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RESEARCH ARTICLE

Robot-assisted Management of Urological Injuries Following Gynecological Surgeries: Our Experience

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ABSTRACT

Background and objectives: Robot-assisted minimally invasive surgeries have rapidly increased during the last decade. The objectives of the present study were to report our initial experience on robot-assisted management of urological injuries following gynecological surgeries, i.e., vesicovaginal fistula (VVF) repair and ureteric reimplantation for ureterovaginal fistula (UVF) and posthysterectomy ureteric strictures, using the da Vinci robotic system.

Materials and methods: We performed robot-assisted surgeries in 12 such cases from February 2016 to September 2018. These include 7 cases of VVF repair, 2 cases of ureterovaginal fistulas and 3 cases of post-hysterectomy ureteric strictures requiring re-implantation.

Results: All 7 patients who underwent VVF repair had no requirement of analgesics from 3rd day onwards and early convalescence, with only 1 having delayed recovery, The patients who underwent ureteric reimplantation for ureterovaginal fistula and ureteric strictures recovered well, with no hydroureteronephrosis or reflux of urine in any of the patients during follow-up.

Conclusion: Our study concludes that, robot-assisted VVF repair and ureteric reimplantation for ureterovaginal fistula and ureteric stricture are safe and feasible and provides all the advantages of minimally invasive surgery, with additional benefit of enhanced precision, range of motion, visualization and access to pelvis and patient-related benefits of less pain, faster recovery, shorter hospital stay and early return to normal activity.

Keywords: Gynecological injuries, Robot-assisted surgery, Ureteric reimplantation, Ureterovaginal fistula repair, Vesicovaginal fistula repair.

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INTRODUCTION

The technological developments of the last decade have revolutionized healthcare. Minimally invasive surgery, i.e., laparoscopic and robotic surgery have redefined the standard of surgical care, by outdoing the traditional style of open surgery. Laparoscopic surgery, from the 1990s, became the standard of care for many procedures. Surgery performed in this manner makes it easier for the patient to recover faster, with early return to normal activity. However, the essential disadvantages of laparoscopic surgery are the two-dimensional view, difficulty in movements, long learning curve, limitation of the clarity of depth, dependence on assistant held the camera, and when that is coupled with hand-eye coordination and operating fatigue, it can become quite tedious to operate, particularly for long surgeries. The latest addition to the open and laparoscopic surgery is robot-assisted surgery.[1] Today robotic surgery is done by the surgeon sitting on an ergonomically designed console, viewing the surgical field in three-dimensional (3D) vision and manipulating the wristed laparoscopic instruments through the masters and foot pedals.[2] The robot can help overcome the challenges faced by laparoscopic surgery. Robotics do seem to have an edge in complex procedures where extensive dissection and proper anatomy reestablishment is required. The endo-wrist technology allows surgical maneuvers that are similar to open surgical techniques, thus making it easy for surgeons with less advanced laparoscopic skills to perform difficult reconstructive tasks like intracorporeal suturing. Currently, applications of robotics in gynecology include hysterectomy, myomectomy, oophorectomy, and ovarian cystectomy, resection of endometriosis and sacrocolpopexy with an increasing role of robotic surgery in gynecological oncology and urogynecology.[3-7]

Because of the proximity of the female genital tract to the lower urinary tract, the potential for genitourinary (GU) injury during obstetric and gynecological (OBS and GYN)

surgery must always be considered. Recent reports from high-volume centers describe urinary system injuries in ≈1% of all OBS and GYN surgeries with ≈70% involving the bladder and 30% involving the ureter.[8,9] Associated factors that historically increase the likelihood of GU injuries include endometriosis, retroperitoneal fibrosis, gynecological malignancy, history of pelvic radiation, previous pelvic surgery, and abnormal GU anatomy.[9]

We report our initial experience of robot-assisted management of urological injuries following gynecological surgeries, including robot-assisted VVF repair and ureteric reimplantation for UVF and post hysterectomy ureteric strictures, using the da Vinci robotic system.

