Asian Journal of Andrology (2021) 23, 120–121
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LETTER TO THE EDITOR

Operational Andrology

Transurethral vesiculoscope-assisted laser incision of the prostatic utricle to treat partial ejaculatory duct obstruction

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Asian Journal of Andrology (2021) **23**, 120–121; doi: 10.4103/aja.aja_144_19; published online: 3 March 2020

Dear Editor,

The patient was a 29-year-old male seeking medical treatment for a 2-year history of primary infertility, and no reproductive abnormalities were observed in his 29-year-old spouse. The study protocol was approved by the Ethics Committee of the First Affiliated Hospital of Dalian Medical University (Dalian, China), and the informed consent was provided by the patient for the publication of his clinical data. The patient denied a history of urinary tract infection and epididymitis, but reported a history of hematospermia. Palpation revealed no palpable varicoceles, normal-sized epididymides, palpable vasa deferentia, and the bilateral testes of 20 ml in volume. Test results revealed no abnormalities in the levels of sex hormones (**Supplementary Table 1**). Semen analysis showed severe asthenozoospermia (**Supplementary Table 2**). Seminal plasma biochemistry analysis showed fructose level of 1.8 mmol l^{-1} (normal level >8.3 mmol l^{-1}). Magnetic resonance imaging (MRI) and transrectal ultrasound scan (TRUS) indicated hemorrhage in the right seminal vesicle and bilateral seminal vesicle dilation (**Supplementary Figure 1**). During TRUS, the patient masturbated until ejaculation, while retaining an transrectal ultrasound probe (Esaote S.p.A., Genoa, Italy) in his rectum, which tracked the process of ejaculation in real time (**Supplementary Video 1**). Calcification blockage within the ejaculatory ducts and verumontanum was observed (**Figure 1**).

The patient was diagnosed with partial ejaculatory duct obstruction (EDO) and underwent transurethral seminal vesiculoscopy. Using a pediatric rigid ureteroscope (6/7.5 Fr; Richard Wolf GmbH, Knittlingen, Germany), the urethra and verumontanum were examined. However, the openings of the bilateral ejaculatory ducts were not detected due to the presence of mucosal edema. Guided by the soft end of the guidewire, the prostatic utricle was accessed through the verumontanum orifice, and the calcification within the orifice was cleared (**Figure 1**). The ureteroscope was then inserted into the seminal vesicles at the 5 o'clock and 7 o'clock positions of the prostatic utricle by puncturing the wall with the hard end of the guidewire.

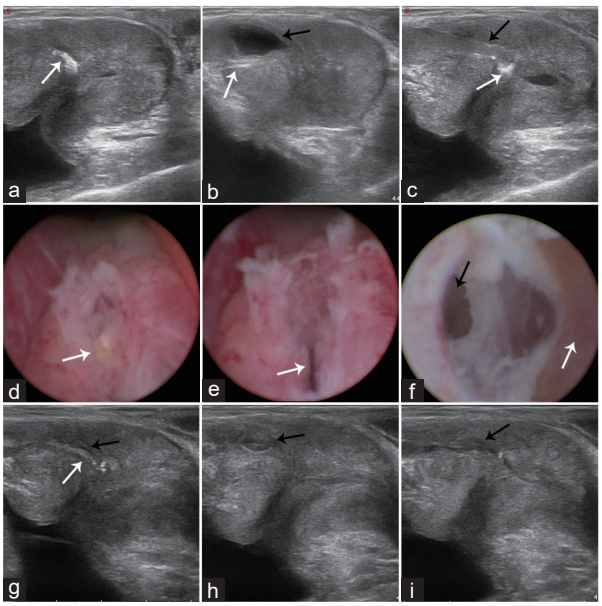

Figure 1: Ultrasonic images and endoscopic images of a partial EDO patient. (**a**–**c**) Ultrasonic images before vesiculoscopy treatment. (**d**–**f**) Endoscopic images during surgery. (**g**–**i**) Ultrasonic images 7 months after surgery. (**a**) Calcification within the ejaculatory duct. (**b**) Ultrasonographic manifestations of the ejaculatory ducts and prostatic utricle before surgery. The white arrow indicates the calcified ejaculatory duct. The black arrow indicates the dilated prostatic utricle. (**c**) TRUS showed the process of ejaculation. The black arrow indicates the seminal fluid flowing through the dilated ejaculatory duct during ejaculation. The white arrow indicates the calcification blockage at the distal end of the ejaculatory duct. (**d**) The calcification within the verumontanum orifice. (**e**) The verumontanum orifice was cleared after surgery. (**f**) The seminal vesicles were connected with the prostatic utricle. The white arrow indicates the wall of the prostatic utricle. The black arrow indicates the exposed right seminal vesicle lumen. (**g**) After surgery, there was less calcification within the ejaculatory duct and adjacent tissues. The black arrow shows the prostatic utricle turned into a potential space. (**h**) During ejaculation, the prostatic utricle expanded and the seminal fluid flowed into the prostatic utricle. (**i**) A new ejaculatory channel consisting of the seminal vesicle and prostatic utricle was formed. EDO: ejaculatory duct obstruction.

