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ORIGINAL PAPER

Laparoscopically assisted microsurgical vasovasostomy for obstructive azoospermia following bilateral inguinal hernia repair: A case series

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Summary *Background: Obstructive azoospermia (OA) is a significant cause of male infertility, with iatrogenic vas deferens injury after bilateral inguinal hernia repair representing a rare etiology. Outcomes of microsurgical vasovasostomy (VV) in this setting remain poorly defined.*
Methods: We conducted a retrospective case series of five patients with OA following bilateral inguinal hernia repair who underwent attempted laparoscopically assisted microsurgical VV. Inclusion criteria were azoospermia confirmed on at least two semen analyses, normal serum FSH and testosterone, preserved testicular volume, and female partners without major reproductive comorbidities. Demographic data, operative details, postoperative semen parameters, patency, and reproductive outcomes (spontaneous conception and assisted reproductive techniques – ART) were descriptively analyzed. Patency was defined as the presence of sperm in the ejaculate.
Results: Median patient age was 39 years (range 35-41), and median partner age was 35 years (range 30-40). Obstruction intervals ranged from 4 to 12 years. Four patients underwent laparoscopic dissection and bilateral VV (three two-layer, one one-layer), while one could not undergo anastomosis due to technical constraints. Operative times ranged from 150 to 420 minutes. One patient reported transient scrotal pain not requiring analgesia. Postoperative patency was achieved in three of the four anastomosed patients (75%), with sperm concentrations ranging from 3.0 ×10^6/mL to 41 ×10^6/mL. Four pregnancies were obtained: three through assisted reproductive techniques (ART) and one spontaneous. Among the ART cases, two required surgically retrieved sperm (patients without patency), whereas one used ejaculated sperm following VV. Importantly, a spontaneous pregnancy occurred in the patient with the highest postoperative sperm concentration (41 ×10^6/mL) after a one-layer anastomosis.
Conclusions: In this small case series, laparoscopically assisted VV proved technically feasible and allowed restoration of vasal patency in selected patients with OA after bilateral hernia repair. Beyond the potential for natural conception, this approach may facilitate the use of ejaculated sperm for ART, avoiding surgical sperm retrieval in selected cases. These findings reinforce the dual role of VV: restoring natural fertility in some patients and providing ejaculated sperm for ART in others.

KEY WORDS: *Azoospermia; Vasovasostomy; Hernia inguinal; Laparoscopy; Infertility, Male.*

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INTRODUCTION

Obstructive azoospermia (OA) accounts for approximately 40% of male infertility cases, with vasectomy being the most common cause (1, 2). The reported incidence of vas deferens injury during open herniorrhaphy is low, ranging between 0.1% and 0.53% (3). However, in series of men evaluated for OA, iatrogenic injury accounts for up to 7-19% of cases, with a significant proportion directly attributed to bilateral hernia repair (4, 5). Prosthetic mesh implantation has been suggested as a potential factor further increasing the risk of vasal obstruction (6).
Microsurgical *vasovasostomy* (VV) is the preferred technique to restore vasal patency in obstructive azoospermia; however, outcomes following iatrogenic injury after inguinal hernia repair are generally inferior to those observed after vasectomy reversal. This difference is attributed to longer damaged vasal segments, extensive peri-vasal fibrosis, and the potential presence of concomitant epididymal obstruction, and immunological effects (7, 8). When the proximal vas deferens is buried in fibrotic tissue or lies intraperitoneally, laparoscopic or robotic assistance may facilitate exposure and mobilization of the vas, allowing a tension-free microsurgical anastomosis; Nevertheless, data specifically addressing laparoscopically assisted vasal reconstruction after bilateral inguinal hernia repair remain limited, and available evidence is largely restricted to small series and technical reports (9-18).
In addition, data from our center provides useful context about microsurgical outcomes in a high-volume single-surgeon practice, which helps frame expectations for patency and pregnancy after microsurgical seminal reconstruction (10, 11).

