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# Urological Science

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## Editorial comment

# Back to basics: Controlling renal pedicle by intracorporeal knot tying during hand-assisted laparoscopic nephroureterectomy



Dissection and control of the renal pedicle is the most critical step of nephrectomy, irrespective of whether it is using the open or laparoscopic approach. Controlling the pedicle with ligation is the standard of care in open nephrectomy. Endovascular gastrointestinal anastomosis stapler (Endo-GIAs), titanium clips, and nonabsorbable polymer clips (Weck Hem-o-lok Polymer Locking Ligation System, Morrisville, NC, USA) are devices used for controlling renal pedicle in the laparoscopic counterparts. These devices are easy to apply and can secure the vessels effectively. However, some concerns exist for each device. Hsi et al<sup>1</sup> compared the complications with endovascular stapling devices, nonlocking titanium clips, and Hem-o-lok clips during laparoscopic nephrectomy by reviewing the Food and Drug Administration Manufacturer and User Facility Device Experience Database. Among 2172 total nephrectomy- or kidney-related reports, failure was reported in 352 using laparoscopic hemostatic devices to secure the renal vasculature.<sup>1</sup> Two hundred and twenty-three complications (63%) were from the use of endovascular stapling devices, 111 (33%) from nonlocking titanium clips, and 18 (5%) from Hem-o-lok. Staple-line malformation (47%) and locking up (29%) were the leading causes of failure for stapling devices. Jamming/feeding difficulties (27%) and trouble closing or “scissoring” clips (26%) were the most common in titanium clips. Dislodgement (44%) was most frequently reported in Hem-o-lok. Other considerations are vessel injury or inadequate vessel control resulting from Hem-o-lok, easy slippage of titanium clips, and the high cost of these devices.

Suture ligation is the standard method of renal pedicle control in open surgery, which is considered one of the basic surgical skills. Several laparoscopic surgeons reported their experiences using suture ligation in controlling the renal pedicle during laparoscopic nephrectomy to overcome the pitfalls of the devices mentioned above. Bomfim et al<sup>2</sup> reported the use of a “boatman’s knot” in renal-vessel ligation during laparoscopic nephrectomy. They performed bilateral laparoscopic nephrectomy in seven pigs with the pedicle controlled with a “boatman’s knot” without complication. Janetschek et al<sup>3</sup> controlled the renal vein with an encircled suture, which was knotted extracorporeally and pushed down by a knot pusher, followed by 10-mm Hem-o-lok clips to occlude the vein completely. Although the feasibility of applying suture ligation in the renal pedicle was proven in these reports, the inherent drawback of minor-force feedback by laparoscopic surgery may lead to inadequate knot strength, which is a concern for such an approach.<sup>4</sup>

Hand-assisted laparoscopic surgery has the advantages of being a minimally invasive surgery with tactile sensation. Performing suture ligation of the renal pedicle during hand-assisted laparoscopic

nephrectomy can achieve secure control of the pedicle by direct-force feedback. Ou et al<sup>5</sup> reported the technique of intracorporeal one-hand tie technique for renal pedicle ligation during hand-assisted retroperitoneoscopic nephrectomy (HARN). The efficacy of this technique was attested to in 32 consecutive patients with upper-tract urothelial cancer that underwent HARN and open-bladder cuff excision.<sup>6</sup>

The technique consists of several intracorporeal maneuvers, and finally four three-throw square knots done to secure the renal vessel ligation (three were placed proximally and one distally) before division. The artery and vein were transected between the proximal and distal ligatures with endo-scissors. There were no major complications associated with this technique. In comparison with another 32 patients with the pedicle controlled using Endo-GIAs, the cost was significantly lowered without obvious increase in the operation time.

In spite of the excellent results attained by the authors, some caveats still have to be noted. (1) During hand-assisted retroperitoneoscopic surgery, the operative field is usually blocked by the hand. Under certain circumstances, the dissection cannot be performed visually, but by individual surgeon perception. Some difficulties might occur in performing the intracorporeal one-hand tie technique because of poor visibility. Therefore, the perception of the fingers without vision is very important, but might involve a learning curve. (2) Anatomically, the renal artery is usually located behind the renal vein. Therefore, control of the renal artery and renal vein using the intracorporeal one-hand tie technique should be slightly different. The space between the renal artery and vein has to be separated widely enough to pass the finger, which could increase the risk of vessel injury. (3) The technique needs to be performed with the hand-assisted device simultaneously. Although the cost of renal pedicle control can be reduced by using this technique, the hand-assisted device will increase the total cost of the operation.

The rapid development of advanced technology in laparoscopic instruments makes the surgery more efficient, but costly. Applause should be given to the intracorporeal one-hand tie technique for enabling control of the renal pedicle during hand-assisted laparoscopic nephrectomy, which adheres to the basic principles of surgery in a secure and cost-effective way.

## Conflicts of interest

The authors declare that they have no financial or non-financial conflicts of interest related to the subject matter or materials discussed in the manuscript.

## Sources of funding

No funding was received for the work described in this article.

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9 November 2015

Available online 19 December 2015