinical experience. *J Endourol* 2008; 22: 663-6.
21. Castellucci SA, Curcillo PG, Ginsberg PC, Saba SC, Jaffe JS, Harmon JD. Single port access adrenalectomy. *J Endourol* 2008; 22: 1573-6.
22. Goel RK, Kaouk JH. Single port access renal cryoablation (SPARC): a new approach. *Eur Urol* 2008; 53: 1204-9.
23. Raman JD, Bagrodia A, Cadeddu JA. Single-Incision, Umbilical Laparoscopic versus Conventional Laparoscopic Nephrectomy: A Comparison of Perioperative Outcomes and Short-Term Measures of Convalescence. *Eur Urol* 2008. (A ser publicado).
24. Desai MM, Aron M, Canes D, Fareed K, Carmona O, Haber GP, et al. Single-port transvesical simple prostatectomy: initial clinical report. *Urology* 2008; 72: 960-5.
25. Aron M, Canes D, Desai MM, Haber GP, Kaouk JH, Gill IS. Transumbilical single-port laparoscopic partial nephrectomy. *BJU Int* 2009; 103: 516-21.
26. Zhu JF. Scarless endoscopic surgery: NOTES or TUES. *Surg Endosc* 2007; 21: 1898-9.
27. Gettman MT, Box G, Averch T, Cadeddu JA, Cherullo E, Clayman RV, et al. Consensus statement on natural orifice transluminal endoscopic surgery and single-incision laparoscopic surgery: heralding a new era in urology? *Eur Urol* 2008; 53: 1117-20.
28. Park S, Bergs RA, Eberhart R, Baker L, Fernandez R, Cadeddu JA. Trocar-less instrumentation for laparoscopy: magnetic positioning of intra-abdominal camera and retractor. *Ann Surg* 2007; 245: 379-84.
29. Martins MVDC, Skinovsky J, Coelho DE, Torres MF. SITRACC – Single trocar access: a new device for a new surgical approach. *Bras J Video-Sur* 2008; 1: 61-3.
30. Canes D, Desai MM, Aron M, Haber GP, Goel RK, Stein RJ, et al. Transumbilical single-port surgery: evolution and current status. *Eur Urol* 2008; 54: 1020-9.

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