MATERIALS AND METHODS

Patients

A total of 12 such cases have been conducted in the past 2 years, both referred from within the hospital and outside. There were 7 cases of VVF repair, 2 cases of ureterovaginal fistulas and 3 cases of post hysterectomy ureteric strictures requiring reimplantations.

Robot-assisted Surgery

- *VVF Repairs:* Thorough workup was done with CT/MR urogram, cystoscopy, and colposcopy, in the 7 high VVF patients. They had developed the same postpartum or after previous open gynecologic surgery. Robotic surgical repair was done with 2-layer suturing technique and interposition of omentum, after complete excision of the fistulous tract. Patients were discharged at 7th postoperative day, regular follow-up done, and periurethral catheter along with bilateral ureteric catheters was removed after 6 weeks.
- *UVF repair:* Of the 2 patients, one underwent DJ- stenting prior but failed to improve and the other was not amenable to stenting. After an adequate workup with CT urogram, cystoscopy, and colposcopy, robotic surgical repair was done. After thorough pelvic dissection and establishment of proper anatomy, the ureter was separated of all adhesions and fistulous tract excised. Ureteroneocystostomy was done after mobilization of the ureter and placing DJ stent. Peruretheral catheter removed on 3rd postoperative day, discharged on 5th postoperative day and DJ stent removed at 6 weeks. Ultrasound and MCU were done at 3rd-month postoperative.
- *Ureteric reimplantation for strictures:* All 3 cases who underwent ureteric reimplantations for lower ureteric strictures developed the same after hysterectomy. Of these 3 cases 2 patients were treated prior with DJ stenting, stents were kept for 2 months and removed, but there was the persistence of pain and hydroureteronephrosis (HUN), which necessitated reimplantation. The other patient had a complete stricture of the lower ureter with gross HUN and hence unable to attempt DJ stenting. All were evaluated with CT urogram and retrograde pyelogram before surgery. All were discharged on the 5th postoperative day, and regular follow-up done. DJ stent was removed after 6 weeks and ultrasound and MCU were done at 3rd-month postoperative.

RESULTS

Of the 7 patients who underwent VVF repair, 6 recovered well with no complications or leak, and no requirement of analgesics from 3rd postoperative day onwards. One patient had a persistent small leak which resolved after continuing bladder drainage with per urethral catheter for 4 more weeks. Figure 1 showing the CT urogram showing the leakage of contrast from the bladder to vagina suggestive of VVF. Mean age was 36 years (range 21–46 years) all with high lying fistulas. Blood loss was minimal (mean 45 mL) and the median length of stay was 7 days. Patients were discharged on the periurethral catheter and bilateral ureteric catheters, along with antibiotics and anticholinergics and advised to follow up after 5 weeks for removal of the catheter. Post-surgery urodynamic studies were done after 3 months for evaluation of bladder function which was essentially normal.

Figure 2 indicating the CT urogram demonstrates contrast leaking from the right lower ureter to vagina suggestive of UVF. Figure 3A indicating the dissection the fistulous tract between the bladder and vagina during VVF repair. Figure 3B indicating the robotic ureteroneocystostomy during UVF repair. Both cases of ureterovaginal fistulas developed the same following hysterectomy. They were discharged on the 5th postoperative day with no requirement of analgesics from 3rd day onwards. All

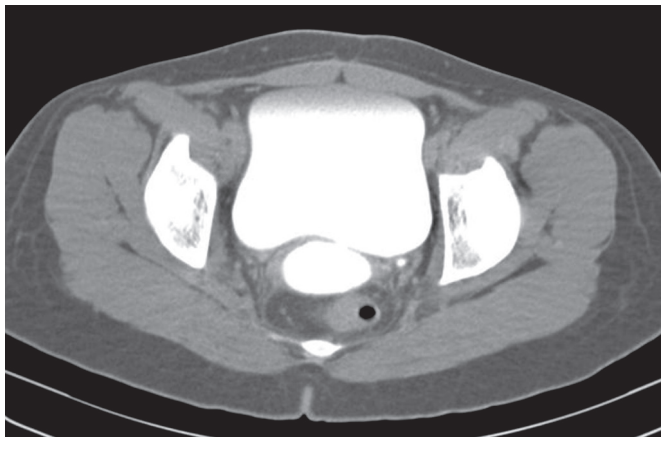


Fig. 1: CT urogram showing the leakage of contrast from the bladder to vagina suggestive of VVF

Fig. 2: CT urogram demonstrates contrast leaking from the right lower ureter to vagina suggestive of UVF

recovered well with no complications or leak and were dry completely. All 3 patients with ureteric strictures needing reimplantation were discharged on the 5th postoperative day after removal of the periurethral catheter.

