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## ORIGINAL ARTICLE

Male Health

# A 30-year retrospective study of rare ectopic seminal tract opening cases

Hong-Fei Wu<sup>1,\*</sup>, Jia-Geng Zhu<sup>2,\*</sup>, Jian-Zhong Lin<sup>1</sup>, Guang-Dong Shi<sup>3</sup>, Jia-Qi Yu<sup>4</sup>, Wei-Zhang Xu<sup>5</sup>, Hong-Bo Yu<sup>1</sup>

Ectopic seminal tract opening is a rare congenital malformation. Until recently, there has been a lack of comprehensive reporting on the condition. The purpose of this retrospective study is to summarize the experience of diagnosis and treatment of this condition based on 28 clinical practice cases throughout the past 30 years. We conducted auxiliary examinations on such patients including routine tests, imaging examinations, and endoscopy. Among these 28 cases, there were ectopic opening of vas deferens into enlarged prostatic utricles (6 cases); ejaculatory ducts into enlarged prostatic utricles, Müllerian ducts cysts, and urethras (18 cases, 2 cases, and 1 case, respectively); and ectopic opening of the unilateral vas deferens and the contralateral ejaculatory duct into enlarged prostatic utricle (1 case). The size of the enlarged prostatic utricle, the type of ectopic seminal tract opening, and the opening's location effectively assisted in the selection of clinical treatment methods, including transurethral fenestration of the utricle, transurethral cold-knife incision, open operation, laparoscopic operation, and conservative treatment. Satisfactory effect was achieved during follow-up. In conclusion, a definite diagnosis and personalized treatment are especially important for patients with ectopic seminal tract opening.

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**Keywords:** congenital malformation; ectopic opening; ejaculatory duct; enlarged prostatic utricle; vas deferens

## INTRODUCTION

Ectopic seminal tract opening (ESTO) is a rare congenital malformation, which is mainly divided into two types, ectopic vas deferens opening (EVDO) and ectopic ejaculatory duct opening (EEDO). Since EVDO was first reported in 1895, only about 66 cases have been reported. Among the cases of EVDO, an ectopic opening into the ureter is relatively common,<sup>1–4</sup> and ectopic opening into the bladder,<sup>5,6</sup> the Müllerian duct cyst (MDC),<sup>7,8</sup> the enlarged prostatic utricle (EPU),<sup>9,10</sup> and renal collective system<sup>11</sup> could also be found in some rare cases. EEDO, first documented in 1939, is even rarer than EVDO, with only about 11 cases having been recorded until now.<sup>12–14</sup>

Various malformations often coexist with ESTO, including congenital imperforate anus,<sup>15</sup> rectourethral fistula,<sup>10</sup> ipsilateral renal dysplasia,<sup>14,16,17</sup> renal agenesis and dysmorphism,<sup>1,8,18,19</sup> hypospadias and cryptorchidism,<sup>11,15,20,21</sup> and vesicoureteral reflux.<sup>3,22</sup> Hence, associated symptoms due to these diseases are often present in patients with ESTO. In addition, other factors such as the type of ectopic opening, the grade and position of the EPU, and the unilateral or bilateral opening also affect clinical symptoms. Besides clinical manifestations, physical examination, urine tests, semen tests, and routine imaging examination are often conducted for diagnosis. Some special imaging examinations, such as percutaneous vasopuncture vesiculography and retrograde contrast radiography through the opening of the EPU under urethroscope, play a crucial role for a definite diagnosis.<sup>23</sup> However, the

rare incidence and atypical symptoms of these conditions make clinical diagnosis and treatment difficult. In this study, we retrospectively analyzed 28 such cases, proposed a new classification of ESTO, and applied it in clinical practice to provide valuable references for diagnosis and treatment of the condition.

## PATIENTS AND METHODS

### *Study population and clinical manifestations*

From August 1985 to August 2015, 28 cases of ESTO in patients aged 2–48 years old were diagnosed and treated in the First Affiliated Hospital of Nanjing Medical University and Nanjing BenQ Hospital (Nanjing, China). The study protocol was approved by the ethics committees of the First Affiliated Hospital of Nanjing Medical University and Nanjing BenQ Hospital. Patients themselves or their parents when necessary provided written informed consent before enrollment.

The results of the physical examination, laboratory tests, and imaging are described in detail in **Supplementary Table 1**. Briefly, the scrotum and perineum were carefully examined. Semen analyses were conducted after liquefaction at the clinics using the WLJY-9000 CASA system (Beijing Weili New Century Science & Tech. Deve. Co. Ltd., Beijing, China). B ultrasound and computed tomography (CT) on the urinary system were performed routinely. Enhanced CT or magnetic resonance imaging (MRI; 1.5T, Siemens Magnetom TrioTim, Munich, Germany) were performed in some cases.

<sup>1</sup>Department of Urology, Nanjing BenQ Hospital Affiliated to Nanjing Medical University, Nanjing 210019, China; <sup>2</sup>Department of Urology, Nanjing First Hospital, Nanjing Medical University, Nanjing 210006, China; <sup>3</sup>Department of Urology, Gaogang Hospital of Traditional Chinese Medicine, Taizhou 225321, China; <sup>4</sup>Fourth Clinical Institute, Nanjing Medical University, Nanjing 211166, China; <sup>5</sup>Department of Urology, Jiangsu Cancer Hospital and Jiangsu Institute of Cancer Research and Nanjing Medical University Affiliated Cancer Hospital, Nanjing 210019, China.

\*These authors contributed equally to this work.

Correspondence: Dr. HF Wu (wuhfnj1943@sina.com)

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### Percutaneous vasopuncture vesiculography

Percutaneous vasopuncture vesiculography was carried out in 26 patients, all except 1 infant aged 2 years old and 1 patient with bilateral cryptorchidism. Briefly, the vas deferens on superficial anterior wall of scrotum was fixed and then the anterior wall was punctured with the 8<sup>th</sup> sharp needle at the most prominent and central part of the vas deferens. The 8<sup>th</sup> sharp needle was pulled out and inserted into the 6<sup>th</sup> blunt needle through the opening into the vas deferens immediately. If successful, 50% meglumine diatrizoate (XuDong HaiPu Pharmaceutical Co., Ltd., Shanghai, China) of approximately 2.5 ml was slowly injected into the unilateral vas deferens. Photographs were taken when patients felt urgency to urinate (**Figure 1a**). The contralateral vas deferens was processed in the same way. Photography was delayed if necessary.

