Robotic Partial Nephrectomy - Initial Experience

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Citation

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Abstract

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INTRODUCTION

Nephron sparing surgery for T1a lesions is the current gold standard. Robotic Partial Nephrectomy (PN) is an established surgical technique, with equivalent oncological outcomes when compared to laparoscopic PN. Our tertiary referral centre has extensive experience in laparoscopic surgery and robotic prostatectomy.

OBJECTIVE

To compare our initial experience with robotic PN, with the current world literature.

METHODS

Prior to commencing robotic PN our surgeon had extensive training in laparoscopic and robotic surgery. Cases were selected that were partially exophytic and less than 4 cm in size. Further, a surgeon experienced in robotic PN was present throughout all cases to act as a mentor and ensure patient safety. Four suitable patients were recruited. All patients were informed that the surgeon had not performed this procedure previously and that a senior surgeon would be supervising. The first case was performed as a demonstration by the visiting specialist. Following this display, another three cases were performed over the next two days. End points were defined as Warm Ischemia Time (WIT), Positive Surgical Margin (PSM) status, total blood loss, total length of operation. WIT and blood loss have been demonstrated to negatively impact on renal function.

A transperitoneal approach was used for all cases. TED stockings were placed pre-operatively and Cefazolin 1g IV was used for antibiotic prophylaxis. The patient was positioned in the flank position over the break in the table with pressure points padded. A 12mm periumbilical port is placed for the camera and two robotic instrument ports are placed in a “V” arrangement centered on the renal hilum. These ports are placed one hands breadth from the camera port which allows triangulation of instruments. A 12 mm assistant port is placed distally in line with the camera port. An optional 5mm assistant port may be placed in the xiphisternum to retract liver if required.

The peritoneum is incised along the Line of Toldt and the bowel is mobilized medially from Gerota’s fascia. The upper pole of the kidney is mobilised from the spleen or liver. The vessels and the ureter are identified and chased cephalad to identify the renal hilum. The hilum is skeletonised to allow for clamp placement. A laparoscopic ultrasound probe is used to identify the location and size of renal tumour, and to confirm resection margins and depth. Gerota’s fascia is opened and the fat is resected from the renal capsule to expose the tumour. This fat is sent as a separate specimen for possible T3 tumours. The margin of resection is scored circumferentially using monopolar cautery.

The assistant clamps the renal hilar vessels separately using laparoscopic bulldog clamps through the 12mm assistant port. The tumour is resected along the previously scored margin using cold resection with the robotic monopolar scissors. The assistant uses suction to expose and maintain visualization of the resection plane of the tumour. After excision, the tumour can be placed beside the kidney or on top of the liver for later retrieval.

The Collecting system is oversewn with 2-0 vicryl suture on an SH needle. A lapra-ty clip is used to secure the stitch. The renal capsular stitches are placed, every 1 cm along the defect. A #1 vicryl stitch is used on a CT needle. On the end

of the stitch there is a weck clip and a lapra-ty is placed at the distal aspect of the stitch. After sewing both sides of the renorrhaphy, the stitch is held tightly with the prograsp instrument, and using the needle driver to apply gentle pressure on the lapra-ty. The lapra-ty will slide down onto the kidney and can be tightened. After sliding down the clips, they can be tightened further with each subsequent stitch. A weck clip is then placed distal to the lapra-ty to lock the suture in position. The kidney is unclamped and hemostasis checked. Flo-seal may be used.

The specimen is placed in a retrieval bag and removed through the 12 mm assistant port. This port may need to be enlarged. Gerota's fascia and fat is closed over the defect using a running 3-0 Vicryl suture on an SH needle. A drain is placed in the perinephric space.

RESULTS

All 3 of our initial cases had negative margins. The mean WIT was 17 minutes, the mean blood loss was 60mL, and mean total length of operation was 120 minutes. These compare favourably with world literature. It has been established that WIT less than 25 minutes is critical. Further blood should be minimised, and 60ml is below average.

CONCLUSIONS

Nephron sparing surgery is the gold standard for appropriate tumours. The preservation of renal function requires minimising WIT and blood loss. It has been demonstrated nephrons incur permanent ischemic injury immediately after clamping the renal hilum [1]. Nephron damage increases with every minute of WIT (Odds ratio: 1.05 for each 1 min increase $p<0.001$) [1]. If WIT exceeds 25 minutes an even greater number of nephrons are damaged [1]. In our series the mean WIT was 17 minutes. This compares favourably with results published by the Cleveland Clinic (WIT laparoscopic 18.2 min vs 20.3 robotic ($p = 0.27$) [2]).

A review of the literature revealed mean blood loss for laparoscopic and open PN is 200 to 300 ml. There is no significant difference between the two groups in centres of excellence. However, intra-operative bleeding has been shown to adversely affect renal function at both early (1 day) and late time points (6 months) [3]. Thus minimizing blood loss must be a goal of any PN technique. Our mean blood loss was 60 mL.

Minimally invasive surgery is associated with less post operative pain and a shorter post operative stay than open PN [4]. In our group there was a 0% PSM rate. The literature revealed no difference in laparoscopic and robotic PN PSM rates [2]. However, laparoscopic and robotic PN are associated with a higher PSM rates compared to the open PN (3% vs 0%, $p = 0.1$) [4].

Our initial experience demonstrates that surgeons who are experienced in laparoscopic and robotic surgery can adapt to robotic PN with minimal learning curve. Further, excellent oncological outcomes are achievable, with minimal WIT and blood loss. As our experience grows we expect that the WIT will decrease further and it will be possible to perform robotic PN for larger lesions.

References

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