Analysis of the efficacy of different surgical approaches in the treatment of hematospermia by Transurethral seminal vesiculoscopy

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Research Article

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Abstract

**Background:** At present, the popularity of Transurethral seminal vesiculoscopy in the treatment of hematospermia is increasing. However, there is still a lack of discussion regarding different surgical approaches. Meanwhile, the underlying predictors of efficacy are also unclear.

**Objective:** To explore the efficacy of different approaches of seminal vesiculoscopy surgery and the predictive factors of good treatment outcome.

**Materials and methods:** A retrospective analysis of 68 patients who underwent seminal vesiculoscopy for hematospermia in our hospital from January 2015 to January 2021. According to different surgical approaches, they were divided into three groups—natural ejaculatory ducts (method A, 45 cases), assisted transurethral resection/incision of ejaculatory ducts (TURED/TUIED) (method B, 14 cases), fenestration in prostatic utricle (method C, 9 cases). We analyzed the recurrence rate of the three surgical approaches and the predictive factors of treatment efficacy.

**Results:** The total recurrence rate after the seminal vesiculoscopy for hematospermia in this group was 32.35%. The postoperative recurrence rates of the three methods were 24.44% for method A, 50.00% for method B and 44.44% for method C, among which method A was the lowest, and there was no significant difference among the three methods (p>0.05). The data of five predictors of 45 cases in method A group were included in the single-factor Logistic analysis, the results suggest that whether complicated with seminal tract stones/cysts was an effective predictor (OR 0.250, p=0.022), which was still an effective predictor in the multi-factor Logistic analysis model (OR 0.244, p=0.010).

**Discussion:** Seminal tract stones/cysts may increase the risk of hematospermia recurrence.

**Conclusion:** The postoperative recurrence rate of hematospermia treated by Transurethral seminal vesiculoscopy technique is low, and the intraoperative natural orifices approach through the ejaculatory duct has the lowest recurrence rate. Complicated with seminal tract stones/cysts can be an effective predictor of good postoperative outcome.

1 Introduction

Hematospermia is a distressing symptom for patients. The causes that need to be considered include genitourinary system infections, vascular malformations, stones, inflammations, tumors and systemic diseases that increase the risk of bleeding. Although most of them are self-limiting, some patients have frequent or persistent hematospermia, which requires further evaluation and intervention by urologists.\(^1\)

The treatment of hematospermia includes conservative treatment and surgical treatment. In conservative treatment, antibiotics can be used for pathogenic microorganism infections. Certain drugs such as Finasteride can also be used to help relieve hematospermia caused by Benign Prostatic Hyperplasia, and to help patients with idiopathic and refractory hematospermia who has ruled out other organic diseases.\(^2\)
However, long-term medication and high recurrence rate are the major problems of refractory hematospermia. Surgical treatment includes open surgery, laparoscopic technique, and transurethral seminal vesiculocopy technique. It is difficult to expose seminal vesicles since they are located deep in the pelvis. Laparoscopy or open surgery requires extensive dissection, the operation consumes lots of time, and complications including severe bleeding and damage to the peritoneal organs such as the rectum may occur. In 1998, Yang et al. successfully performed endoscopic examination of the seminal vesicles on the patient for the first time. Since then, a new chapter has been opened in the examination and treatment of the seminal tract and seminal vesicles; Numerous clinical studies have shown that Transurethral seminal vesiculocopy is a safer and more effective treatment. According to the local patency of the ejaculatory duct orice, the surgical approaches include the natural ejaculatory duct (A), transurethral resection/incision of ejaculatory duct (TURED/TUIED) combined with seminal vesiculocopy (B), the fenestration in prostatic utricle (PU) combined with seminal vesiculocopy (C), seminal vesiculocopy through the pathological opening in PU (D). Currently, there are few comparative data on the efficacy of different surgical approaches for the treatment of hematospermia. This study intends to explore the efficacy of different approaches for the treatment of hematospermia by seminal vesiculocopy.