### Staining urethroscopy and contrast radiography through intubating opening of the EPU or the MDC

Such methods were employed when the ectopic opening into the MDC or EPU could not be precisely diagnosed through percutaneous vasopuncture vesiculography. Briefly, the central opening of the seminal caruncle and bilateral opening of the ejaculatory duct was found via urethroscopy and then diluted methylene liquid was injected slowly into the vas deferens. The case was identified as ESTO in the EPU when the liquid flowed from the central opening (**Figure 1b**). The case was determined as having a normal opening when the liquid flowed from a bilateral opening. If the liquid did not flow out but needed to be pumped out, the case was diagnosed as ESTO into the MDC.

If urethroscopy staining was carried out alone, the F5 ureteral catheter (Shangyi Kangge Medical Instruments Co., Ltd., Shanghai, China) was inserted into the EPU through the central opening of the seminal caruncle. Subsequently, 50% meglumine diatrizoate was injected into the ureter through the ureteral catheter, and photographs were taken with dynamic observation. If there was no opening in the middle of the seminal caruncle observed by naked eye, which was then confirmed by the F5 ureteral catheter, we punctured the center of the seminal caruncle with the needle under the cystoscope. The final step was to withdraw the fluid, followed by injecting the contrast medium to observe dynamically.

## RESULTS

### Test results

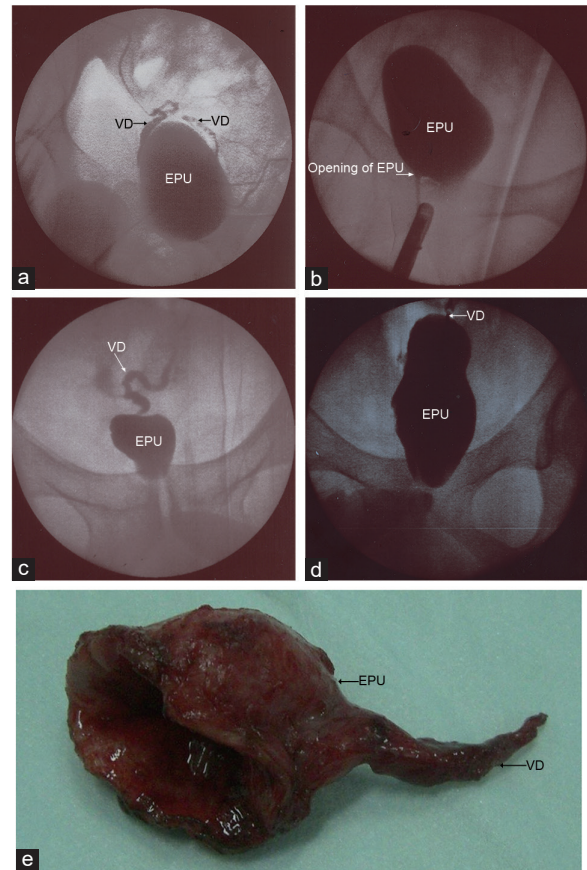
In our group, routine urine tests indicated that leukocytes and erythrocytes were found to be higher than normal in 23 samples. In addition, urine culture tests indicated that 15 samples were positive for *Escherichia coli*. Semen analysis of 26 cases revealed 11 cases of normal sperm, 10 cases of azoospermia, 4 cases of oligospermia and asthenospermia, and 1 case of necrospermia.

### Diagnosis

Six patients were diagnosed with EVDO in the EPU (**Figure 1**). Eighteen patients were proven to suffer from EEDO into the EPU (**Figure 2**), of which seven patients experienced complications of intracapsular calculus (**Figure 2a** and **2b**). One case turned out to have unilateral EVDO and contralateral EEDO into the EPU (**Figure 3a**). Two cases were verified as having EEDO into the MDC (**Figure 4a** and **4c**). One patient was diagnosed with EEDO in the urethra (**Figure 5**). Relevant diagnostic auxiliary examination results are listed in **Supplementary Table 1**.

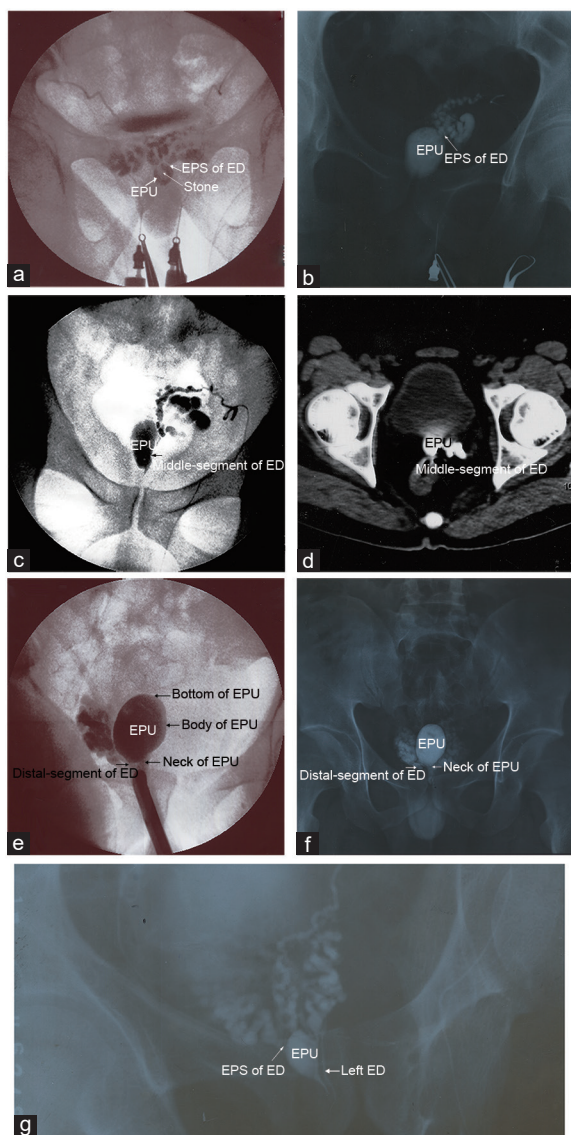
### Treatment

Two cases of EEDO in the MDC underwent transurethral fenestration of the cyst (**Figure 4c**), and the surgical margin was



**Figure 1:** EVDO into the EPU. (a) Percutaneous vasopuncture vesiculography displayed bilateral EVDO into the body of EPU, absence of bilateral seminal vesicles, and no reflux of contrast medium to the bladder; (b) the EPU was verified by retrograde contrast urethrography through the central outlet of seminal caruncle. No reflux of contrast medium to bilateral vas deferens was observed; (c) percutaneous vasopuncture vesiculography showed that the left vas deferens opened ectopically into the bottom of the EPU and the left seminal vesicle and the distal segment of the right vas deferens was absent; (d) right vas deferens angiography during open surgery proved right EVDO into the bottom of EPU. (e) The bilateral vas deferens during open surgery was found to open ectopically into the bottom of the EPU (Grade II), most of the wall was removed, the left vas deferens was ligated, and the wall of EPU was partially preserved to ensure the patency of the right seminal duct. VD: vas deferens; EVDO: ectopic vas deferens opening; EPU: enlarged prostatic utricle.

