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LETTER TO THE EDITOR

Operational Andrology

The importance of laparoscopy in the surgical reconstruction of inguinal vas injury

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Dear Editor,

We are very interested in the recent paper published by Chen *et al*.[1] because we also have treated patients with iatrogenic vasal injury. We agree with the opinion in this paper that surgical reconstruction of vas injury is more complex than vasectomy reversal. Because inguinal vas injuries in China are commonly caused by inadvertent iatrogenic treatment during childhood, the range and length of vas injury are often unknown before surgical reconstruction. Guidelines regarding male infertility by the European Association of Urology suggest that it is virtually impossible to correct large bilateral vas deferens defects resulting from involuntary excision of the vasa deferentia during hernia surgery in early childhood.[2] Chen's study reported that 21.0% (13/62) of the patients merely underwent vasal exploration without reconstruction due to failure to find the distal vasal stump.[1] How can we overcome this issue and further improve the vasal reconstruction rate? Here, we describe our experiences of surgical treatment for patients with iatrogenic vasal injury.

Eight patients with azoospermia (mean age 28.1 years, range 23–37) who had previous surgery in the inguinal region were enrolled from June 2012 to May 2015. Of these eight patients, six had a history of bilateral inguinal surgery (spermatic cord hydrocele or hernia in the inguinal region), one had unilateral inguinal surgery and contralateral orchidopexy (spermatogenesis failure), and one had unilateral inguinal surgery and contralateral orchidectomy due to a testicular tumor. All of the patients underwent a comprehensive evaluation of infertility, which included a physical examination, semen analyses, seminal plasma test, sexual hormone test, ultrasonography, testicular biopsy, and were diagnosed with obstructive azoospermia. All patients were informed the risks and benefits of reconstructive surgery in detail and voluntarily signed consent forms approved by the Ethics Committee at our hospital.

The surgical exploration procedure was similar to the technique reported by Chen *et al*.[1] If both the distal and proximal vas ends could be located and reconnected without tension in the inguinal region, and then the vasovasostomy (VV) was directly performed on site. An assisted laparoscopic procedure was necessary if either the distal vas end was located and dissected near the internal ring but the defective vas was too long to anastomose with the proximal end of the vas, or if the distal vas end retreated into the pelvis and was inaccessible at the inguinal area. This procedure is the same as previously reported.[3] If no sperm were found in the fluid from the proximal vas end, a secondary epididymal obstruction was considered, and the modified transverse intussusception vasoepididymostomy (VE), which we previously reported,[3] was performed at the time of the vasovasostomy.

Patients started to ejaculate 3 weeks after the reconstructive surgery. Semen analyses were initiated at 1 month, followed by trimonthly (3, 6, 9, and 12 months) semen analyses. We continued following the patients (**Table 1**) for 12 to 34 months.

Of the eight patients, six underwent seminal duct reconstruction surgery, five of these patients had sperm in their ejaculate at follow-up, and two naturally conceived. The sixth patient underwent a unilateral vasovasostomy and epididymostomy at the same time but had no sperm in his ejaculate during the 12-month follow-up. Two of the patients were unable to be reanastomosed due to either atrophic or missing pelvic vas. In seven of the patients with either a long defect of the vas or inability to locate the distal vasal end in the inguinal region, laparoscopic mobilization of the pelvic vas was performed on two patients bilaterally and three patients unilaterally. Another three sides of missing pelvic vas (one bilateral and one unilateral) and one side of atrophic pelvic vas were found laparoscopically. Overall, only three sides of vasovasostomy were directly performed in the inguinal region. Three cases of secondary epididymal obstruction were identified, and two of them underwent ipsilateral VE at the time of VV.

The incidence of iatrogenic injury to vas is not infrequent, especially in inguinal surgeries during childhood.[4] Although vasovasostomy for iatrogenic vasal injury is technically more difficult than a vasectomy reversal, it is feasible and worthwhile.[3] The technical difficulty is due to the possible long-segment loss of vas, failure to dissect or find the distal vasal end and secondary epididymis obstruction. A laparoscopic technique is needed to mobilize the pelvic vas and bridge the long defect of vas,[5] and an epididymis obstruction could be repaired using an ipsilateral vasoepididymostomy.[1]

It is well-known that microsurgical vasovasostomy is not a technically difficult procedure, and the success rate of a vasectomy reversal is up to 80%–99.5%.[6] Chen *et al*. reported that the patency rate of bilateral vasovasostomy was 76.7% but did not specify whether the anastomoses were under tension in cases involving a large defect of the vas. However, a direct on-site anastomosis under tension could result in

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Table 1: Outcomes of surgical exploration of inguinal vas injury and further procedures performed on patients