Old blood clots and congested mucosa were visible within the right seminal vesicle, and jelly-like sediments were observed within the left seminal vesicle (**Supplementary Figure 2**). The vas deferens ampulla

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Received: 25 June 2019; Accepted: 25 November 2019

was recognized as a deep and tapering tube at the medial part of the seminal vesicle lumen. The contents in the seminal vesicle cavity were aspirated through the working tube of the vesiculoscope using a syringe, and numerous nonmotile sperm were observed under the microscope. The ureteroscope was carefully placed into the depth of the vas deferens ampulla, and repeated aspirations revealed few motile sperm under the microscope. After thoroughly flushing the bilateral seminal vesicles of their contents with normal saline, the punctured holes in the prostatic utricle were then made bigger with a holmium laser (**Figure 1**).

During the first 2 weeks after the operation, the patient was encouraged to ejaculate every 2 days to prevent closure of the punctured hole. Postoperatively, repeated semen analyses showed gradual improvement in sperm motility (**Supplementary Table 2**). After surgery, the patient complained of new-onset mild ejaculatory weakness, but no differences were reported in orgasm and urination compared with those before surgery. There were no other complications. At 7 months after the operation, TRUS with masturbation showed the formation of a new ejaculatory channel (**Supplementary Video 2**).

EDO, a rare cause of male infertility, is surgically curable. The obstruction can result from seminal vesicle stones, cysts, local inflammation, postoperative scar, or congenital atresia.[1,2] The patients of complete or classic EDO typically have low semen pH, low seminal plasma fructose levels, low semen volumes, azoospermia, and seminal vesicle dilation.[3,4] Semen parameters in partial obstruction cases are highly variable (semen volumes and sperm concentrations may range from low to normal). A diagnosis of partial EDO is suspected in men with acidic seminal fluids, low or undetectable fructose levels, decreased sperm motility, and seminal vesicle dilation, and to some degree, this disease is diagnosed by the process of elimination.[2,3] At present, TRUS-guided seminal vesicle aspiration is widely accepted as a relatively reliable tool for the diagnosis of partial EDO. Theoretically, sperm are absent from the seminal vesicles of normal fertile men. Therefore, an elevated number of sperm within seminal vesicle aspirates is suggestive of sperm reflux due to an obstruction.[5,6]

The best surgical approach for treating EDO is still controversial, especially for partial EDO. Transurethral resection of the ejaculatory duct (TURED), which involves cutting the verumontanum, is the most common surgical procedure for reliving an obstruction. However, resection of the distal end of the ejaculatory ducts poses the risk of urinary reflux into the seminal vesicles.[7] Wang *et al.*[8] described a minimally invasive procedure for the treatment of EDO using an ureteroscope. This procedure does not damage the verumontanum and poses no risk of urine reflux and diluted semen. Currently, two vesiculoscopic approaches are in use. The first one is a retrograde technique along the natural lumen of the ejaculatory duct, and the second one is a technique through the punctured wall of the prostatic utricle. The retrograde approach enables a single expansion of the ejaculatory duct cavity by the insertion of the vesiculoscope. This approach theoretically does not damage any structure, although it requires a small-sized vesiculoscope and great skill. The diameter of the distal ejaculatory duct cavity is only 0.3 ± 0.1 mm,[9] and it can be narrower and curved in EDO cases. When the orifice is indiscernible, an approach through a puncture in the wall of the prostatic utricle can be performed to enable effective detection and flushing of the seminal vesicle cavity. However, the mechanisms of these approaches for relieving the obstruction are unproved.

In our case, the primary diagnosis of partial EDO was confirmed by intraoperative vesiculoscope-assisted seminal vesicle aspiration. The presence of nonmotile sperm in seminal vesicle aspirates proved indicated sperm reflux, whereas the presence of motile sperm in vas deferens ampulla aspirates confirmed the patency of the vas deferens and normal spermatogenesis. The holmium laser provides precision cutting of tissues and avoids unnecessary damage to adjacent structures. Regular postoperative ejaculation can prevent closure of the punctured hole. Thus, a new ejaculatory channel consisting of the seminal vesicle and prostatic utricle was formed, which was well demonstrated by TRUS (**Supplementary Figure 3**). After surgery, there was a clear improvement in semen motility. However, the reason for the weak ejaculatory force after surgery was not determined, since the patient had no symptoms of urinary tract obstruction. The decreased pressure due to the opened seminal vesicles may have been an underlying cause. However, further studies are needed to confirm our impression.