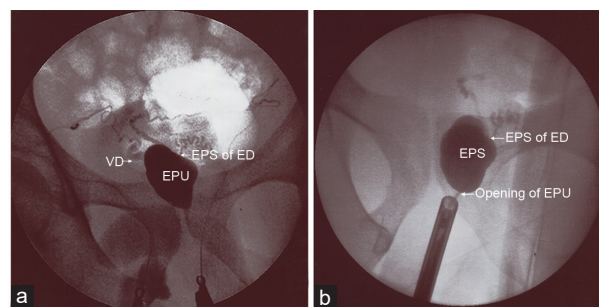
between the central opening of the caruncle and the neck of the bladder. Among 24 adults, 2 patients whose EPUs were relatively smaller underwent transurethral cold-knife incision on the opening and anterior wall of the EPU (**Figure 2a**), and transurethral fenestration of the EPU was performed in 19 patients whose EPUs were relatively larger. In addition, in some patients, intracapsular calculus measuring 3–7 mm were cleaned (**Figure 6**). Open or laparoscopic resection of the cyst was performed in three cases of ESTO in the neck of the EPU when conservative treatment was insufficiently effective (**Figure 2e** and **2f**). A 2-year-old infant diagnosed with bilateral EVDO in the EPU during operation underwent vasoligation on the left-epididymitis side and resection of most of the EPU (**Figure 1e**) with some cystic wall preserved for tubular reconstruction to ensure smooth flow of the contralateral seminal tract. Conservative therapy practiced in one patient proved to indicate right EEDO in the urethra (**Figure 5**).



**Figure 2:** EEDO into the EPU. (a) Percutaneous vasopuncture vesiculography showed that ectopic opening of the EPS of the bilateral ejaculatory duct into the bottom of EPU (Grade I) with intracapsular stones; (b) contrast radiography exhibited left EEDO into the bottom of the EPU (Grade II). The left seminal vesicle was dilated. The right vas deferens failed to be punctured; (c) percutaneous vasopuncture vesiculography displayed that the middle segment of the left ejaculatory duct opened ectopically into the body of the EPU; (d) computed tomography showed left EEDO into the body of the EPU, accompanying by hypoplasia of the right seminal tract; (e) percutaneous vasopuncture vesiculography failed, but retrograde contrast radiography under the cystoscope proved right EEDO into the neck of the EPU (Grade II); (f) delayed contrast radiography after retrograde intubation displayed bilateral EEDO opened ectopically into the neck of EPU (Grade II); (g) percutaneous vasopuncture vesiculography revealed that right EEDO opened ectopically into bottom of the EPU and normal left ejaculatory duct. ED: ejaculatory duct; EEDO: ectopic ejaculatory duct opening; EPU: enlarged prostatic utricle; EPS: external-prostatic-segment.

#### Follow-up

Twenty-seven patients were followed up for up to 43 months. Preoperative symptoms of discomfort were remarkably relieved after surgery and anti-inflammatory treatment. Although semen quality improved in those who complained of infertility after surgery, no



**Figure 3:** Unilateral EVDO and contralateral EEDO into the EPU. (a) Percutaneous vasopuncture vesiculography showed right EVDO and left EEDO into the bottom of EPU (Grade II); (b) retrograde contrast radiography indicated that the EPU and the contrast medium flowed into the bilateral seminal tract. EPS: external-prostatic-segment; EVDO: ectopic vas deferens opening; VD: vas deferens; ED: ejaculatory duct; EEDO: ectopic ejaculatory duct opening; EPU: enlarged prostatic utricle.

natural pregnancy was achieved. Fertility was obtained in two patients through intracytoplasmic sperm injection.

#### DISCUSSION

In the present clinical practice, ESTO is diagnosed mainly through intravenous urography, MRI, and voiding cystic urethrography.<sup>23</sup> Hence, cases of ESTO in the urinary tract can be identified effectively. On the contrary, we carried out percutaneous vasopuncture vesiculography in these cases, for which more cases of ESTO in the EPU and MDC can be discovered. Among these cases, complaints of hemospermia, hematuria, infertility, dysuria, or distending pain in the perineal emerged frequently, indicating that such patients often display these symptoms. Therefore, we need to consider the possibility of ESTO when diagnosing patients with such manifestations. Notably, percutaneous vasopuncture vesiculography should be considered when necessary.

Based on previous reports and our experience within the past 30 years, we proposed the following classification, which proved to be helpful to diagnose and treat these conditions in our clinical practice.

#### Overall classification

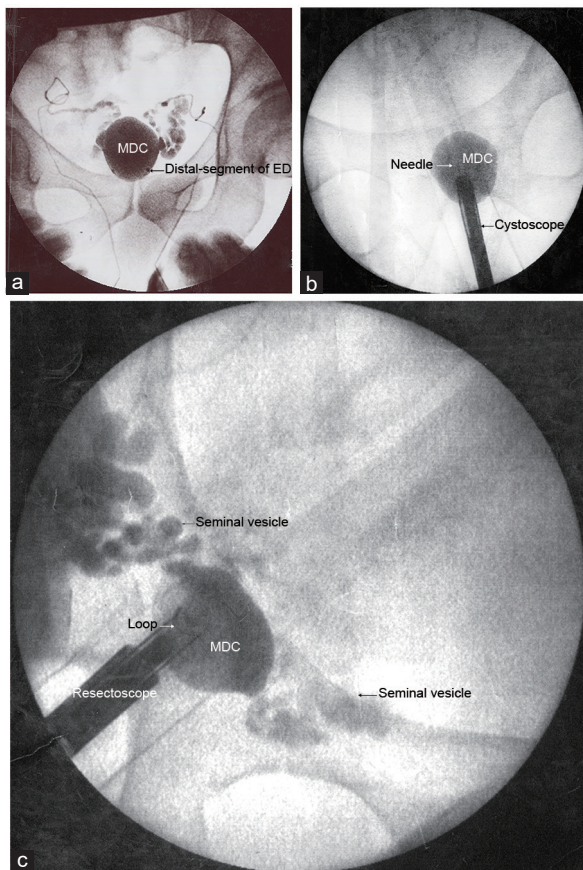
In general, they can be divided into three types according to the location of ESTO: (1) ESTO into the urinary tract, which can be located in the renal pelvis or calyx, ureter, bladder, and urethra; (2) ESTO into the Müllerian duct residual cyst, which can emerge in the MDC and the EPU; and (3) ESTO into the rectum, which was very rare.

