CASE REPORT

Robotic-assisted laparoscopic repair of a vesicovaginal fistula: a time-consuming novelty or an effective tool?

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SUMMARY

Vesicovaginal fistulas are a rare complication of hysterectomy. When conservative therapy fails, vaginal or abdominal repair is necessary. A robotic-assisted laparoscopic approach can be a useful tool to repair complex fistulas. A 50-year-old woman with a vesicovaginal fistula located at the top of the vagina, was treated with robotic-assisted laparoscopic repair. The fistula tissue was removed from the vaginal wall and bladder, and epiploic of the sigmoid was interposed in between. The total operation time was 104 min. The hospital stay was 3 days; no complications occurred. Cystography 6 weeks and 6 months postoperative confirmed a successful repair. A review of current literature is presented regarding the application of robotic assistance during this procedure. The presented case shows that robotic-assisted laparoscopic repair of a vesicovaginal fistula seems to be a feasible technique with promising results.

BACKGROUND

Vesicovaginal fistula is a rare but severe complication of hysterectomy. In developed countries, the prevalence of fistulas is 0.9–2.6% per hysterectomy, accounting for 85% of all cases.¹ This percentage is dependent on the type of surgery (vaginal, abdominal or laparoscopic) and/or the indication for hysterectomy (benign or malignant).¹ Fistulas can occur intraoperative when the bladder is damaged or when sutures are placed through the bladder. This causes necrosis and tissue loss, and eventually the formation of a fistula follows. Other known risk factors are postoperative infections, radiation of the pelvis, diabetes mellitus and smoking.¹ In developing countries, with less extensive medical care, the most common cause for a fistula is pressure necrosis of the pelvic tissue due to compression by the fetal head in obstructed labour.

At first, patients are usually offered conservative therapy, that is, a urethral catheter. When conservative treatment fails, surgical repair remains the only option. Most commonly a vaginal approach of the fistula is offered. However, when the tract of the fistula cannot be visualised an abdominal approach must be considered. Recently, minimal invasive procedures have been described. Laparoscopic approach offers the advantage of a magnified operative field, and is known to cause less abdominal pain resulting in shorter hospital stay and a quicker recovery with earlier return to work.^{2–3} Robotic-assisted surgery aids more precise dissection and easier intracorporeal suturing.⁴

We report on robot-assisted laparoscopic repair of a vesicovaginal fistula and present a brief review of literature on this new robot-assisted technique.

CASE PRESENTATION

A 50-year-old woman was referred to our urogynaecology unit under suspicion of a vesicovaginal fistula. Seven months ago, the patient had undergone an abdominal hysterectomy in another hospital for chronic menorrhagia. The procedure was described as uneventful. However, she developed involuntary loss of urine immediately postoperative. The leakage was throughout the day with no discrepancy when moving or lying down. The patient came this late because she thought the problem might resolve spontaneously and was ashamed to visit a physician about this. Speculum examination identified a midline fistula of 0.5 cm at the top of the vagina. Urine loss could be provoked by the Valsalva-maneuvre. Cystoscopy confirmed a vesicovaginal fistula at the transition of the trigonum; the fistula did not appear to impair either urethral orifices. Several surgical options and the operative risks were discussed with the patient. Together it was decided to perform a robotic-assisted laparoscopic repair of the fistula. The localisation of the fistula at the top of the vagina and bladder made it impossible to be accessed with an open procedure.

TREATMENT

A robot-assisted laparoscopic repair of the vesicovaginal fistula was performed under general anaesthesia. The da Vinci Si Surgical System (Intuitive Surgical, Sunnyvale, California, USA) was used for this procedure. The patient was placed in a dorsal lithotomy position and the bladder was filled with methylene blue. By speculum examination the fistula was clearly identified at the vaginal apex and a small catheter was inserted through the fistula tract into the bladder. Catheter placement makes intra-abdominal identification easier. With a secured fistula tract, the pneumoperitoneum was created and the patient was placed in trendelenburg position. Under laparoscopic view the other ports were introduced. The robot was docked sideways, on the left side of the patient. Some adhesions, probably formed due to the hysterectomy, were removed. The top of the vagina was exposed up to where the fistula tract was identified. With a 1.5 cm margin, the bladder was separated from the fistula tract. Using sharp dissection, the vaginal wall was opened; the fistula was excised and removed. The

