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Original Article

Surgery Section

Robot Assisted Laparoscopic Repair of Vesicovaginal Fistula: A Retrospective Study at a Tertiary Care Centre, Chennai, India

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ABSTRACT

Introduction: Vesicovaginal Fistula (VVF) is the most common acquired fistula of the urinary tract in women. Robotic surgery is recently introduced for VVF repair and has benefits over conventional methods.

Aim: To describe experience with robot-assisted laparoscopic repair of VVF in patients.

Materials and Methods: This was a retrospective observational study conducted from February 2014 to February 2018, at Department of Urology, Apollo Main Hospital, Chennai, Tamil Nadu, India. The study included 24 patients who underwent robot-assisted laparoscopic VVF repair. After cystoscopy ureteric catheter was passed through the fistula and retrieved through vagina. Bilateral ureteric catheters were placed simultaneously with vaginal packing. Da Vinci Si robot was docked with patient in trendelenburg position. After trocar placement transperitoneally the fistula was approached. Through vertical or transverse cystotomy, fistula was identified. With the circumferential incision around the fistula, both the bladder and vagina was separated and the fistulous tract was excised. Bladder was closed vertically and vaginal opening was closed transversely interposing the Omentum. Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) version 20.0.

Results: The mean age of participants was 40.33 years. Elective hysterectomy done for benign conditions (91.67%) was the major cause of VVF in patients followed by emergency hysterectomy (8.33%). All of the patients underwent adhesiolysis while two patients performed right ureteric re-implantation additionally. The median operative time was 127.50 minutes. The median duration of drain and hospital stay was three days each. Urethral Foley's catheter removal done at 2-3 weeks based on operating surgeon's preference and the mean duration of follow-up was 26 months.

Conclusion: Robot-assisted laparoscopic VVF repair is convenient and an effective approach in the successful management of VVF in complex fistulas and recurrent cases.

Keywords: Adhesiolysis, Catheter, Cystoscopy, Da Vinci Si robot, Oophorectomy

INTRODUCTION

The VVF is the most common acquired fistula of the urinary tract in women [1,2]. Most VVF are the outcomes of pelvic surgeries, where 90% occur after hysterectomy [3]. In developed nations, gynaecologic surgery is the most common cause of VVF, particularly as a complication of abdominal hysterectomy. It is estimated that VVF occurs after 1 in 1800 abdominal hysterectomies [4].

The utilisation of minimally invasive strategies is increased in an effort to decrease the morbidity related with open transabdominal VVF repair [5]. VVF that are seen in low-resourced countries occur as an effect of persistent obstructed labour because of the tissue ischaemia, as the bladder gets compressed between the pubic symphysis and the foetus. In well-resourced countries, it often occurs due to the iatrogenic injury, with over 60% subsequent to hysterectomy [6].

The conventional methods for VVF repair including transvaginal method for low lying fistulae and transabdominal repair for supra trigonal VVF [7]. The postoperative morbidities including the risk of abdominal trauma and bowel injury are related with the transabdominal approach for VVF repair. Though the postoperative morbidity associated with transvaginal approach is less than transabdominal approach, fistula closure is not always possible through transvaginal approach [5,7]. The minimally invasive approach in the form of laparoscopy was used to decrease this morbidity. However, it was observed that there is a steep learning curve for intracorporeal suturing and optimal vesico-vaginal dissection. These drawbacks of the conventional laparoscopy are overcome by the initiation of robotic surgery while maintaining the benefits of minimally invasive approach [5,8].

The benefits of robotic-assisted surgery above traditional laparoscopy include enhanced instrument dexterity, three-dimensional visualisation with improved depth perception and articulation [3]. Though the utility of robotic approach is growing and is being increasingly explored. There is limited data available from India [5,9]. Hence, the current study aimed to describe the experience with robot-assisted laparoscopic repair of VVF in patients operated in a tertiary hospital, India.

MATERIALS AND METHODS

This was a retrospective observational study conducted in the Department of Urology, Apollo Main Hospital, Chennai, Tamil Nadu, India, during February 2014 to February 2018.

Inclusion criteria: Patients who underwent robot-assisted laparoscopic VVF repair for supra trigonal fistulas were included in the study.