In summary, we used vesiculoscope-assisted seminal vesicle aspiration and laser incision of the prostatic utricle for the treatment of partial EDO. To the best of our knowledge, this is the first report to describe the use of TRUS to observe the process of ejaculation in real time and the mechanism of this approach for relieving the obstruction. Further clinical trials are needed to evaluate the long-term efficacy of this procedure.

AUTHOR CONTRIBUTIONS

TJ conceived of the study and participated in its design. KNW conceived of the study, participated in its design and drafted the manuscript. WLX contributed to interpretation of the imagine results. LZ contributed to literature search. All authors read and approved the final manuscript.

COMPETING INTERESTS

All authors declared no competing interests.

ACKNOWLEDGMENTS

This study was supported by the National Natural Science Foundation of China (NO. 21272032) and Natural Science Foundation of Liaoning Province of China (NO. 201502037).

Supplementary Information is linked to the online version of the paper on the *Asian Journal of Andrology* website.

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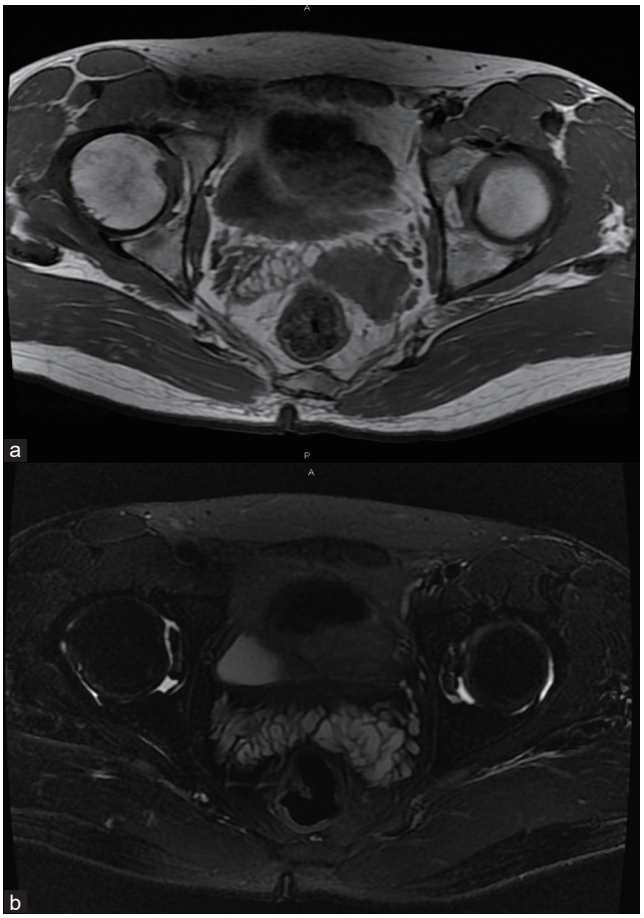
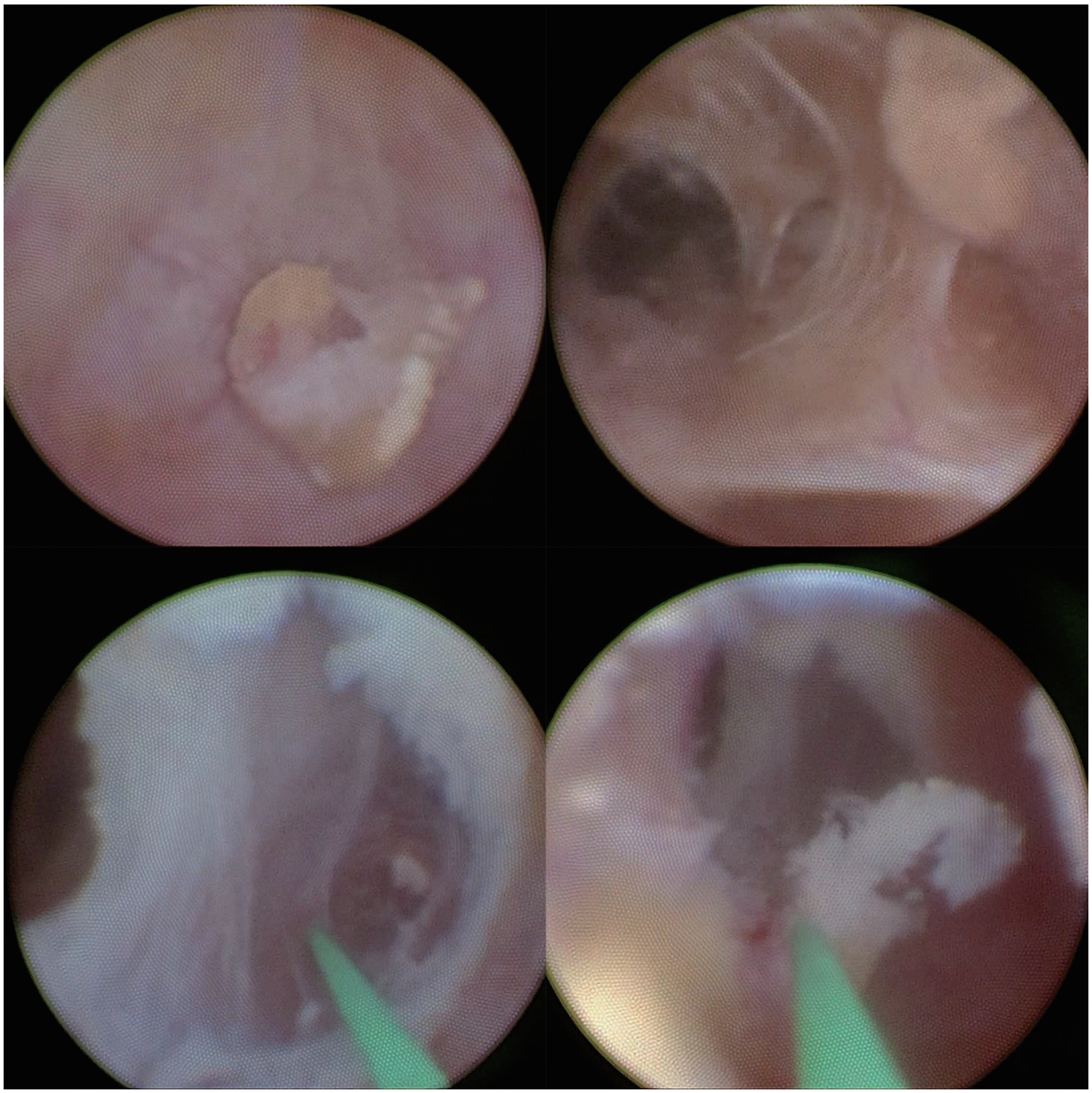
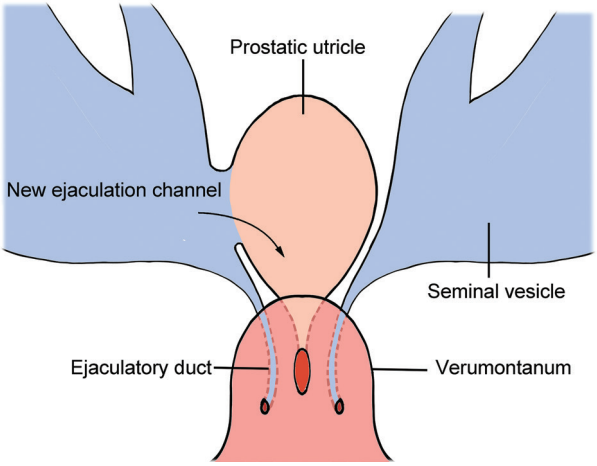