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incision in the bladder was made following the catheter through the tract, exposing the fistula in the bladder. The catheter was removed and the vaginal wall was closed with a knotted 2 vicryl suture. Followed by excision of the fistula from the bladder. The bladder mucosa was repaired in a double layer with a running stitch of 4 vicryl on an renal bypass needle for the mucosa and 3 vicryl for the muscle layer. Bladder integrity was tested by filling the bladder up to 120 mL. Both fistula repair sites were separated by a fatty epiploic of the sigmoid. Three 4 vicryl stitches were placed to secure the fatty epiploic after which an abdominal drain was placed through the assistant port.

The robot was undocked; the patient was placed in a supine position and the port sites were closed. There was no notable blood loss; the total console time was 75 min and the total operation time was 104 min. A transurethral catheter was left in place with oral prophylactic antibiotic treatment until the catheter was removed. There were no intraoperative or postoperative complications.

OUTCOME AND FOLLOW-UP

The patient was discharged in good condition from the hospital after 3 days. A cystography performed 10 days postoperative confirmed a successful repair, and the transurethral catheter was removed. Follow-up at 3 and 6 months postoperative showed no complications or recurrence.

DISCUSSION

Since the introduction of robotic-assisted laparoscopic surgery in gynaecology in 2004, its application in urogynaecological procedures continues to grow.⁵ Robotic-assisted repair promises to be a valuable asset for vesicovaginal fistulas not amenable to a vaginal approach. The first robotic-assisted laparoscopic repair of a vesicovaginal fistula was reported in 2005.⁶ Since then a total of 30 patients in seven case reports have been described (table 1).^{7–12} The largest study compared robotic-assisted laparoscopic reconstruction with the ‘open’ abdominal procedure. In this retrospective study robotic repair significantly lowered total blood loss and shortened hospital stay by almost 2 days. In accordance with another study, no significant difference in the outcome was found.¹⁰ However, robotic surgery easily overcomes the problem of fibrosis and extensive adhesiolysis with recurrent fistulas and as such may be a better option than abdominal surgery.^{10 12}

Small differences in technique appear to exist among authors; some used a conventional laparoscopic approach to explore the fistula tract. They docked the robot only for suturing of the bladder and vaginal wall.^{6 9} All other studies performed the entire procedure with robotic assistance.^{7 8 10–12} Also, the origin of the interposed tissue was different between cases: omentum was most commonly used to separate the sutures closing the fistula.^{7 9 10} One applied a peritoneal inlay flap in order to prevent the time-consuming harvesting of the omentum.⁸ Others placed a patch of fibrin glue in between instead of using tissue.⁶ In the present study, we used a fatty epiploic of the sigmoid because this requires only minimal manipulation of the mesenterium while mobilisation of the omentum can be difficult with the patient in steep trendelenburg position. The use of interposed tissue (omentum or epiploic of the sigmoid) does not seem to have a higher risk of complications.

The operation time varied among cases; not all authors clarified reported operation time. Some authors describe total console time whereas others describe total OR time (including anaesthesia and docking).^{6–12} It is suggested that increased

Table 1 Overview of literature robotic-assisted laparoscopic vesicovaginal fistula repair

