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Laparoscopy-assisted pelvi-scrotal vasovasostomy

O. K. Z. Shaeer[1,2] and K. Z. Shaeer[1,2]

[1]Andrology Department, Faculty of Medicine, Cairo University; [2]Center for Fertility and Andrology Care, Kamal Shaeer Hospital, Cairo, Egypt

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Summary. Iatrogenic obstruction of the vas deferens within the inguinal canal can be managed by direct onsite vasovasostomy. However, in cases with large defect of the vas, the anastomosis may be under tension. Dissecting through the site of a previous hernia repair is tedious, and may lead to recurrence of the hernia. The present work reports an, first of a kind, alternative technique that avoids the latter drawbacks. Fifteen cases were operated upon. Under laparoscopic vision, the pelvic vas was dissected and the lateral-most end was clipped, cut and extruded from the abdomen through a port in the external inguinal ring. End-to-end vasovasostomy and microsurgical anastomosis for the vasal vessels were performed, bridging the retrieved stump of the pelvic vas with the scrotal vas. There were positive results in the form of sperm count ranging from 1.5 to 15 million ml^{-1}, an average of 7.25 (SD 5.44) in nine of 15 cases (60%), within the first 6 months following surgery. 'Pelvi-scrotal vasovasostomy' can be offered as a cost-effective and successful alternative or supplement to intracytoplasmic sperm injection, for cases with iatrogenic large defects of the vas deferens within the inguinal canal.

Introduction

Inguinal surgery is one of the frequent causes of seminal tract obstruction. The incidence of obstruction was found to be as high as 26.7% in subfertile patients with a history of childhood inguinal herniotomy (Matsuda, 2000). This may have been caused by transection, crushing or devitalization of the vas by surgical manipulation or the sharp edge of a mesh through which the vas passes. Moreover, jeopardizing the testicular vessels can cause functional azoospermia (Hendry, 1990).

The treatment for such a condition of obstructive azoospermia is essentially intracytoplasmic sperm injection (ICSI). Various surgical approaches have been suggested to bridge large defects of the vas. Anastomosing the remnants of the vas within the inguinal canal may be resorted to (Matsuda, 2000). However, in the majority of cases with iatrogenic vasa lesions, the length of vas defects rendered direct vasovasostomy either impossible or too risky because of tension (Gilis & Borovikov, 1989). Grafting (both autologous and homologous vasa) yielded poor results (Gilis & Borovikov, 1989). Extra-anatomical rerouting of the vas deferens was elaborated (Gilis & Borovikov, 1989). The latter technique is reported to be rarely used because of the degree of surgery involved (Buch & Woods, 1990).

The present work reports a new technique, where inguinal obstruction of the vas deferens is corrected by laparoscopic harvesting of the pelvic vas, to be anastomosed microsurgically to the scrotal vas through the external inguinal ring, thus bypassing the obstructed inguinal vas. This technique should provide enough length of the vas for a tension-free anastomosis. Laparoscopy provides easier access without tedious dissection through the site of previous hernia repair.

Patients and methods

Patient selection and preparation

Fifteen infertile male patients were selected for the procedure, based on history of bilateral inguinal hernia repair, in addition to signs of obstructive azoospermia: normal-sized testicles, full

Correspondence: Dr Osama Kamal Zaki Shaeer, 21 Gaber Ibn Hayan St., Dokki, Cairo, Egypt, 12311 ARE, PO Box 47 Bab El-Louk, 11513, Cairo, Egypt. Tel.: (202)3359047, (202)3374360, (20)106600606; Fax: (202)7605181, (202)7951742; E-mail: dr-osama@link.net

epididymides, azoospermia with normal semen volume, normal quantitative seminal fructose, normal serum FSH and normal spermatogenesis as shown in bilateral testicular biopsies.

Furthermore, vasography showed free flow of the dye up to the mid-region of the inguinal canal. Transrectal ultrasonography showed no abnormality. Urine analysis and expressed prostatic discharge analysis were carried out to exclude infection.

None of the 15 patients reported postoperative complications apart from one patient who had recurrence of the hernia on one side and was re-operated.

The female partners were examined by the gynaecologist, and prepared for ICSI. Prior informed written consent was obtained from all couples.

