SURGICAL TECHNIQUE

Laparoscopic repair of vesico-vaginal fistula without intentional cystotomy and guided by vaginal transillumination

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Abstract

Objectives: Repair of vesico-vaginal fistula (VVF) by laparoscopy provides excellent exposure, which facilitates its implementation through small cystotomy. In some cases it is difficult to locate the fistula without prior opening of the bladder. We present a maneuver using vaginal transillumination to locate the fistula and to reduce the size of the bladder opening during laparoscopic repair without intentional cystotomy.

Material and methods: A total of 4 patients with supra-trigonal FVV produced post-hysterectomy received laparoscopic repair. All patients underwent physical examination, dye test, urethrocystoscopy and intravenous pyelography. Fistula was located using a cystoscope inserted through the vagina and placed over the fistula. The emitted light guides laparoscopic dissection into the plane between the vagina and the bladder just above the fistula, without previous intentional cystotomy.

Results: The mean age of patients was 42 (38–47) years. The bladder opening size did not reach 2 cm. The mean operative time was 160 (120–186) min and catheterization time was 10 days. There were no recurrences.

Conclusions: The laparoscopic repair of VVF without intentional cystotomy, by direct dissection of the fistulous tract guided by vaginal transillumination is effective, because it quickly locates the fistula in all cases, reduces the size of the bladder opening, shortens operative times and reduces irritative symptoms.

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PALABRAS CLAVE

Reparación laparoscópica de fistula vésico-vaginal sin cistotomía intencional y guiada por transiluminación vaginal

Resumen

Objetivos: La reparación de una fistula vésico-vaginal (FVV) por vía laparoscópica permite una excelente exposición, lo que facilita su ejecución a través de una cistotomía pequeña. En algunos casos la localización de la fistula sin apertura vesical previa resulta difícil. Se presenta
Introduction

The treatment of vesico-vaginal fistula (VVF) is surgical in most cases, and it can be performed through a vaginal or abdominal approach. The choice of the repair technique is controversial, and it is subject to various factors that depend on the characteristics of the patient and the fistula itself (size, location), but they are mainly due to the surgeon’s preference. 1-3 Most of the VVFs are treated through the vagina because of their low morbidity; however, the abdominal pathway is indicated in patients with supratrigonal fistulas. O’Connor’s technique is considered the gold standard for the abdominal treatment of the VVF. This surgery entails a bivalve bladder opening to clearly show the orifice of the fistula. 4

The laparoscopic repair of the VVFs has been described extensively with good results, 5-22 using techniques that reproduce the surgical steps of abdominal surgery, including also the bivalve opening of the bladder. 5-6 The use of laparoscopy has made it possible to repair the VVF through much smaller cystotomies, 5-6 and even without intentionally opening the bladder. 7,15-21 However, in some cases, the location of the fistula without bladder opening can be difficult, like when there are multiple adhesions or presence of marked inflammation of the tissues. This extends the surgical time 7,8 and may even require making a vertical cystotomy of a certain size.

The ‘cut the light’ technique has been used successfully in several urological surgeries that combine laparoscopic and endoscopic approaches simultaneously, in which the light of the endoscope seen by transillumination outside the organ serves as a guide to locate a precise area which must be cut. For example, for removal of calculi in obstructed calyces, an endoscope is introduced into the renal pelvis pointing to the calculus and the emitted light is used as a guide for performing nephrostomy laparoscopically on the illuminated renal cortical area. 23

For laparoscopic repair of the VVFs, a maneuver was designed for fast localization of the fistula by applying this principle of ‘cutting the light’, and which also ensures that the bladder opening is small, in a technique called laparoscopic repair of VVF without intentional cystotomy guided by transillumination vaginally. The aim of this paper is to describe this technique and show its potential effectiveness in a series of patients with VVF that were repaired laparoscopically.

Material and methods

4 patients with supra-trigonal VVFs produced after hysterectomy by myomatosis and with indication for transabdominal repair were included. Informed consent was obtained in all cases. All the patients received conservative treatment with prolonged bladder catheterization for more than two months, without obtaining clinical improvement. We performed a thorough clinical evaluation of the patients for an accurate diagnosis and appropriate selection of cases. Abdominal, pelvic, and gynecological examination was included. Intravesical instillation of methylene blue was performed to locate the fistula when checking the presence of dye in the vagina by means of the Moir test, or of the three intravaginal tampons placed at different depths to identify the location of the fistula. 24 Urethrocystoscopy was also performed to show fistula at an intravesical level and check the proximity to the ureteral meatuses. Finally, the study was completed with intravenous pyelography to rule out ureteral involvement in the fistulous process. All patients underwent laparoscopic repair of the VVF as a first attempt of surgical treatment.