MATERIALS AND METHODS

We reviewed five patients diagnosed with OA secondary to prior bilateral inguinal hernia repair who were submitted to attempted vasal reanastomosis at our service. Patients presented the following criteria: azoospermia confirmed on at least two semen analyses, normal serum FSH and testosterone, preserved testicular volume on clinical examination, and female partners without major reproductive comorbidities.

The surgical technique consisted in the attempted laparoscopic dissection of the proximal vas deferens to mobilise the proximal segment and allow a tension-free microsurgical vasovasostomy.
Laparoscopic access was obtained using a transperitoneal approach. Careful bilateral dissection of the vas deferens was performed following its course to the level of the internal inguinal ring, with particular attention to preservation of the vasal blood supply.
After adequate mobilization, both vasa were exteriorized through a 5-mm trocar site via a small incisions medial to the external inguinal ring, using the shortest possible pathway to minimize tension. Microsurgical vasovasostomy was subsequently performed extracorporeally. A high longitudinal scrotal incision of approximately 3 cm was made over the pubic tubercle region, followed by layered dissection and opening of the spermatic cord sheath. The proximal end of vas deferens was identified and isolated using atraumatic clamps, and meticulous dissection was carried out to preserve its vascularization. A transverse section of the vas deferens was performed, and patency of both ends was assessed.
The vasal sheaths were secured using 6-0 polypropylene sutures, and an operative microscope was positioned approximately 20 cm from the surgical field.
Microsurgical anastomoses were performed under an operative microscope using 8-0 ethilon sutures in either one- or two-layer fashion according to luminal quality and calibre. In one patient the proximal vas could not be mobilized sufficiently, and no anastomosis was performed. The patients characteristics analyzed were the following: age, comorbidities, prior children, partner's age and comorbidities, FSH/testosterone, obstruction interval (years), procedure details, type of anastomosis, operative time (minutes), complications, postoperative patency (semen analysis), and pregnancy (spontaneous *vs* assisted reproductive techniques - ART).

Results

Five patients were included. Median patient age was 39 years (range 35-41 years), and median partner age was 35 years (range 30-40 years). Obstruction intervals ranged from 4 to 12 years. Four patients underwent laparoscopic dissection followed by bilateral microsurgical vasovasostomy (three two-layers, one one-layer), while one patient could not undergo anastomosis due to technical constraints. Operative time ranged from 150 to 420 minutes. One patient reported transient postoperative scrotal pain not requiring analgesia.
Postoperative patency was achieved in three of the four anastomosed patients (75%), with sperm counts ranging from 3.0 $\times 10^6$/ml to 41 $\times 10^6$/ml. Regarding reproductive outcomes, four pregnancies were obtained: three through ART and one spontaneous. Among the ART cases, two required surgically retrieved sperm (patients without patency), whereas one used ejaculated sperm following VV. Notably, a spontaneous pregnancy occurred in the patient with the highest postoperative sperm concentration (41 $\times 10^6$/ml) after a one-layer anastomosis (Table 1). This case highlights that microsurgical VV can restore the potential for natural conception in selected patients, although ART may still be required, using ejaculated sperm rather than surgically retrieved specimens.

Discussion

This case series demonstrates that laparoscopically assisted microsurgical vasovasostomy is technically a reliable and effective approach for patients with OA after bilateral inguinal hernia repair. The observed patency rate of 75% among attempted anastomoses and the achievement of pregnancy in four of five couples are consistent with previously reported outcomes of laparoscopy- or robot-assisted vasal reconstruction in complex post-herniorrhaphy scenarios. (9, 12-14).

Table 1.
Clinical characteristics, surgical details, and outcomes of patients undergoing laparoscopically assisted microsurgical vasovasostomy after bilateral inguinal hernia repair.