Author	Patients n=31	Fistula aetiology	Primary or recurrent fistula	Interval repair (months)	Fistula size (cm)	Total robot time or total op time (min)	Interposed tissue	Total blood loss (mL)	Hospital stay (days)	Postop catheterisation (days)	Success rate	Follow-up (months)	Complications
Gupta <i>et al</i> ¹⁰	12	Hysterectomy or obstetric	Recurrent	6 (3–14)	2.8 (1.5–6)	140* (110–180)	Omentum, peritoneal flap, epiploic appendices of sigmoid	88 (50–200)	3.1 (2–5)	14–21	12/12	NS	None
Hemal <i>et al</i> ¹²	7	Hysterectomy n=3 Obstetric n=4	Recurrent	5–8 4–12	2–3.5 2.5–4	120–140* 135–160† 95–135* 110–155†	Omentum	50–150 50–120	3–4 2–3	14	7/7	3–12	None
Kurz <i>et al</i> ⁸	3	Hysterectomy	Primary	NS	NS	NS	Peritoneal flap	NS	5	14	3/3	1–10	None
Melamed <i>et al</i> ⁶	1	Hysterectomy	Primary	NS	NS	280†	Fibrin glue	50	2	14	1/1	4	None
Schimpf <i>et al</i> ¹¹	1	Hysterectomy	Primary	3	1	150* 270†	Epiploic of sigmoid	NS	1	NS	1/1	3	None
Sears <i>et al</i> ⁹	1	Hysterectomy	Primary	6	0.5	NS	Omentum	NS	NS	NS	1/1	NS	None
Sundaram <i>et al</i> ⁷	5	Hysterectomy n=4 Myomectomy n=1	Primary	3	NS	233† (150–330)	Omentum	70	5 (4–7)	10	5/5	6	None
Present case	1	Hysterectomy	Primary	9	0.5	104	Epiploic of sigmoid	50	3	10	1/1	6	None

* robot time.
† total theatre time.
NS, not specified; Op, operation.

experience of the surgeon and the rest of the team in robotic-assisted surgery may shorten total operation time.¹¹

There is no consensus on the optimal interval between the onset of symptoms and the repair of a fistula. In iatrogenic vesicovaginal fistulas, detected early after operation, it is hypothesised that repair should be immediate; however, there are no data to support this.¹³ In case of delayed fistulas, it is theorised to wait 3 months for the granulation tissue and oedema to be absorbed and allow for spontaneous recovery.¹⁴ The size of the fistula does not seem to affect the outcome.

There is inconsistency in the duration of follow-up. Available literature reports a duration of 1–12 months.^{8 12} It is assumed that recurrence of a fistula is quick, thus a long follow-up is not necessary; a 3-month period is sufficient.

Most studies report a catheterisation of 14 days following surgery. In our case the catheter was removed after 10 days when cystography confirmed successful fistula repair. An optimal time to remove the catheter remains unclear.

Laparoscopic robotic-assisted repair has some advantages over the conventional laparoscopic repair. First, a three dimensional view improves the visualisation of the fistula tract. Second, endowrist instruments allow easy and accurate application of the tension-free sutures.⁴ Furthermore, the surgery takes place in an ergonomically designed console and offers a superior working

position. Finally, robotic-assisted surgery has a more favourable learning curve.¹⁵ A possible disadvantage of robotic-assisted procedures is the high costs involved with the robot.^{4 5} This makes robotic surgery only cost effective in high-volume centres, or when the robot is shared by various surgical specialties.

In conclusion, robotic-assisted laparoscopic repair of a vesicovaginal fistula is a promising technique. This novelty does not seem too time consuming. In our opinion this is a good additional tool to perform this type of technically difficult surgery.

Contributors CSP wrote the manuscript, AK and SESK operated the patient, and HWRS, AK and SESK revised the manuscript.

Competing interests None.

Patient consent Obtained.

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Learning points

- Vesicovaginal fistulas are a rare and severe complication of hysterectomy. Granulation and fibrosis can cause extensive adhesive lesions.
- Robotic-assisted laparoscopic repair of complex vesicovaginal fistulas can be a useful additional tool. It seems to be a safe and promising option for this technically difficult procedure.
- It is suggested to either perform surgery for vesicovaginal fistulas as soon as possible or wait for the granulation and oedema to diminish.
- Compared with the conventional laparoscopic operation, robotic-assisted surgery has advantages such as three-dimensional visualisation, easy intracorporeal suturing and improved ergonomics. A disadvantage is the high costs involved.

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