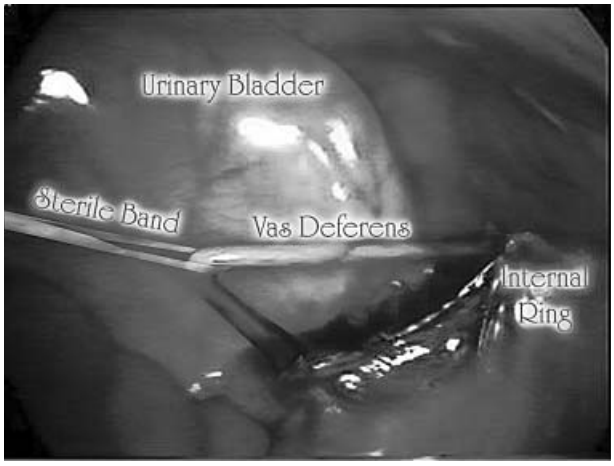

Figure 1. Vas dissected off the underlying structures and held-up by tape.

Procedure

The female partners underwent induction of ovulation. On the day of oocyte retrieval, the male partners were admitted for surgery. Under general anaesthesia, the urinary bladder was emptied through a catheter. Spermatozoa were retrieved through percutaneous fine needle aspiration from the testis and sent for the adjoining assisted reproduction laboratory for preparation for ICSI and cryopreservation.

Verres needle was inserted into the abdomen through the upper border of the umbilicus. Pneumoperitoneum was established. A 10-mm port was introduced on a safety trochar, replacing the Verres needle. A camera was inserted through the port. Abdominal exploration was performed. Two 5-mm ports were inserted on either sides, at a point midway between the anterior superior iliac spine and umbilicus.

The peritoneum overlying the vas was stretched upwards with a grasper and snipped with scissors. Dissection of the vas off the underlying structures was performed. Once the vas was freed all around at this point, a sterile tape was introduced, looped around the vas, and held up, to stretch the vas upwards. Blunt and sharp dissection were then used to separate the vas completely from the underlying structures, freeing the length between the internal ring laterally and the urinary bladder medially (Fig. 1).

The vas was stretched medially by pulling on the tape, and a clip was applied on the lateral-most end, as it dips into the internal ring. The tape was retrieved, the vas was grasped just medial to the clip, and was transected between the clip and the grasper by scissors.

A 5-cm long incision overlying the external inguinal ring was performed. The spermatic cord

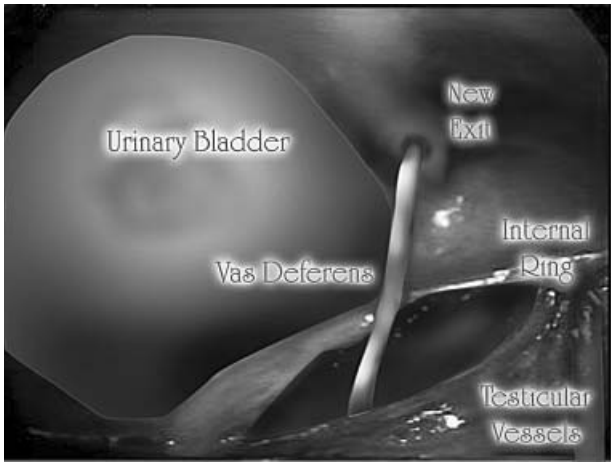

Figure 2. Vas passing through the new exit, testicular vessels exiting through the internal ring.

was identified and delivered through the incision. The vas was separated from the spermatic cord up to the site of hernia repair and down to the neck of the scrotum, and cut at the point where it dips into the anterior abdominal wall. A port was inserted through the most medial part of the external ring into the abdomen, minding the spermatic cord. A grasper was introduced through the port to which the pelvic vasal stump was handed over and pulled outside the abdomen, avoiding torsion of the vas (Fig. 2). The pelvic stump was trimmed. Patency of both stumps was tested by intraoperative vasography.

Microsurgical vascular clips were applied to both stumps of the vasal vessels. Both vasal stumps were trimmed so as to recede beyond the cut end of the vessels. Both vasal and vessel ends were dilated by microsurgical vessel dilators. End-to-end microsurgical anastomosis was performed. Six sutures were placed connecting the circumference of both

stumps involving the whole thickness of the vas. Each was sutured with a separate double-armed proline thread, with the needles passing from inside outwards, so that the knot would be on the outer surface of the vas. Microsurgical anastomosis for the vasal vessels was performed, using proline 9/0.

In some cases where the pelvic vas was not comfortably long, the re-anastomosed vas was gently pulled back into the abdomen, making use of the abundant length of the vas on the scrotal side, aiming at alleviating tension from the anastomotic line, and avoiding pressure on the full urinary bladder by the outstretched vas. The urinary bladder was filled up through the catheter, under vision, to confirm that it was not hindered in anyway.

The laparoscopic instruments and ports were retrieved under vision, pneumoperitoneum undone, after confirming adequate haemostasis. The abdominal and inguinal incisions were closed, leaving a drain in the abdomen and another in the inguinal area. The drains were pulled out 48 h later. For all patients, surgery was performed on one side only, and the other side was postponed to another setting.