Mean age was 46 years with a mean stricture length of 1.5 cm, located within 2.5–3 cm of VUJ. All were comfortable in postoperative period with no requirement for any pain killers after 3rd postoperative day. During follow-up of the ureteric reimplantation patients, DJ stent was removed after 6 weeks postop, and there was no persistent hydroureteronephrosis or reflux seen in the ultrasound and MCU done at 3 months.

DISCUSSION

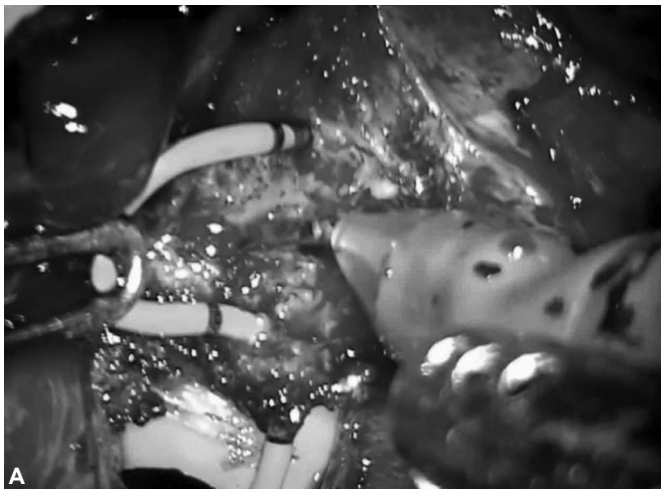
Minimally invasive surgery can be considered as one of the important surgical innovations in the field of medicine. Robot-assisted surgery has been shown to be safe and feasible in gynecological surgery procedures especially for hysterectomy, myomectomy, oophorectomy, and ovarian cystectomy, resection of endometriosis, sacrocolpopexy and lymphadenectomy.[2-7,10,11] Here we report our initial experience in robot-assisted management of urological injuries following gynecological surgeries, i.e., VVF repair and ureteric reimplantation for UVF and post-hysterectomy ureteric strictures, using the da Vinci robotic system.

Conventional open transabdominal repair of VVF requires a long lower abdominal incision, pain and delayed recovery. Ureteric reimplantation with open technique is cumbersome with difficulties in the mobilization of ureter from the pelvis and requiring large abdominal incisions and increased convalescence. Even laparoscopic repair is limited by difficult ergonomics in pelvic procedures, especially those with prior surgeries. Robot-assisted VVF repair is a perfectly suitable procedure, and various literature has shown positive results.[12,13] Robot-assisted VVF and UVF repair result in less postoperative pain due to remote center (RC) and early recovery, with results equivalent or better than conventional open or laparoscopic techniques, with the benefits of shorter hospitalization and quicker convalescence.[14] It also provides tremendous advantages to the surgeon in terms of enhanced precision, the range of motion, reduced fatigue, better suturing, visualization and access to the pelvis.

We also report early recovery and minimal postoperative complications, with the additional edge where extensive dissection and proper anatomy reestablishment is required.

CONCLUSION

Robot-assisted repair of complicated urological injuries following gynecological surgeries is feasible, safe, and can be used successfully with good outcomes. Robot-assisted techniques may reduce convalescence in a patient population with an operative complication, where quick recovery with minimum morbidity is paramount.



Figs 3A and B: (A) Dissection the fistulous tract between the bladder and vagina during robotic VVF repair; (B) Robotic ureteroneocystostomy during UVF repair

A prospective trial comparing the same to open and/or laparoscopic procedures would be warranted.

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