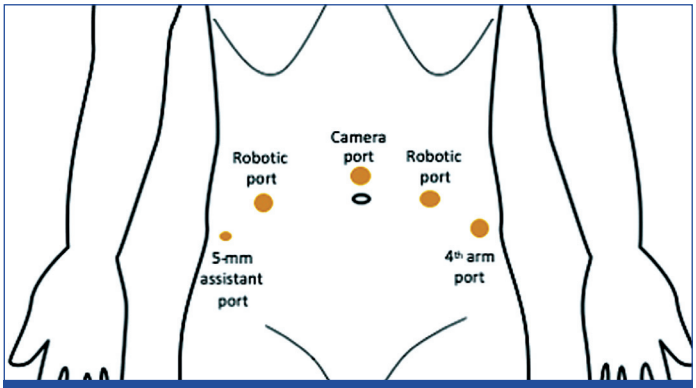
Exclusion criteria: All patients who underwent manual surgical repair were excluded from the study.

Total 24 patients who underwent robot-assisted VVF repair during the specified study duration were considered in this study. Detailed preoperative assessment included physical examination, medical history, routine laboratory work-up, upper tract imaging, and cysto-vaginoscopy. Operative data included operative time, fistula location, estimated blood loss, any concomitant procedures and complications. Postoperative data included blood loss, duration of abdominal drain, hospital stay, Foleys duration and follow-up period.

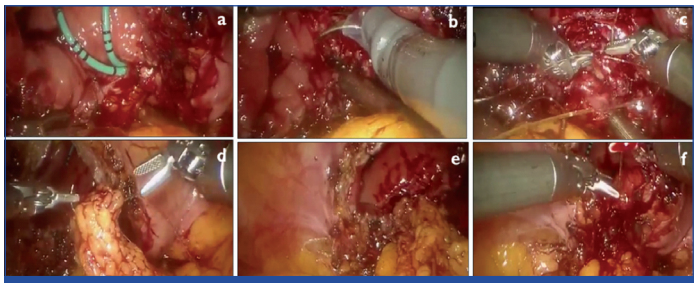
Surgical Technique

Patients were operated under general anaesthesia. In all the patients, cystoscopy was performed with 22 Fr cystoscope. Bilateral ureteric catheter of 5 Fr were then placed, another ureteric catheter

was passed through VVF. A 18 Fr Foleys catheter was introduced into the bladder and vaginal packing was done. After creation of pneumoperitoneum, ports were placed as shown in [Table/Fig-1]. Patients were then placed in the steep trendelenburg position and the Da Vinci Si robot was docked [10]. Initially, adhesiolysis was performed to provide adequate exposure of the operative field. The bladder was mobilised from the vagina using sharp dissection with minimal electrosurgery, allowing for a tension-free double-layered closure of the bladder. Removal of the cannulating catheter was done after the epithelialised edges of the fistula were resected. 1-0 Vicryl (Ethicon, Cincinnati, Ohio, USA) was used to close the vagina in a single layer and 2-0 stratafix (Ethicon, Cincinnati, Ohio, USA) was used for double-layer bladder closure. The integrity of the suture lines was then tested by back-filling the bladder >150 mL of sterile water. Omentum is used for interposition between bladder and vagina as it is our institutional practice [Table/Fig-2a-f].



[Table/Fig-1]: Ports position and placement.



[Table/Fig-2]: Steps involved robot-assisted vesicovaginal fistula repair. a) Fistula; b) Dissecting bladder wall; c) Closure of vagina; d) Omentum interposition; e) Interposed omentum; f) Closed posterior wall of bladder.

STATISTICAL ANALYSIS

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 20.0. Categorical variables were presented as number (percentage) and continuous variables were presented as mean (standard deviation) or median (range).

RESULTS

A total of 24 patients underwent robot-assisted VVF repair was enrolled in this study. The mean age of the patients was 40.33 years. Elective hysterectomy in 22 (91.67%) was the major cause of VVF in patients with benign conditions followed by emergency hysterectomy in 2 (8.33%). In majority of the patients recurrent VVF was observed as a result of open surgery in 4 (16.67%), followed by laparoscopic surgery in 1 (4.17%). The majority of the fistulae (70.83%) occurred as the result of Total Abdominal Hysterectomy (TAH) and Bilateral Salpingooophorectomy (BSO). All of the patients underwent adhesiolysis, in two patients (8.33%) additionally right ureteric re-implantation was needed as a concomitant surgery for associated uretero vaginal fistula. The omentum was used as an interposed material in all patients. The cure rate was 100.0% in all patients. The median operative time was 127.50 minutes. The mean blood loss was 43.54 mL. The median duration of drain and hospital stay was 3 days each. Urethral Foley's catheter removal was done at 2-3 weeks based on operating surgeons' preference and the duration of follow-up was 26 months [Table/Fig-3].