Meanwhile, oocytes were retrieved from the female partners and ICSI proceeded up to embryo transfer.

Results

All patients were followed up by semen analyses for 12 months. By the sixth month of postoperative follow-up, nine of 15 cases (60%) showed sperm in the ejaculate ($P = 0.004$). Sperm count ranged from 1.5 to 15 million ml^{-1}, an average of 7.25. Standard deviation was 5.44. Average first-hour motility was 30% (SD 14.5). By the end of the 12th month, one of the nine patients with positive results declined to azoospermia on account of recurrent episodes of pyospermia. The other eight showed sperm count ranging from 5 to 18 million ml^{-1}, an average of 11.88 (SD 4.55). Average first-hour motility was 35% (SD 14.5). Eleven of the 15 patients impregnated their wives, nine on account of ICSI, and two naturally.

Discussion

Vasovasostomy bridging the remnants of the vas deferens within the inguinal canal lead to post-operative appearance of sperm in 39% of patients (Matsuda, 2000). In men with postoperative azoospermia, a secondary epididymal obstruction caused by a long-term obstruction was considered. Ipsilateral epididymovasostomy following successful inguinal vasovasostomy resulted in the postoperative appearance of sperm in the ejaculate in 100% of the patients and a subsequent natural pregnancy rate of 50%. The overall pregnancy rate among couples, following surgery in 18 patients was 43% (Matsuda, 2000).

However, in the majority of cases with iatrogenic vasa lesions, the length of vas defects rendered direct vasovasostomy either impossible or too risky, because of tension (Gilis & Borovikov, 1989), not to mention that it holds the risk of jeopardizing the previous hernia repair and is less appealing cosmetically, especially in bilateral cases.

The method of extra-anatomical suprapubic vas rerouting was elaborated, allowing shortening the vas length necessary for anastomosing by 9–14 cm, as demonstrated in cadaveric studies and in one case with large vas deferens defect (Gilis & Borovikov, 1989).

In 2001, Zhu *et al.* published the largest series on extra-anatomical rerouting of the vas deferens (five patients). The technique involved an inguinal incision as in hernia repair, pulling the edge of the internal oblique and transverse muscles with a retractor, freeing the pelvic peritoneum from the pelvic cavity wall, freeing the vas deferens from the pelvic wall up to the seminal vesicles and releasing it from the internal ring. The tip of the operator's index finger would then be inserted posterior to the inguinal canal on to the external ring, and a haemostat clamp would pierce the external ring from outside inwards, aimed at the finger tip, to allow the pelvic vas to be delivered through the puncture (Zhu *et al.*, 2001). Such techniques are reported to be rarely used because of the degree of surgery involved, dissecting through the site of a hernia repair (Buch & Woods, 1990). The risk of recurrence of hernia is also present.

Our technique of laparoscopic harvesting of the vas avoids the difficult dissection through the site of a previous hernia repair, especially in bilateral cases, and should also spare the patient the possibility of recurrence of hernia. Laparoscopic harvesting of the pelvic vas provides a healthy stump with intact blood vessels that can be anastomosed, contrary to the devitalized remnants in the inguinal canal. The anastomosis is under less tension compared with direct inguinal vasovasostomy. Finally, minimal access surgery provides better cosmetic results and a more comfortable postoperative period.

As for our procedure, the average postoperative hospital stay was 2 days, and return to work was within 4 days following surgery. No data is available for comparing convalescence following our procedure to that following the open-surgery

procedure. Nevertheless, our experience with bilateral inguinal herniorrhaphy – which should be similar in convalescence to the open procedure – indicated a postoperative hospital stay of 2 days (on average) and return to work is within 10 days.

As for cost, our procedure (when performed bilaterally in one setting) should cost 30% less than ICSI (ovarian stimulation inclusive). The cost of ICSI increases further with age in case of older female. The female is exposed to the burdens of multiple hospital visits, hyperstimulation and multiple pregnancies, unlike the case with our procedure.

The open-surgical alternative should cost less regarding the procedure *per se*. But when considering the delayed return to work, it should cost more than the laparoscopic procedure.

Sperm yield from 'pelvi-scrotal vasovasostomy' is expected to rise after operating on the other side, and upon management of coincident proximal obstruction in some cases. This coincident obstruction may be the result of previous vasography, previous trial at epididymovasostomy, or longstanding obstruction.

Conclusion

Laparoscopic pelvi-scrotal vasovasostomy can be offered as a cost-effective, successful replacement or supplement to ICSI, in indicated cases. Our technique provides easier access, a more reliable anastomosis and lower risk of recurrence of hernia, as compared with the current surgical solutions.

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