Mainly, they can also be classified into EVDO and EEDO according to different parts of the seminal duct. Moreover, other types such as unilateral EVDO with contralateral EEDO and unilateral ESTO with normal or agenetic contralateral seminal tract have been found.

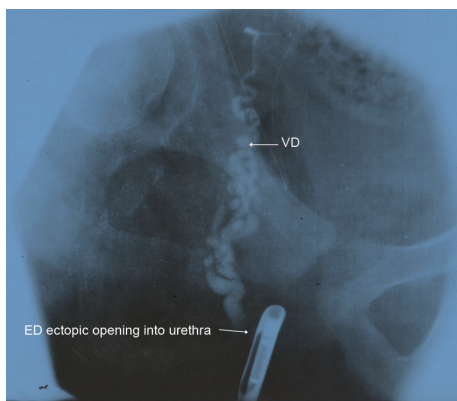
#### Types of ESTO into the EPU in our group

Five classification methods have been applied to these cases. First, according to the segment of the seminal tract for the ectopic opening, they can be divided into the following three types: (1) EVDO in the EPU is referred as Type I: 6 cases; (2) EEDO in the EPU is identified as Type II: 18 cases; and (3) unilateral EVDO with contralateral EEDO in the EPU is defined as Type III (also named mixed type): 1 case (Figure 3).

Second, in accordance with the segment of the ejaculatory duct for the ectopic opening, they can be divided into the following types: (1) external-prostatic-segment EEDO: 4 cases (Figure 2a and 2b); (2) middle-segment EEDO: 3 cases (Figure 2c); and (3) distal-segment EEDO: 11 cases (Figure 2e and 2f).

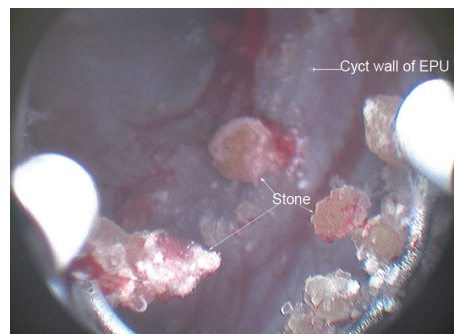


**Figure 4:** EEDO into the MDC. (a) Percutaneous vasopuncture vesiculography displayed that the distal segment of the bilateral ejaculatory duct opened ectopically into the MDC (Grade II). No contrast medium flowed into the bladder through the urethra; (b) MDC was developed through the cystic puncture and contrast medium injection under cystoscopy; (c) transurethral fenestration of the cyst was performed. ED: ejaculatory duct; EEDO: ectopic ejaculatory duct opening; MDC: Müllerian duct cyst.



**Figure 5:** EEDO in the urethra. Percutaneous vasopuncture vesiculography showed right EEDO into the urethra accompanied by dysplasia of the seminal vesicle and the left vas deferens. Urethroscopy proved right ESTO into the urethra. ESTO: ectopic seminal tract opening; VD: vas deferens; ED: ejaculatory duct; EEDO: ectopic ejaculatory duct opening.

Third, in accordance with the location of ESTO into the EPU, they can be classified into the following types: (1) bottom type: 10



**Figure 6:** Transurethral fenestration of the EPU. The operation was performed; multiple intracapsular stones were visible, varying 3–7 mm in size. EPU: enlarged prostatic utricle.

cases (Figure 1c–1e, Figure 2a and 2b); (2) body type: 12 cases (Figure 1a and Figure 2c); and (3) neck type: 3 cases (Figure 2e and 2f).

Fourth, based on the opening of the bilateral vas deferens and development of the contralateral seminal tract, they can be classified into the following types: (1) unilateral EVDO in the EPU with normal contralateral seminal tract is referred as Type Ia: none; (2) bilateral EVDO into the EPU is identified as Type Ib: 4 cases (Figure 1a); and (3) unilateral EVDO into the EPU with agenetic contralateral seminal tract is defined as Type Ic: 2 cases (Figure 1c).

Fifth, based on the opening of the bilateral ejaculatory duct and development of the contralateral seminal tract, they can be divided into the following three types: (1) unilateral EEDO into the EPU with normal contralateral seminal tract is referred as Type IIa: 10 cases (Figure 2g); (2) bilateral EEDO into the EPU is identified as Type IIb: 5 cases (Figure 2a and 2f); and (3) unilateral EEDO into the EPU with agenetic contralateral seminal tract is defined as Type IIc: 3 cases (Figure 2c and 2d).

A simple diagram of the above classification is shown in **Supplementary Figure 1–4**. In practical clinical work, the types of ESTO into EPU are mainly based on different anatomical positions of the vas deferens and the ejaculatory duct opening's location in the EPU and development of the contralateral seminal tract. ESTO can be a single type or be different combinations of the above types.

#### Clinical application

This classification is important because the type of ESTO and location of the opening in the EPU are tightly connected with clinical manifestations and the selection of therapeutic methods.

Based on our clinical experience, patients with EVDO in the EPU exhibited more severe symptoms than those with EEDO in the EPU owing to a higher grade and larger size of the cyst. In our group, there were six cases of EVDO in the EPU and their cysts were in Grade II (IKOMA grade),<sup>21</sup> of which the largest one was 7 cm × 12 cm in size. These cases were all complicated with agenesis of the ipsilateral seminal vesicle (Figure 1). In addition, patients diagnosed with external-prostatic-segment EEDO in the EPU displayed more serious manifestations than those with distal-segment EEDO in the EPU. Symptoms including infection, oligospermatisms, asthenospermia, infertility, and perineal discomfort are also positively related with the grade of EPU.