Surgical technique

The patients were operated under general anesthesia, placed in lithotomy position with Trendelenburg. We used two monitors simultaneously, one for the endoscopic approach and one for the laparoscopic part. The surgical team was arranged as follows: the chief surgeon to the left of the patient, the first assistant contralateral to the former, and a second assistant was sitting between the legs.
of the patient to perform the cystoscopy time. The ureters were catheterized, as well as the fistulous tract to aid in their identification. Transperitoneal approach was performed with 4 trocars distributed as follows: a 10-mm port at the navel to insert the optic, and three 5-mm working ports, two for the surgeon, pararectal and some centimeters below the navel, and one near the anterior superior right iliac spine to insert the suction cannula (Fig. 1).

The 30° optic was used in all the cases. It begins with the release of adhesions to achieve adequate exposure of the posterior aspect of the bladder. The second assistant performs a vaginoscopy using the rigid cystoscope up to placing the tip thereof over the hole evident of fistula in the vaginal mucosa, and the light of the laparoscope is turned off simultaneously (Fig. 2A). In these circumstances, the focus of the cystoscope light becomes evident to laparoscopic view by transillumination, and it enables to quickly and accurately locate the area of the fistula at the extravesical level (Fig. 2B).

The light area is marked with the monopolar electrocautery, the lighting in the laparoscope is retrieved, and a sharp dissection is started at the point marked, in the plane between the vagina and bladder, just above the fistula, up to opening the vagina and visualizing the catheter occupying the fistulous tract, with which a minimal vaginal and vesical opening is achieved (Fig. 3A–C).

The catheter which runs through the fistulous tract is withdrawn. By means of sharp and blunt dissection, a separation plane is developed between the anterior vaginal wall and the posterior wall of the bladder, on the tissues surrounding the area of the fistula (Fig. 4A and B). The edges of the fistula were not resected in order not to increase its size, as they were not devitalized or inflamed.

The opening of the vagina is closed by means of a suture line in transverse direction and continuously using 2.0 polyglactin. Then, a vascularized omental flap is made using the ultrasonic scalpel, which is placed in the plane of dissection between the bladder and the vagina, and it is secured with two attachment points (Fig. 5A and B). Finally, the opening of the bladder is closed by a suture line in the longitudinal direction and continuously using 0 polyglactin (Fig. 6). A Foley catheter 20 Fr is inserted and the tightness of the bladder suture is checked with the instillation of 250 ml of saline. The procedure is completed by placing a Jackson-Pratt drain.

Results

The mean age of the patients was 42 years (range: 38–47). All of them had a single supra-trigonal VVF produced after

Figure 1 Placement of the trocars.

Figure 2 Vaginal transillumination. A. The tip of the rigid cystoscope is placed, inserted through the vagina, on the fistulous hole, and the light of the laparoscope is turned off simultaneously. B. The focus of the cystoscope light becomes evident to laparoscopic vision by transillumination and it makes it possible to quickly locate the fistula.
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Figure 3  Sharp dissection in the plane between the vagina and the bladder on the fistula. A. Dissection up to opening the vagina and visualizing the catheter occupying the fistulous tract. B. Photograph of the vaginal and bladder opening on the fistula with exposure of the catheter. C. The bladder opening is the diameter of the fistula and it does not reach 2 cm.

Discussion

Surgical repair of the VVF has a high success rate, regardless of the technique used,\textsuperscript{1,2,3} provided the basic principles of effectiveness are maintained in the management of fistulas, among which are included: (a) careful evaluation of the characteristics of the fistula; (b) adequate exposure during hysterectomy. In all the cases, the approximate size of the bladder opening did not reach 2 cm. The mean operative time was 160 min (range: 120–186); the mean intraoperative bleeding was inestimable. There was no conversion to open surgery or perioperative complications. The residence time of the probe was 10 days. No anticholinergics were administered in any of the patients. All the patients are without leaks.

Figure 4  Sharp and blunt dissection to develop a separation plane between the anterior vaginal wall and the posterior bladder wall surrounding the area of the fistula. A. Image of the development of the plane of separation. B. Photograph of the same motif.
the intervention; (c) watertight bladder closure without tension; (d) suture on healthy tissues with good blood supply and without the presence of infection; (e) carrying out the bladder and vaginal closure in different directions; (f) interposition of well-vascularized tissue, especially in complex cases; and (g) maintaining adequate drainage.\textsuperscript{1,3,24}

Publications on laparoscopic repair of VVFs have resulted comparable to those obtained with open surgery, because these same principles were applied in all of them.\textsuperscript{5-22}

There is no consensus on the type of surgical repair of VVFs or about the right time for surgery. The vaginal approach is the best option due to its low morbidity by avoiding a laparotomy and a cystotomy, it has a brief hospital stay, shorter recovery, and with less pain;\textsuperscript{24} however, it is not applicable in all cases.\textsuperscript{1} It is well established that the abdominal approach is the route of choice for the treatment of large supravaginal fistulas (>2 cm), with location near the meatuses, in complex fistulas, patients with narrow vagina, and with other associated pathologies.\textsuperscript{24} In our series, 4 patients with supravaginal fistula were selected to apply the laparoscopic technique. Laparoscopic repair combines the low morbidity of the treatment vaginally and the maximum success rate of the abdominal pathway.\textsuperscript{9}

