Robotic reconstructive urology: possibilities for the urological surgeon beyond the prostate

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The rapid dissemination of robotic-assisted laparoscopic surgery into surgical practice over the past five years has been startling. Urology has been quick to develop robotic-assisted techniques, particularly in the treatment of localised prostate cancer, where large series with excellent outcomes have been reported. The UK currently has 23 da Vinci (Intuitive Surgical, Sunnyvale, CA, USA) surgical systems, with several more planned, and most are primarily used to perform robotic-assisted radical prostatectomy (RARP).

However, there are a growing number of other reconstructive urological procedures facilitated by this robotic system, which, although less numerous and thus potentially less financially rewarding than RARP, may also have huge patient benefits.

The da Vinci system is ideally suited to reconstructive procedures due to its ability to permit straightforward, efficient and dextrous suturing. The seated console surgeon is in a comfortable ergonomic position, with three-dimensional stereoscopic vision, tremor filtered, and can use the increased degrees of freedom provided by the Endowrist (Intuitive Surgical) technology. Laparoscopic suturing becomes enjoyable again rather than arduous and although requiring dedicated training, this skill is not limited to those with exceptional laparoscopic skills.

As robotic surgery has become part of mainstream urology, trainees are increasingly keen to learn its techniques. Despite advocating the introduction of an established UK training programme in robotics in 2004, currently few centres are able to offer significant console time to trainees due to the immaturity of individual robotic programmes. With no

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The urological equivalent of the laparoscopic cholecystectomy providing a high-volume relatively simple robotic-assisted procedure, registrars must learn the challenges of RARP directly or seek international robotic fellowships. An alternative is for British programmes to offer them access to other robotic reconstructive procedures. In a recent survey of USA trainee urologists, 78 per cent thought it would be required or beneficial to have formal robotic training as part of their residency programmes (Figure 1).1

ROBOTIC-ASSISTED PYELOPLASTY (RAP)

Laparoscopic pyeloplasty is a technically demanding procedure that requires advanced training and precise intracorporeal suturing skills. Both laparoscopic pyeloplasty and RAP provide the benefits of decreased postoperative pain, shorter hospitalisation, rapid convalescence, and an improved cosmetic result seen with a minimally invasive approach. RAP specifically benefits from the ease of dissection, excellent vision and, in particular, the enhanced suturing possible with the da Vinci system. It is generally performed transperitoneally due to the limited space available in the retroperitoneum with the da Vinci system. Three robotic ports and an assistant port are required, with the robot docked obliquely over the patient in the lateral position. The procedure lasts 1.5 hours in experienced hands and has a success rate of >95 per cent.4 Anastomotic leaks are rare and many patients can go home on the day after RAP. Kidneys with anatomical abnormalities can be treated4 and functional or symptomatic recurrence seems rare at three years follow-up.

A recent comparison of laparoscopic pyeloplasty and RAP found that the robotic approach enabled the surgeon to achieve a quicker dissection and reconstruction with fine sutures, coupled with simple antegrade ureteric stenting.4 There is also huge potential to use a robotic approach in paediatric pyeloplasty and ureteric reimplantation.

ROBOTIC-ASSISTED PARTIAL NEPHRECTOMY (RAPN)

Similarly to the open approach, after port placement and bowel reflection, the tumour is identified and the hilar vessels are clamped, the tumour is excised and deep sutures placed to control haemostasis and repair any entry to the collecting system. The ability to quickly, precisely and securely close the parenchymal defect after excision of a renal tumour has been the predominant technical challenge in minimally invasive partial nephrectomy.

Laparoscopic partial nephrectomy (LPN) requires advanced suturing skills that many urologists will not achieve outside of dedicated fellowship programmes combined with significant natural talent. As a result, LPN has struggled to gain universal acceptance due to concerns about prolonged warm ischaemic times and the potential for postoperative haemorrhage.

The combination of the precise suture placement possible with the da Vinci system and its ability to facilitate the straightforward and elegant technique of Hem-o-Lok (Teleflex Medical, Research Triangle Park, NC, USA) sliding clip renorrhaphy5 has generally overcome these concerns. In this technique, Hem-o-Lok clips are placed on several polyglactin (Vicryl) sutures across the renal defect. The initial clips are slid down the sutures until tightly apposed to the renal parenchyma allowing tension adjustment (sliding). After this, secondary clips are applied to lock the initial clips, achieving a highly reliable and reproducible haemostatic closure.

RAPN is the fastest growing robotic procedure worldwide.8 It has the considerable advantage over LPN of a shallower ‘learning curve’ and the ability to perform less experienced surgeons to perform the procedure safely and efficiently. In particular, robotic assistance has made tumour excision and intracorporeal reconstruction easier.

CONCLUSION

Robotic-assisted reconstructive urological surgery is developing rapidly and the da Vinci robot should not be viewed as a device for performing RARP alone, as a wide spectrum of urological and other procedures can benefit from robotic assistance. Although financially challenging to purchase a robotic system specifically for reconstructive indications, robots in situ can be made to...

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work harder over a wider range of urological pathology. As centres increase their experience with robotic operating, they should diversify their range of procedures. This will improve robotic and laparoscopic skills, provide improved training opportunities within the less demanding cases and benefit patients hugely.

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