For patients with bilateral ESTO in the bottom or body of the EPU, therapeutic methods should be selected according to the EPU grade. Specifically, patients with relatively smaller EPU should undergo transurethral cold-knife incision on the opening and anterior wall of the cyst, while transurethral fenestration of the EPU should be conducted on patients with a relatively larger one.

In addition, excision of the EPU is not recommended because it may contribute to several unexpected conditions. For instance, the seminal tract located at the opening of the EPU may be removed; therefore, semen would not be excreted smoothly. However, if nonoperative treatments of severe symptoms have achieved little efficacy, surgery can also be considered. For patients with ESTO into the neck of the EPU (**Figure 2e** and **2f**), open resection or under-laparoscopic resection of the EPU can be considered. In the surgery, we should protect the opening of the seminal tract at the neck of the EPU and carve the opening of the EPU into the urethra simultaneously to ensure smooth semen flow.

For patients with unilateral ESTO into the EPU with a normal opening of the contralateral seminal tract (**Figure 2g**), therapeutic methods are mostly identical to those for patients with bilateral ESTO into the EPU, and normal opening should be protected during the operation. Patients with unilateral ESTO in the EPU with dysplasia or agenesis of the contralateral seminal tract (**Figure 2c** and **2d**) can be treated with the same approaches as those for patients with bilateral ESTO into the EPU.

Finally, for patients with ESTO in the EPU whose EPU is relatively smaller and related symptoms are mild, symptomatic treatment should be considered first and should be followed up thereafter.

## CONCLUSION

ESTO is rare and often associated with multiple malformations. Commonly, it is divided into three types named EVDO, EEDO, and mixed type (unilateral EVDO with contralateral EEDO). Locations of the ectopic opening include the urinary tract, the residual MDC, and the rectum. Moreover, it can be classified into unilateral and bilateral ectopic openings as well. Specifically, patients with unilateral ESTO can have normal or incompletely developed or absent contralateral seminal tract. In addition, EVDO is also associated with agenesis of the ipsilateral seminal vesicle. EEDO is divided into three types: external-prostatic-segment EEDO, middle-segment EEDO, and distal-segment EEDO. In addition, ESTO into the EPU can be classified into three groups consisting of the bottom type, body type, and neck type. In general, symptom data, physical examination, laboratory tests, imaging tests, and other methods are indispensable for diagnosis, among which percutaneous vasopuncture vesiculography is the most reliable. In addition, retrograde contrast radiography through opening of the EPU under urethrocystoscope can help us determine an exact diagnosis. Finally, treatment should adhere to the principle of individualization, aiming at eliminating symptoms, correcting malformations, protecting renal function, and restoring the semen outflow tract patency. Based on our experience and previous reports, a classification of ESTO has been proposed, which exerts a great impact on surgical method selection. Our study has some limitations. For example, we paid more attention to adults with hemospermia and infertility than to other patients and investigated more cases of ectopic opening into the EPU than those of ectopic opening into other structures.

## AUTHOR CONTRIBUTIONS

HFW and JGZ conceived of the study, designed and carried out the surgeries, made contributions in acquisition and analysis of the data, and drafted the manuscript. JZL, JQY, and WZX helped draft the manuscript and assisted in the analysis of the data. GDS and HBY

helped acquire and collect the data. All authors read and approved the final manuscript.

## COMPETING INTERESTS

The authors declared no competing interests.

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

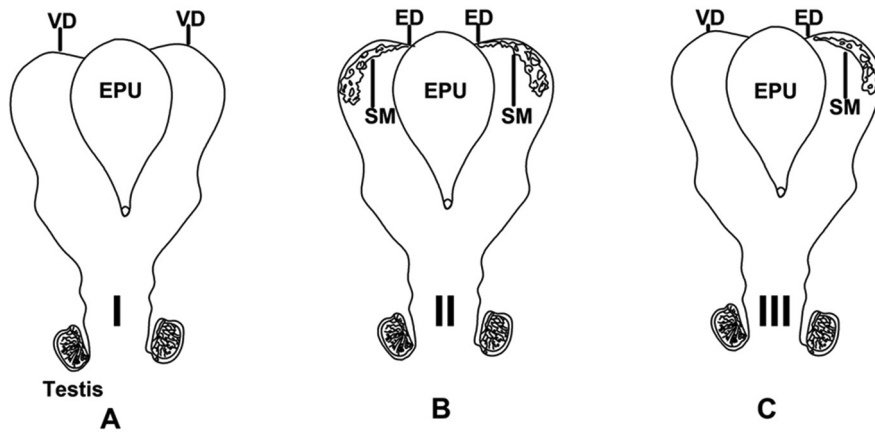
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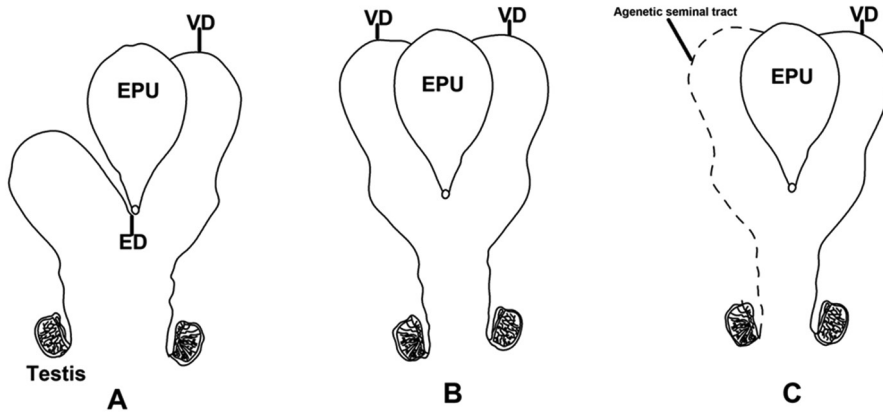
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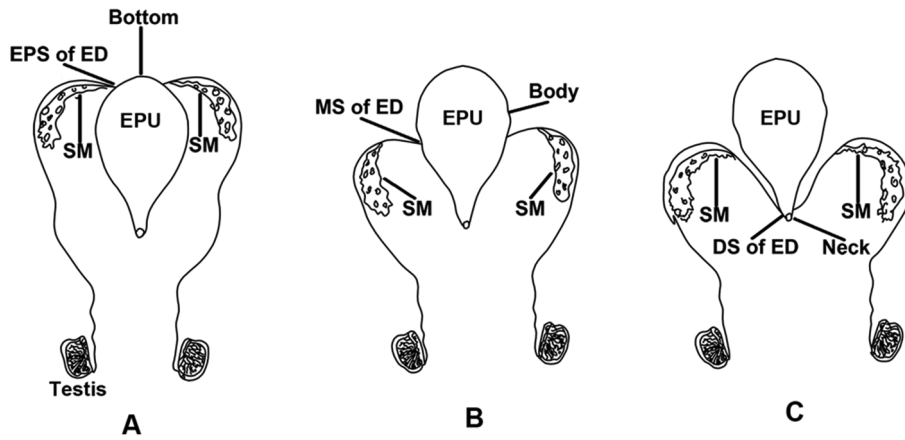




