Editorial

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Expanding indications in robotic upper renal tract surgery: The sky's the limit

With over 4,000 da Vinci robotic systems in operation throughout the world performing mainly prostate and gynaecological surgery there seems to be plenty of capacity and opportunity to expand robotic indications even further. Whilst robotic partial nephrectomy (RPN) has become an established technique in many centres there remains some reluctance to use this technology across the wider spectrum of upper renal tract disease. The enhanced 3-dimensional optics, tremor elimination, precise dissection and suturing ease permitted with the robotic system lends itself to the delicate complexities of upper renal tract surgery. Those aspects of upper tract surgery that require reconstruction are particularly suitable for robotic assistance.

Since the first RPN by Gettman et al. [1] in 2005, it has become increasingly obvious that use of the robotic approach has significant benefits in terms of a reduction in warm ischaemia times when compared to laparoscopic surgery [2]. It may also allow a quicker procedure, a reduction in intra-operative complications such as vascular injuries due improved suturing dexterity, and the ability for more surgeons to perform procedures of higher complexity. The recent British Association of Urological Surgeons audit in the United Kingdom [3], where all urologists performing nephrectomies are mandated to submit their personal data each year, shows significant advantages to a robotic approach when compared with the open or laparoscopic counterparts. This audit looked at over 1,400 partial nephrectomies over 3 years across the country and showed improvements in positive margin rates, intra and postoperative complications, and length of hospital stay. There was no recording of warm ischaemic times or tumour complexity in the initial audit so case selection will have had an impact on these results for the different approaches. Despite this the data represents a national perspective rather than just the highest volume centres and seems to clearly indicate that if a minimally invasive partial nephrectomy is indicated, it may be optimally performed robotically. Thus for the vast majority of tumours we feel that RPN represents the current Gold standard.

With regards to laparoscopic radical nephrectomy most urologists would not routinely use the robot for this relatively routine task. However we feel there are several potential advantages to its use. For instance the procedure may well be quicker than the standard laparoscopic approach enabling more cases (3 or 4) to be carried out in an all-day operating list. If the robot and maintenance contract are already in place in the hospital it may be cost neutral as many laparoscopic disposables are eliminated such as a Harmonic Scalpel or Ligasure device and disposable ports [4]. Robotic radical nephrectomy uses the same port placement and set-up as partial nephrectomy so is ideal for training within a fellowship programme. Small improvements in the quality of the robotic case may permit increased confidence allowing surgery without using a wound drain or even a urethral catheter. Perhaps the key advantage of robotic radical nephrectomy is the potential to expand the indications for minimally invasive renal surgery to include patients with tumours who would otherwise be deemed too complex for laparoscopic surgery. Most larger tumours >10 cm, those invading adjacent organs, those carried out for cytoreductive indications, or those with clear venous invasion are avoided by laparoscopic nephrectomists. The additional control and dexterity provided by robotics brings many of these cases into the remit of the robotic surgeon. There are now case series of tumours with significant renal vein, levels I–III thrombii successfully managed robotically [5].

The challenge of nephro-ureterectomy for upper tract transitional cell carcinoma (TCC) is often not the nephrectomy component but the ureterectomy component

where precise dissection of the distal ureter and accurate closure of the cystotomy defect are paramount. There is no doubt from our perspective, having performed many with both approaches, that compared with laparoscopic surgery the robotic approach adds an increase in quality to this step and also makes lymphadenectomy more feasible. Although costs have been shown to be higher, postoperative complications seem reduced [6]. The optimal bladder closure with a robotic approach permits early removal of catheter, the ability to safely instill intravesical chemotherapy and hence can decrease length of stay.

With regards to the less common retroperitoneal procedures the robotic system can usually add some technical quality to the operations. Whilst adrenalectomy is a very established laparoscopic technique, dissection around the great vessels and particularly the inferior vena cava can be fraught with danger. In the event of a major vascular injury use of the enhanced suturing permitted by the da Vinci system may make the difference between conversion to open surgery or salvaging the situation. Less stressful reconstructive procedures such a dismembered pyeloplasty, ureteric reimplantation and ureterolysis for retroperitoneal fibrosis may all benefit from robotic dexterity [7].

There are however many potential disadvantages of using the robot over a pure laparoscopic approach. The main downside stated is clearly cost as the system still costs almost $1.5 million to purchase and comes with an expensive maintenance contract. If the robot has already been purchased for pelvic surgery (prostate/gynaecology) then these costs are far less, and extending indications to the upper tract becomes more appealing. From a practical perspective there are also disadvantages in terms of robotic specific complications due to untrained and inexperienced use of the system. The distance between the console surgeon and the assistant can lead to misunderstanding and poor communication whilst operating in an area where significant bleeding can occur without warning with dramatic consequences. Judging tension when elevating structures takes experience and although suturing is easier it still requires training and practice. Assistant instruments can occasionally become inadvertently lodged beneath robotic arms due to lack of tactile feedback and diathermy arcing can occur from robotic scissors into adjacent structures causing damage and potential haemorrhage. Like all complex surgical tools dedication to training and ongoing audit and assessment of one's performance are vital.

Despite these potential problems overall we feel that units with an established robotic programme should try and get the most out of their costly equipment. Expanding the upper tract programme has many potential advantages in terms of health economics and clinical delivery. When compared to laparoscopic procedures it is often possible to perform a whole range of operations more quickly, more safely and with additional quality in an integrated robotic renal tract programme. When it comes to the upper urinary tract we feel the sky's the limit.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

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