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Robotic radical cystectomy - revision and resection: an evolution in operative technique and platforms

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Robotic radical cystectomy remains the hardest operation within urology. As surgeons, we consistently look to improve our outcomes. With new robotic platforms, robotic surgery is advancing. Applications of robotic surgery in urology are rapidly expanding. These include single docking abilities and access from the kidney to the prostate without having to change patient position [1]. Emerging robotic platforms are being developed to improve performance of a wider variety of urologic interventions [2]. At the start of any learning curve, the complication rate can be high. Robotics improve safety outcomes and approaches to previously inaccessible areas. Can revision surgery be done safely robotically by the inexperienced surgeon?

The use of Indocyanine Green (ICG) fluorescence imaging during robotic assisted laparoscopy has been shown to be helpful in identifying critical structures during cholecystectomies [3]. Additionally, Injection of intavenous ICG highlights pelvic vasculature. This can aid in identifying blood supply to myomas during robotic assisted laparoscopic myomectomy and decrease surgical blood loss [4]. The question then becomes, how can this be used to improve surgical outcomes for robotic radical cystectomy?

There are several steps within cystectomy that can use Firefly fluorescence to guide it further. This technology can assist in localizing a lesion in the bladder. The localization of the disease with this technology is efficient and precise, minimizing the lack of tactile feedback to localize the pathology during robotic assisted surgery [5]. This allows for a much more precise resection. Additionally, by integrating intraoperative near infrared fluorescence imaging into a robotic system, surgeons can identify the vascular anatomy in real-time with the technical advantages of robotics that is useful for meticulous lymphovascular dissection [6]. This technique can allow for precise lymph node dissection within the pelvis and identification of the SMA. This allows for a safe controlled resection.

Indocyanine green (ICG) fluorescence technology has also been used to delineate bowel perfusion. The optimal point of transaction can be marked under white (visible) light followed by intravenous injection of 6-8 mg of ICG [7]. The bowel is then visualized via near infrared laparoscopy and the point of transaction of the proximal is revised based on optimal bowel perfusion. This demonstrates the feasibility and advantages of the use of fluorescence imaging during creation of anastomosis; the advantages of endoscopic imaging to delineate integrity of the anastomosis as well the technique with regards to creating the anastomosis [7]. This can be used as part of cystectomy, when forming the conduit. To take this one step further, it can also be used, to assess the vasculature of the ileal conduit segment.

In conclusion, we have another 'pair of eyes' to enable us to conduct a safe controlled resection, with good vascular control, and which also allows us to conduct as safe anastomosis at the most precise location.

Robotic surgery has been used with success for ileal conduit revision with repair of ureteral stenosis [1]. Five tracers can be used for the 4 arms of the Si da Vinci robot in a 4-arm approach. Estimated blood loss was minimal (50 ml) [1]. There were no perioperative complications after this procedure. At 3 months of follow-up, the patient remained complication-free [1]. This demonstrated redo surgery is not an easy procedure due to postoperative adhesions and anatomical distortion. Robotic surgery is precise for dissection of adhesions and robotic suturing. Re-do surgery using a robot, which is a complicated procedure is the way forward.

Application of robotic surgery has also been used to manage a robotic cystectomy with conduit diversion [8]. A ureteroileal anastomotic stricture was treated robotically. A robotic uretero ileal anastomosis revision was performed through 3 robotic ports (12 mm, 8 mm, 8 mm) at a new site on the conduit using interrupted sutures with bowel mucosal eversion [8]. There has been no recurrence of stricture after six months.

Again, this demonstrates successful use of robotics in complication revision. Even though the learning curve can be difficult for a surgeon, totally intracorporeal RARC with intracorporeal neobladder is a complex procedure, but it can be performed safely, with a structured approach, at a high-volume established robotic surgery centre without compromising perioperative and pathological outcomes during the learning curve for surgeons [9].

Postoperative bleeding is a known risk of any surgery. Although this risk is recognized, there is limited characterization of the rate of this occurrence in laparoscopic and robotic surgery [10]. Bleeding requiring re-operation is a recognized rare complication of minimally invasive surgery, even in experienced hands [10]. None of the patients post robotic prostatectomy required transfusion. All reoperations occurred within the first 24 hours postoperatively and indications for reoperation included hemodynamic instability in all cases, but this can be conducted robotically with success.

It has been demonstrated that robotic surgery is clearly an advantage technique (easy manoeuvring, comfortable and ergonomic position for the surgeon, 3D visualization and short learning curve) [11]. Robotic revision surgery is a challenging but feasible procedure in well-selected patients. Appropriate tracer and patient positioning is crucial to facilitate this surgery. Adhesiolysis can also be conducted robotically, with the advantage of extended instruments for greater access.

In conclusion, this minimally invasive procedure is facilitated by the use of the robotic platform and advances in robotic technology. An experienced robotic team and mentor can impact the learning curve of a new surgeon in the same centre resulting in decreased complication rates [9].

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