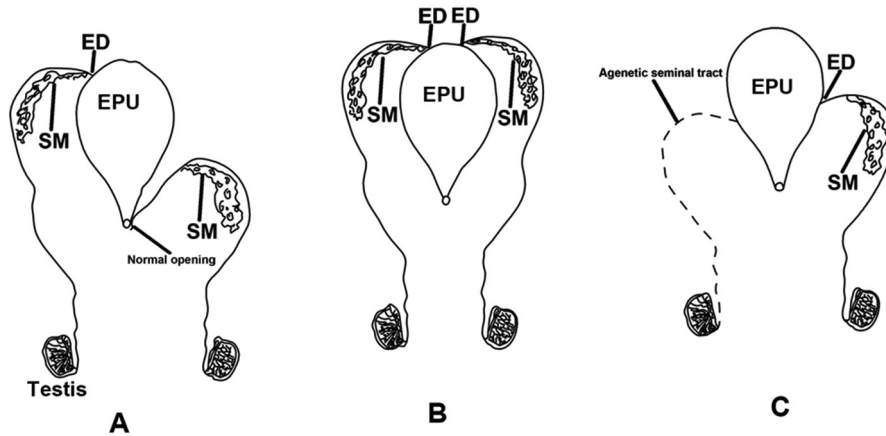
**Supplementary Figure 1:** A simple diagram of the classification according to the segment of the seminal tract for the ectopic opening. VD: vas deferens; ED: ejaculatory duct; SM: seminal vesicle; EPS: external-prostatic-segment; MS: middle-segment; DS: distal-segment.



**Supplementary Figure 2:** A simple diagram of the classification in accordance with the segment of the ejaculatory duct for the ectopic opening. VD: vas deferens; ED: ejaculatory duct; EPS: external-prostatic-segment.



**Supplementary Figure 3:** A simple diagram of the classification in accordance with the location of ESTO into the EPU and the opening of the bilateral vas deferens and development of the contralateral seminal tract. VD: vas deferens; ED: ejaculatory duct; SM: seminal vesicle; EPS: external-prostatic-segment; MS: middle-segment; DS: distal-segment.



**Supplementary Figure 4:** A simple diagram of the classification based on the opening of the bilateral ejaculatory duct and development of the contralateral seminal tract. VD: vas deferens; ED: ejaculatory duct; SM: seminal vesicle; EPS: external-prostatic-segment; MS: middle-segment; DS: distal-segment.

**Supplementary Table 1:**

These 28 cases detailed results of complaints, physical examination, laboratory tests, and imaging, treatment methods and follow-up are available.

No.	Age (year)	Marriage and Childbearing Status	Complaint	Physical Examination	Laboratory Examination	Imaging Examination	Percutaneous vasopuncture vesiculography (PVV)	Retrctrograde urethrography(RU), Urethroscope (US)and Retrograde catheterization Radiography(RC R)	Diagnosis	Treatment	Follow-up
1	31	Married for 4 years; Childbearing (-)	Hemospermia for 1 year; Infertility	Dysplasia of right vas deferens (VD)	Routine semen test (RST) Asthenospermia	BU(B ultrasound): cystic substance (20*30mm) between bilateral SM; CT: cystic	Ectopic opening of left middle - segment of ED into body of EPU (Fig.2c)	RU: enlarged prostatic utricle (EPU) (30mm*21mm)	Ectopic opening of left middle-segment (MS) of ED into body of EPU (grade II); Dysplasia of right VD and SM	Transurethral fenestratio n of the utricle +Calculus removing	36 months No hemospermia; Enhanced sperm viability; Infertility



						calculus; dysplasia of right seminal vesicle (SM)(Fig.2D)					
2	26	Married for 6 years; Childbearing (-)	BU showed cyst in the SM area (47*26mm)	DRE: cystic masses above prostate	RST: Azoospermia Testicular biopsy: normal spermatogenesis	CT: cystic substance (52*36mm) behind bladder	Ectopic opening of bilateral VD into body of EPU (Fig.1a)	RCR: EPU(60*40mm); Invisible VD. (Fig.1b)	Ectopic opening of bilateral VD into body of EPU (grade II); Agenesis of bilateral SM.	Transurethral fenestration of the utricle	43 months: Asthenospermia; Childbearing(-)
3	30	Married; Childbearing (+)	Hemospermia for 1 year	Normal testicle, epididymis and VD	RST: normal sperm count and viability; RBC++; WBC+	BU: cystic substance (18*12mm) between bilateral SM	Ectopic opening of EPS of right ED into body of EPU (grade I );Nor mal opening of left ejaculatory		Ectopic opening of external- prostate segment (EPS) of right ED into body of EPU (grade I );Norma l opening of left	Transurethral fenestration of the utricle	7 months: RST: normal

							duct (ED).(Fig.2g)		ED		
4	32	Married; Childbearing (+)	Hemospermia for 8 months	Normal testicle, epididymis and VD	RST: Normal sperm count and viability; RBC++; WBC+	BU: cystic substance (17*10mm) between bilateral SM	Ectopic opening of left DS of ED into body of EPU; PVV in the right was failed	US: Normal opening of left ED	Ectopic opening of left distal-segment (DS )of ED into body of EPU (grade I )	Transurethral fenestration of the utricle	10 months: RST: normal
5	41	Married; Childbearing (+)	Hemospermia for 5 months	Normal testicle, epididymis and VD	RST: Normal sperm count and viability; RBC++; WBC+	BU: cystic substance (13*9mm) between bilateral SM	Ectopic opening of left DS of ED into neck of EPU; Normal opening of right ED		Ectopic opening of left DS of ED into neck of EPU (grade I );	Transurethral fenestration of the utricle	6 months: RST: normal
6	30	Married for 5 years; Childbearing	Infertility	Dysplasia of right VD	Azoospermia	BU and CT: cystic substance (30*26 mm)	Ectopic opening of left DS of ED into neck of EPU	RCR: EPU (30*26mm); Invisible left SM and VD	Ectopic opening of left DS of ED into neck of EPU (grade II );	Transurethral fenestration of the	13 months: Asthenospermia; Childbearing(-