Parameters	N, %
Age (years), mean (SD)	40.33±5.73
Elective hysterectomy	22 (91.67)
Emergency hysterectomy	2 (8.33)
Prior VVF repair	
Open	4 (16.67)
Laparoscopic	1 (4.17)
Previous abdominal surgeries	
LSCS	8 (33.33)
Tubectomy	3 (12.50)
LSCS, Appenectomy	2 (8.33)
LSCS, Laproscopic cholecystectomy	1 (4.17)
Tubectomy, LSCS	1 (4.17)
Additional procedure	
Adhesiolysis	22 (91.67)
Adhesiolysis, right ureteric re-implantation	2 (8.33)
Interperitoneal flap	
Omentum	24 (100.0)
Postoperative data	
Cure rate (%)	24 (100.0)
Operative time (minutes)	127.50 (100.0-270.0)
Blood loss (mL), mean	43.54
Duration of drain (days)	3 (2-4)
Hospital stay (days)	3 (2-4)
Foleys duration (days)	21 (14-21)
Follow-up (months)	26 (5-52)

Data shown as median (range), unless otherwise specified.
LCSC, lower segment caesarean section.

[Table/Fig-3]: Patients baseline and demographic characteristics.
LSCS: Lower segment caesarean section

DISCUSSION

The laparoscopic surgery is broadly accepted surgery and largely benefits the patient. Reports show a comparable efficacy between open and robot-assisted repair of recurrent VVF, but the robot-assisted procedure has the advantages of significantly lower blood loss and postoperative hospital stay [9]. The acceptance of laparoscopic VVF repair is hindered by the limitations of laparoscopic instruments. On the other hand, the robotic-assisted approach comprises of additional benefits of improved precision and enhanced three-dimensional visualisation [7]. In the present study, 22 patients developed VVF as a result of previous elective hysterectomies for benign conditions, two patients underwent emergency hysterectomy for bleeding while lower segment caesarean section and five were recurrent VVFs (4-open, 1-laparaoscopic).The outcomes of this study and in previously published studies are compared and summarised in [Table/Fig-4] [4,5,9,11-15].

The majority of the fistulae (70.83%) occurred as the result of TAH and BSO and all of the patients required adhesiolysis while omentum was used in all the patients similar to previous demonstrations [14,15].

The present investigation also included recurrent case who had undergone prior VVF repair using open and laparoscopic approach. Agarwal V et al., and Bohra G et al., reported that 90% of the fistulae occurred as a result of a hysterectomy [4,5]. The present study also shows similar aetiology of fistula. However, contradictory to these reports, previous study reported that in developing countries obstructive complications were the most common cause of VVF [16]. Bora GS et al., reported nine recurrent VVFs and the present study had five recurrent VVFs [5]. Also, only eight patients required adhesiolysis in the study by Bora GS et al., while in the present study all of the patients (n=24) required this procedure.

Authors	Year	Place of study	Number of patients	Age (years)	Operative time (min)	Flap for interposition	Blood loss (mL)	Hospital stay (days)	Foleys duration (days)	Postoperative complications	Cure rate (%)	Follow-up (months)
Sundaram BM et al., [14]	2006	Malaysia	5	Range 26-38	233	Omentum	70	5	10	None	5 (100)	6
Gupta NP et al., [9]	2010	India	12	Median 27 (range 16-46)	140	Omentum, Colonic epiploica Peritoneal inlay	88	3	Range 14-21	None	12 (100)	NR
Rogers AE et al., [15]	2012	United States of America	2	Range 42-51	NR	Omentum	NR	2	Range 10-14	None	2 (100)	12
Pietersma CS et al.. [11]	2014	Netherland	1	50	104	Epiploic of sigmoid	50	3	10	None	1 (100)	6
Agarwal V et al., [4]	2015	New York, United States of America	10	Median 45 (range 32-61)	210	Peritoneal inlay Colonic epiploica Bladder adventitia	69	2	13	2 patients	10 (100)	23.6
Bora GS et al., [5]	2017	India	30	Mean 43.5±8.6	133	Sigmoid epiploicae Omentum Peritoneal	50	7.5	NR	None	28 (93.3)	38 (46)
Antonelli A et al., [12]	2021	Italy	6	NR	160	Omental, pericolic fat interposition	25	NR	13	None	NR	NR
Kidd LC et al., [13]	2021	United States of America	22	NR	187	NR	50	1	NR	2 patients	20 (91)	28.9
Present study	2022	India	24	Median 40 (range 37-42)	142	Omentum	43.5	3	14	None	24 (100)	26