Attribute	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Age (y)	40	35	40	41	37
Comorb.	Varic., Depression, Drugs	Orch. post-crypt.	-	-	Hydrocelectomy (uni)
Partner Age (y)	40	38	30	35	32
Partner Comorb.	0	0	0	0	Uterine Myoma surgery
Obstr. int. (y)	5	12	4	10	12
Procedure	Lap vas + VV	Lap vas + VV	No anast.	Lap vas + VV	Lap vas + VV
Anast.	2-layer	2-layer	-	2-layer	1-layer
Op time (min)	420	210	295	150	237
Comp.	None	None	None	None	Mild pain
Patency ($\times 10^6$/mL)	4.8	3.0	0	0	41
Pregnancy	No	ART	ART	ART	Yes
Spont. preg.	No	No	No	No	Yes

Anast. = Anastomosis; ART = assisted reproductive techniques; Comorb. = Comorbidities; Comp. = Complications; Lap vas + VV = Laparoscopic vas dissection + vasovasostomy; No anast. = No anastomosis; Obstr. int. = Obstruction interval; Op. time = Operation time; Orch. = Orchitis; Post-crypt. = Post-cryptorchidism; Spont. preg. = Spontaneous pregnancy; uni = Unilateral; Varic. = Varicocele; y = Years.

Importantly, the occurrence of a spontaneous pregnancy highlights that natural conception remains possible in carefully selected patients, particularly when postoperative semen parameters are favorable and obstruction intervals are moderate. In most cases, restored patency allowed the use of ejaculated sperm for ART, supporting the concept that vasovasostomy in this setting should be viewed not as an alternative to assisted reproduction, but as a complementary strategy that may avoid the need for surgical sperm retrieval (7, 8, 10, 11).

Previously published series, including *Oliveira et al.* (10) and *Araújo et al.* (11), further contextualize these findings and suggest that meticulous microsurgical technique and accumulated institutional experience play an important role in optimizing patency and reproductive outcomes, whether spontaneous or assisted. This study has several limitations. Its retrospective design and the rarity of obstructive azoospermia following bilateral inguinal hernia repair resulted in a small sample size, limiting statistical analysis and generalizability. Follow-up intervals between surgery, postoperative semen analyses, and achievement of pregnancy were not standardized and reflected real-world clinical practice rather than a predefined protocol. Criteria for referral to assisted reproductive techniques were not uniform and were influenced by multiple factors, including female partner age, reproductive history, and time constraints. In addition, associated comorbidities, including varicocele, prior orchitis, or previous scrotal surgery, may have influenced reproductive outcomes and represent potential confounding factors. Despite these limitations, this case series provides clinically relevant insight into a rare and technically demanding reconstructive scenario.

Conclusions

Laparoscopically assisted microsurgical vasovasostomy is a safe and effective strategy to restore patency in patients with OA following bilateral inguinal hernia repair. In this series, patency was achieved in most patients, and pregnancies occurred in four of five couples. While most conceptions were achieved through ART, the observation of a spontaneous pregnancy demonstrates the potential for natural fertility in carefully selected patients. These findings reinforce the dual role of VV: restoring natural fertility in some patients and providing ejaculated sperm for ART in others.

Declarations

Ethical approval and consent for participate: *The study was conducted in accordance with institutional and national ethical standards. Ethics committee approval was waived due to the retrospective nature of the study and the use of fully anonymized clinical data. No identifiable patient information or images are included in the manuscript.*

Availability of data and material: *The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request. All relevant data supporting the conclusions of this manuscript are included within the article and its tables.*

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Authors' contributions: *Samuel Bastos, Vítor Oliveira and Luís Xambre designed the research study. Ana Sabença, Rui Maciel, Miguel Lourenço and João Peralta performed the research and analyzed data. Vítor Oliveira provided help and advice on surgical technique and data interpretation. Samuel Bastos wrote the manuscript. Vítor Oliveira and Luís Xambre provided senior supervision and final manuscript review. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.*

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