		(-)				behind bladder; Dysplasia of right SM			Dysplasia of right VD	utricle	)
7	38	Married for 10 years; Childbearing (-)	Infertility	Normal testicle and VD; Enlarged epididymis	Spermatozoa	BU and CT: cystic substance (46*38 mm) behind bladder	Ectopic opening of bilateral DS of ED into body of EPU		Ectopic opening of bilateral DS of ED into body of EPU (grade II)	Transurethral fenestration of the utricle	18 months: RST: Asthenospermia; Childbearing (-)
8	16	Marriage(-)	Hypospadias; Small penis	Small penis; hypospadias; dysplasia of left VD	Urine test: WBC+	BU: Dysplasia of bilateral SM	Ectopic opening of right DS of ED into urethra; dysplasia of left VD(Fig.5)	US: Opening of right ED into urethra	Ectopic opening of right DS of ED into urethra; Dysplasia of left VD	Observation	Loss
9	25	Married for 4 months; Childbearing	Frequent urination; Fetid sperm;	DRE: cystic masses	RST: Azoospermia; WBC++++	BU and MRI: Cystic substance	Contrast radiography of VD in surgery:		Ectopic opening of right VD into bottom of EPU	Open surgery Resection	10 months: Perineal discomfort

		g (-)	Perineal discomfort	behind prostate		(80mm*38mm) behind bladder, thick cystic wall, dysplasia of bilateral SM	Ectopic opening of right VD into bottom of EPU (Fig.1d)		(grade II);	of EPU; Ligation and resection of right VD.	recovered; RST: Few WBC in semen; Azoospermia
10	48	Married; Childbearing g (+)	Hemospermia for over 1 year	Normal testicle, epididymis and VD	RST: normal sperm count and viability; RBC+++; WBC+	BU: cystic substance (11*9mm) below bladder, with focal strong echo in cyst	Ectopic opening of bilateral DS of ED into body of EPU	RU: Visible EPU, contrast agent retrograding into bilateral SM	Ectopic opening of bilateral DS of ED into body of EPU (grade I ); Intracystic calculus	Transurethral fenestration of the utricle; Calculus removing	12 months: RST: normal
11	46	Married; Childbearing g (+)	Hemospermia for over 10 years	Normal testicle, epididymis and VD	RST: Normal sperm count and viability; RBCs+++;	BU and CT: cystic substance (14mm*	Ectopic opening of left DS of ED into body of EPU.	US: Normal opening of right ED	Ectopic opening of left DS of ED into body of EPU (grade I );	Transurethral fenestration of the	12 months: RST: normal

					WBC++	10mm) behind bladder, with little calculus in cyst	Normal opening of right ED		Intracystic calculus;	utricle; Calculus removing	
12	27	Married; Childbearing (+)	Hemospermia for 3 months	Normal testicle, epididymis and VD	RST: Normal sperm count and viability; RBC+++	BU and CT: cystic substance (33*25mm) behind bladder, with little calculus in cyst.		Contrast radiography via EPU under US: Cyst (34mm*25mm), contrast retrograding into bilateral SM(Fig 2 e.2f)	Ectopic opening of bilateral DS of ED into neck of EPU (grade II); Intracystic calculus	Resection of EPU under laparoscopic	10 months: RST: normal
13	35	Married for 5 years; Childbearing (-)	Infertility; Perineal discomfort after excreting semen	Enlarged epididymis DRE: cystic masses behind	RST: Azoospermia	BU: cystic substance (35*38mm) behind bladder	Ectopic opening of bilateral DS of ED into body of Mullerian duct cyst; No	RU: Cyst was not developed	Ectopic opening of bilateral DS of ED into body of MDC (Grade II)	Transurethral fenestration of the MDC	12 months Relieved perineal discomfort; RST: Oligospermia

				prostate			contrast agent in urethra (Fig.4a)				sm and asthenospermi a
14	30	Married for 2 years; Childbearing (-)	Infertility	DRE: cystic masses behind prostate	RST: Azoospermia; Testicular biopsy: Normal spermatogenesis	BU: cystic substance (31*28mm) behind bladder	Ectopic opening of bilateral DS of ED into body of MDC; No contrast agent in urethra	Contrast radiography via puncturing cyst under UC: visible SM(Fig 4b); RST: Necrospermia	Ectopic opening of bilateral DS of ED into body of Mullerian duct cyst	Transurethral fenestration of the MDC (Fig.4c)	18 months: Childbearing-; Oligospermia asthenospermi a
15	46	Married; Childbearing (+)	Hemospermia	Normal testicle, epididymis and VD	RST: Normal sperm viability; RBC+++; WBC+	BU and CT: cystic mass (12*10mm) behind bladder	Ectopic opening of left DS of ED into bottom of EPU; Normal right ED	RCR under cystoscope: EPU (12*10mm), visible VD and SM	Ectopic opening of left DS of ED into bottom of EPU (grade I );	Transurethral fenestration of the utricle	6 months: RST: Normal semen
16	47	Married; Childbearing	Hemospermia	Normal testicle,	RST: Normal; RBC+++; WBC+	CT: cystic mass	Ectopic opening of EPS	Contrast radiography under	Ectopic opening of EPS of right	Transurethral	12 months: RST: Normal

		g (+)		epididymis and VD		(11*9mm) behind bladder, with calculus in cyst	of right ED into bottom of EPU (Fig.2a)	cystoscope: EPU (12*10mm); Visible VD and SM	ED into bottom of EPU (grade I )	fenestration of the utricle; Calculus removing	semen
17	31	Married for 5 years; Childbearing g (-)	Infertility; Hemospermia	Normal testicle, epididymis and VD	RST: Azoospermia; RBC+++; WBC+	BU: cystic mass(25*20mm) behind bladder	Ectopic opening of right MS of ED into body of EPU; Normal left ED		Ectopic opening of right MS of ED into body of EPU (grade I );	Transurethral fenestration of the utricle	12 months: RST: Azoospermia
18	28	Married for 2 months; Childbearing g (-)	Frequent, urination, Hemospermia, and perineal discomfort for 2 months	Normal testicle and VD; Enlarged epididymis; DRE: cystic masse	RST: Azoospermia; RBC+++; WBC+; Testicular biopsy: Normal spermatogenesis	BU: cystic mass (60*38mm) behind bladder	Ectopic opening of bilateral VD into body of EPU; Agenesis of bilateral SM	RCR under cystoscope: EPU (110*75mm); Visible bilateral VD	Ectopic opening of bilateral VD into body of EPU (grade II); Agenesis of bilateral SM; Massive cyst	Open resection of EPU; Ligation of bilateral VD	12 months: Symptom-; RST: Azoospermia; Fertility after ICSI treatment