[Table/Fig-4]: Comparison with other studies [4,5,9,11-15].
NR: Nothing relevant

Promising outcomes from robotic-assisted approaches to VVF repair have been described. A study by Sundaram BM et al., described a series of patients who underwent complete robot-assisted repair by understanding the potential benefits of this new technology, its feasibility, and possibly lower morbidity [14]. Literature describes the supratrigonal fistula repair; however, there are few discrepancies regarding infratrigonal repairs using robot-assisted technique. Several interposition flaps have been reported in the studies, such as omental flap, amniotic allograft interposition tissue, and peritoneal flaps. There are two principles associated with interposition flap [1]. It functions as a barrier [17] and enables tissue growth and maturation by entering into the vascular lymphatic vessels. Several previous literatures describe omentum as the frequently used flap [14,15]. The cure rate of patients in this study was 100% which is observed in previous reports [3,18]. Literature reported several factors that may affect the success of fistula, such as fibrosis, fistula size, the surgeon's experience, health status of patient, radiation exposure, and previous surgical attempts [19-22]. The technical steps of the surgery are also more important for successful VVF repair. A study reported that it is necessary to place an interposition graft to achieve highest possible cure rate [23].

The present study reported median operative time as 127.50 minutes. Other investigations report operative time ranging between 104 to 330 minutes; duration of hospital stay ranging from 2-7 days [8,14,24-27]. This heterogeneity depends on varying experience of surgeons and unpredictability in timing as few doctors record the console time [24]. The reported blood loss in a study varies between insignificant and 120 mL [17]. The mean follow-up period is also variable between 6-26 months after surgery which is comparable to this study. None of the patients had early intraoperative and significant postoperative complication. This is the most important advantage of minimally invasive surgery over open surgery [5,9].

Several studies were presented on robotic VVF repair using different techniques, such as placing JJ stent, so as to protect the ureters during surgery. Some described employing Foley catheter, ureteric catheter or a Fogarty catheter to occlude the opening [11,18,26]. The present study used Foley catheter with a median duration of 21 days. Bora GS et al., used ureteric catheter while Kurz M et al., reported the use of Foley catheter [5,26]. The fibrin sealant for repair has also been described by certain studies [13,28]. The observations from the present study are consistent with previous studies in terms of age of patients, interposition flap, operative time, postoperative complications and cure rate [Table/Fig-4] [4,5,9,11-15,26]. However, this study showed less blood loss during the procedure. In conclusion, the surgical approach, such as vaginal or abdominal, laparoscopic, or with robotic assistance, is often preferred based on the complexity, location, and surgeon's preference [29].

Limitation(s)

This clinical data from India provides actual clinical experience in patients undergoing VVF repair with robotic approach that will add value to the available data and may be helpful in seeking clinical insights about this methodology. The present study is primarily limited by its retrospective nature from a single centre and a small sample population. Moreover, data related to patient-reported outcomes of dyspareunia, sexual dysfunction, and bother scores were not noted.

CONCLUSION(S)

In conclusion, the robot-assisted laparoscopic VVF repair has favourable clinical outcomes offering a complete cure with minimal blood loss and it is a rapid process. This approach has demonstrated lower morbidity, shorter hospital stays, and a quicker recovery. Thus, it is convenient and an effective approach in the successful management of VVF in complex fistulas and in recurrent cases. Further, randomised clinical studies with a larger sample size undergoing VVF repair using robot-assisted laparoscopic methodology are warranted to provide robust data.

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