Supplementary Figure 1: The preoperative MRI image: (**a**) T1- and (**b**) T2-weighted MR images. The result of MRI shows that the width of the right seminal vesicle was 1.5 cm and the width of the left seminal vesicle was 2.5 cm; MRI of the right seminal vesicle revealed long T1 and T2 signal indicating hemorrhage in the seminal vesicle cavity. MRI: Magnetic resonance imaging.



Supplementary Figure 2: The removed calcification from verumontanum orifice, old blood clots in the seminal vesicle, exposing seminal vesicle with a holmium laser.



Supplementary Figure 3: The mechanism of this vesiculoscopic approach for relieving the obstruction.

Supplementary Table 1: Test results of sex hormones before surgery

Test item	*Result*	*Unit*	*Reference range*
FSH	8.46	mIU ml^{-1}	1.27–19.26
TES	6.800	ng ml^{-1}	1.75–7.81
LH	4.80	mIU ml^{-1}	1.24–8.62
PRL	309.28	μIU ml^{-1}	56–278
E2	36.00	pg ml^{-1}	20–47

FSH: follicle-stimulating hormone; TES: testosterone; LH: luteinizing hormone; PRL: prolactin; E2: estradiol

Supplementary Table 2: Seminal parameters before and after surgery

Date	*Concentration (10^6 ml^{-1})*	*Motility*			*pH*	*Volume (ml)*
		PR (%)	*NP (%)*	*IM (%)*		
2 days before surgery	256.3	2	4	94	6.8	5
1 week after surgery	189.3	4	4	92	7.1	4
2 weeks after surgery	133.4	15	10	75	7.2	2.5
1 month after surgery	252.8	28	7	65	6.9	4
6 months after surgery	101.6	24	5	71	6.8	5

PR: progressive motility; NP: nonprogressive motility. IM: immotility