				above prostate							
19	45	Married; Childbearing (+)	Hemospermia for 8 months	Normal testicle, epididymis and VD	RST: Normal sperm count and viability; RBC+++; WBC+	BU: cystic mass (22*15mm) between bilateral SM; CT: identical manifestation + calculus in cyst	Ectopic opening of left MS of ED into body of EPU ; Normal right ED	RCR under cystoscope: EPU (22*16mm); Contrast agent retrograding into left VD and SM	Ectopic opening of left MS of ED into body of EPU (grade I )	Transurethral fenestration of the utericle; Calculus removing	12 months: RST: Normal semen



20	19	Marriage (-)	Frequent urination; Perineal discomfort; Constipation and dysuria fetid semen for 1 month;	Postoperative changes of perineum type hypospadias; Dysplasia of right VD; DRE: cystic mass above prostate	Urine test: purulent cell+++; RST: Azoospermia; RBC+++; WBC+++	BU and CT: cystic mass(70*66mm) behind bladder; thick cystic wall; dysplasia of right SM; Enhanced CT scan: obvious enhance ment of cystic wall	Ectopic opening of left VD into body of EPU ; Associated infection; Dysplasia of right VD	RCR under cystoscope: EPU (100*70mm); Invisible bilateral VD	Ectopic opening of left VD into body of EPU (grade II ) with infection; Dysplasia of right VD	Transurethral fenestration of the utricle	43 months: Urine test; Normal RST: Azoospermia
21	34	Married for 10 years; Childbearing (-)	Infertility	Nodule in right VD; Agenesis of remaining distal-	RST: azoospermia; Testicular biopsy: normal spermatogenesis	BU: little cyst in prostate; CT: prostate cyst (42*36mm);	Ectopic opening of left VD into bottom of EPU; Absence		Ectopic opening of left VD at bottom of EPU (grade II ); Absence of SM;	Transurethral fenestration of the utricle	17 months: RST: Asthenospermia

				testicle segment;		Agnesis of bilateral SM	of SM-; Agnesis of distal-testicle segment of right VD (Fig. 1c)		Agnesis of right VD		
22	35	Married; Childbearing (+)	Hemospermia for 4 years; ejaculation with calculus discharging	Normal testicle, epididymis and VD	RST: normal sperm count and viability; RBC+++	BU: cystic mass (38*28mm) above prostate, with strong echo in cyst	Ectopic opening of EPS of left ED into bottom of EPU; The right VD failed to puncture (Fig.2b)	US: normal opening of right ED	Ectopic opening of EPS of left ED into bottom of EPU (grade II); Calculus in cyst;	Transurethral fenestration of the utricle; Calculus removing	6 months: RST: Normal semen
23	28	Marriage(-)	Hemospermia for 4 months	Normal testicle, epididymis and VD	RST: azoospermia; RBC+++; WBC++	BU: cyst behind prostate; CT: cyst	Ectopic opening of right ED and EPS of left ED	RCR under cystoscope: visible EPU; Contrast agent	Ectopic opening of right ED and EPS of left ED into bottom of	Transurethral fenestration of the	4 months after operation: Hemospermia-;

						(44*30mm) above prostate; agenesis of right SM	into bottom of EPU; Agenesis of right SM; Dysplasia of left SM(Fig.3a)	retrograding into left VD and SM(Fig.3b)	EPU (grade II); Agenesis of right seminal vesicle; Dysplasia of left SM	utricle	16 months after operation: Enhanced sperm viability; Infertility
24	38	Married for 10 years; Childbearing (-)	Infertility	Normal testicle, epididymis and VD; DRE: cystic masses above prostate	RST: Asthenospermia	BU, CT and MRI: cyst (45*32mm) behind prostate	Ectopic opening of bilateral distal- segment VD into body of EPU		Ectopic opening of bilateral distal- segment VD at body of EPU (grade II)	Transurethral fenestration of the utricle	17 months: Asthenospermia; Enhanced sperm viability
25	26	Married for 1 year; Childbearing	Infertility	Dysplasia of right VD	Oligoasthenospermia	BU: cyst(25*20mm)	Ectopic opening of left ED into bottom		Ectopic opening of left ED into bottom of EPU	Transurethral fenestration	24 month: Asthenospermia

		g (-)				behind prostate	of EPU (grade I); Dysplasia of left SM and right VD		(grade I); Dysplasia of left SM and right VD	n of the utricle	Enhanced sperm count
26	2	child	Recurrent left epididymis pain; Fever for 2 months; Urethral purulence	Apparently enlarged epididymis with apparent pain; Purulence at urethral opening	Urine test: purulent cells+++	CT: cystic mass (42mm*31mm) behind prostate			Ectopic opening of bilateral VD into bottom of EPU (grade II); Agenesis of bilateral SM	Ligation of left VD, resection of major left EPU and tubular plasty of remaining cystic wall (Fig. 1e)	3 months: Urine test(-); Chronic inflammation of left epididymis
27	35	Married; Childbearing g (+)	Hemospermia for 5 years; Perineal discomfort	Normal testicle, epididymis and VD; DRE:	RST: Asthenospermia	BU: cyst(30mm*21mm) behind prostate	Ectopic opening of left ED into bottom of EPU; Normal	Contrast radiography under cystoscope: EPU (20mm*10mm); Contrast agent	Ectopic opening of right ED into bottom of EPU (grade I)	Transurethral fenestration of the utricle	6 months: Hemospermia(-); RST: normal No Perineal

			for 3 months	cystic masses above prostate			opening of left ED	retrograding into a relatively larger cyst (30mm*20mm) and right SM			discomfort
28	39	Married; Childbearing (+)	Hemospermia for 1 year	Normal testicle, epididymis and VD	RST: normal sperm count and viability; RBC (++); purulent cells++	BU: cyst (11mm*6mm) behind prostate	Ectopic opening of EPS of right ED into bottom of EPU; Normal opening of left ED		Ectopic opening of EPS of right ED into bottom of EPU (grade I );	Transurethral fenestration of the utricle	6 months: Hemospermia(-)