Delaying surgical treatment of the VVF was previously recommended to improve the tissue conditions expecting to reduce inflammation; however, that waiting time can be devastating to the quality of life of the patients. The fact that, at present, the etiology of the VVFs is different from that which existed in previous decades, where obstetric fistulas prevailed, raised an early surgical treatment.\textsuperscript{25} Blaivas et al.\textsuperscript{1} showed that early repair of the VVF offers the same effectiveness as delayed surgery, with the benefit of shortening the times of discomfort for the patients. Late repair is recommended in patients with VVF produced after radiotherapy or due to obstetric trauma, where the inflammatory process is more intense, and early repair can be performed in patients with VVF produced after hysterectomy, because there is no important inflammation of the tissues.\textsuperscript{16} Despite these considerations, late surgery was performed in all the cases in this series.

The ‘bivalve’ bladder opening described in the repair of the VVF through the abdomen with open technique has the disadvantages of causing irritative symptoms, prolonging the operating time, and increasing bleeding.\textsuperscript{14} Since the first description of a laparoscopic repair performed by Nezhat et al.,\textsuperscript{22} most authors report that with laparoscopy it is possible to achieve good illumination, magnification of vision, excellent exposure, direct and quick access to the fistula, and even a more delicate dissection.\textsuperscript{5,7,8,10,11,13-15} Thanks to this, laparoscopy has enabled to repair the VVF through much smaller bladder incisions.\textsuperscript{9-14} This is shown by the trend of laparoscopic publications to perform the so-called ‘limited cystotomies’\textsuperscript{16-13} or the technique of ‘mini-O’Connor’.\textsuperscript{14} The first report on VVF repair with robotic assistance was carried out by Melamud et al.,\textsuperscript{26} and it also conforms to the same conduct.

Additionally, laparoscopy has allowed some authors to repair the VVF without making an intentional cystotomy for its location, by using a technique that focuses on dissecting directly on the fistulous tract, in the plane between the vagina and bladder, up to opening the fistula itself. Von Theobald et al.\textsuperscript{26} and Miklos et al.\textsuperscript{19} were the first to describe this variant of repair ‘without intentional cystotomy’ which has been effectively applied by several authors,\textsuperscript{7,15-21} even
using robotic assistance. Recently, Abdel-Karim et al. have described the first VF repair by single-port laparoscopic surgery, and they also applied the technique without intentional cystotomy with direct dissection on the fistula. There are no articles comparing the results obtained with the technique of limited cystotomy vs. the technique without intentional cystotomy. Our experience with the latter was successful.

However, in some cases, it may be difficult to locate the fistula without making a prior cystotomy, which can prolong the operating time, as some authors refer. This limitation was the motivation to develop the technique we describe. Sotelo et al. presented the laparoscopic repair of VFVs using the cystoscope light as a guide to perform a limited cystotomy, introducing it into the bladder and pointing it towards the fistula, in order to make the incision at the closest site to the fistulous tract. This maneuver is effective to try to reduce the size of the cystotomy, but it requires an extension of the incision to reach the fistulous tract.

Our maneuver also uses the cystoscope light as a guide, but it probably reduces even more the size of the bladder opening for three reasons: first because it is cut directly on the fistula without performing intentional cystotomy; secondly because the light guide is inserted vaginally to ensure that the incision is mainly in the vagina and, finally, because it makes it possible for the opening of the bladder to be only the size of the fistula, also allowing to quickly locate the fistula in all cases. The limitations of our experience are due to the small number of patients, to the fact that all were unique fistulas and no case was after radiotherapy, and that it is not compared with another group of operated patients who undergo cystotomy.

Some other maneuvers have been described to facilitate the location of the fistula. Schimpf et al. reported a case of robotic repair where the fistula was identified by applying gentle traction on the ureteral catheter that runs through the fistulous tract. Hemal et al. presented a series of robotic repair where the fistula was identified with a similar maneuver by applying gentle traction on the Foley catheter.

It is logical to think that reducing the size of the bladder opening for VF repair may offer some benefits. The suturing time decreases, so it shortens the surgical time, reduces the risks of suture dehiscence, shortens bladder catheterization time, minimizes postoperative irritative symptoms, and eliminates the management requirements of anticholinergics to control these symptoms.

In summary, laparoscopic repair of the VF without intentional cystotomy with direct dissection on the fistulous tract, guided by vaginal transillumination, is effective because it quickly locates the fistula in all cases, reduces the size of the bladder opening, shortens operative times, decreases irritative symptoms, and minimizes the risk of dehiscence and leak. It takes more series and a much greater number of patients to evaluate the real effectiveness of the procedure.

**Conflict of interest**

The authors declare that they have no conflict of interest.

**Appendix A. Supplementary data**

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.acuroe.2012.07.007.

**References**