Findings during surgical exploration in inguinal region	*Number of cases*	*Surgical procedure*	*Seminal analysis at follow-up*	*Outcomes*
Large defect of the vas (>3 cm); failure of dissecting distal end at least on one side	5	Laparoscopic mobilization of the retroperitoneal vas deferens (two bilaterally and three unilaterally), three bilateral microscopic VV, one bilateral VV and VE at the same time due to secondary bilateral epididymal obstruction, and one left VV (right pelvic vas was not located laparoscopically)	Return of sperm in ejaculate	Two natural conceptions
Defective right vas at the internal ring and secondary epididymal obstruction, contralateral orchidopexy (spermatogenesis failure)	1	The whole segment of the right pelvic vas was laparoscopically classified as atrophic, no healthy pelvic vas could be used	No sperm	ICSI
Bilateral large defect of the vas (>3 cm) and failure to find bilateral distal end	1	Bilateral pelvic vas was unable to be located laparoscopically; unable to reanastomose	No sperm	ICSI
1 cm defect of right vas and secondary ipsilateral epididymal obstruction, history of left orchidectomy	1	On-site VV and VE performed concurrently on right vas	No sperm	ICSI

ICSI: intracytoplasmic sperm injection; VV: vasovasostomy; VE: vasoepididymostomy

a lack of sperm in the ejaculate during follow-up. In recent years, some studies suggested that laparoscopic mobilization of the pelvic vas and redirection through the external ring could bridge the large defect of the vas to make the anastomosis tension-free.[5] Another technical difficulty in the surgical reconstruction of iatrogenic vas injury is that the distal end of the vas could not be located and dissected in the inguinal region in some cases. Compared to the inguinal vas obstruction resulting from a fibroblastic response and extrinsic compression related to use of polypropylene mesh for hernia repair, iatrogenic vas injuries in childhood were primarily caused by either transection or resection of the inguinal vas in our study, and the distal end will likely retreat into the pelvic cavity while the body grows and develops. Matsuda[7] reported that the distal end of the vas deferens was located either at the internal inguinal ring or more distally in the pelvic cavity in 56.7% of cases with a history of childhood inguinal herniorrhaphy. Chen's study[1] showed that 21.0% (13/62) of the patients merely underwent vasal exploration without reconstruction due to failure to find distal vasal stump. Although the distal end could possibly be located with a larger incision and extensive peritoneal dissection, laparoscopic retrieval of the pelvis vas does appear to be a more viable option and provides an opportunity for microsurgical reconstruction. In our study, five patients with either a long defect of the vas or failure to locate the distal vasal end in the inguinal region underwent vasal reanastomosis using laparoscopic techniques, and all of these patients have sperm in their ejaculate.

In our study, there were important and unpredictable findings which caused failure of vasal reanastomosis in three patients (four sides) at the time of the laparoscopic procedure to attempt to find the pelvic vas: one case with complete atrophy and fibrosis of the right pelvic vas and contralateral nonfunctioning testis, one with a missing right pelvic vas (reanastomosis only performed on left side) and another with a missing bilateral pelvic vas. On all four sides, the ipsilateral proximal (testicular) vas was normally developed, and the ipsilateral seminal vesicle presented with a normal sonographic image. After reviewing the literature, Matsuda[7] reported that one case without the distal end of the vas deferens was identified despite an extensive search both extra- and intra-peritoneally at the time of open surgery. It is unclear whether the atrophic and missing pelvic vas were congenital or acquired; we presume that it is more likely that the atrophy of the vas was caused by ischemic injury, and the missing distal vas resulted from extensive resection and then underdeveloped after vas disconnection caused by iatrogenic injury. This is based on the fact that all of the ipsilateral proximal regions of the vas and distal seminal vesicles were developed normally. It is suggested that when a severed inguinal vas is recognized during pediatric surgery, the ends should be approximated and connected with sutures as much as possible, which could facilitate the surgical repair in the future.

In summary, the preparation of laparoscopic and microscopic equipment is necessary and possibly useful during surgical repair of vasal injury in the inguinal region. Despite this, there are still a few cases of vasal injury that could not be repaired because of possible atrophy or missing pelvic vas after iatrogenic injury to the vas during childhood.

AUTHOR CONTRIBUTIONS

HTJ, KFX, and JGY conceived of the study, participated in its design, drafted, revised the manuscript and performed the statistical analysis. HTJ, KFX, and JGY coordinated the study and helped to draft the manuscript. HTJ, ZQL, JNG, QY, YL, and ZYZ participated in the surgical procedures and data acquisition. All authors read and approved the final manuscript.

COMPETING INTERESTS

The authors declare no competing interests.

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