## 2 Materials And Methods

### 2.1 Clinical data

From January 2015 to January 2021, the data of patients who underwent seminal vesiculocopy due to hematospermia in the First Affiliated Hospital of Fujian Medical University were collected. This study was approved by the First Affiliated Hospital of Fujian Medical University Ethics Committee. All patients had failed or had poor response to at least one conservative therapy for three months. The patients underwent routine seminal vesicle MRI scan plus enhanced examination before surgery; All patients underwent seminal vesiculocopy surgery.

Inclusion criteria: 1. Persistent typical hematospermia; 2. Normal urine routine and prostatic fluid examination; 3. Persistent or recurrent hematospermia after 3 to 6 months of systemic antibiotics or local physical therapy.

Exclusion criteria: 1. Patients with congenital abnormalities or tumors in the genitourinary tract as determined by preoperative MRI and transrectal ultrasonography; 2. Patients with systemic hemorrhagic disease.

A total of 68 patients were included in the study: ages range 22–65 years old, with an average age of 40.49 years. The duration of disease ranged from 3 to 240 months, with a median of 14.5 months. 39 cases were unilateral, and 29 cases were bilateral. MRI revealed fresh bleeding in 7 cases. 43 cases had complicated with seminal tract stones/cysts. The A method was used in 45 cases, the B method was used in 14 cases, and the C method was used in 9 cases. (Table 1)
Table 1
Demographic data of enrolled patients

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Age (year)</strong></td>
<td>40.49 ± 11.40</td>
</tr>
<tr>
<td>duration of disease (month)</td>
<td>14.50 (9.25, 36.0)</td>
</tr>
<tr>
<td>side of the lesion</td>
<td></td>
</tr>
<tr>
<td>unilateral</td>
<td>39</td>
</tr>
<tr>
<td>Bilateral</td>
<td>29</td>
</tr>
<tr>
<td>Fresh bleeding revealed by MRI</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7</td>
</tr>
<tr>
<td>No</td>
<td>61</td>
</tr>
<tr>
<td>Seminal tract stones/cysts</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>43</td>
</tr>
<tr>
<td>No</td>
<td>25</td>
</tr>
<tr>
<td>Surgical approach</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>45</td>
</tr>
<tr>
<td>B</td>
<td>14</td>
</tr>
<tr>
<td>C</td>
<td>9</td>
</tr>
</tbody>
</table>

2.2 Observation indicators

The indicators collected and analyzed in this study include age, duration of disease, unilateral/bilateral lesions, seminal vesicles MRI showed fresh bleeding/non-fresh bleeding, whether complicated with seminal tract stones/cysts and surgical approach. 1-year follow-up for recurrence situation, (first ejaculation from the first week after surgery, regular ejaculation every week, at least once; It is normal that there still is visible blood in the semen during ejaculation within one month after the operation. The standard of recurrence is: regular ejaculation after the operation, at least four times ejaculation per month, it is a recurrence when there still is visible blood in the semen three months after operation), according to the above-mentioned postoperative outcome, the predictive factors are included for statistical analysis.

2.3 Surgical methods

The patient is placed in the lithotomy position after successful anesthesia. Take the outer urethra as the center, routinely disinfect and the towels are spread. A 12F catheter was indwelled for drainage, Wolf 4.5/6.5F rigid ureteroscope was used as surgical endoscope and connected with TV imaging system. The endoscope was inserted into the bladder through the urethra under direct vision with normal saline as perfusion solution. The urethra and bladder were observed for stones, diverticulum and tumors.
Method A: Retreat the endoscope body to the verumontanum to see whether the appearance and shape of the verumontanum are normal. Put the seminal vesiculoscopy into the verumontanum cavity (PU), explore the PU and exit the PU. At 5 o'clock, enter the cavity of the left seminal vesicle, check for bleeding, stones, cysts or old blood clots, and rinse with normal saline repeatedly; if the stones are combined, connect the holmium laser to perform seminal vesicle lithotripsy. The stones are crushed into powder and rinsed and cleared; if a seminal vesicle cyst or an ejaculatory duct cyst is combined, a related cystectomy is performed. Withdraw the endoscope to the left ejaculatory duct and determine the position of the PU again, enter the right seminal vesicle at 7 o'clock in the PU; explore and process the seminal vesicle cavity in the same way.

Method B: Resection/incision through the ejaculatory duct of the urethra in case of obstruction of the ejaculatory duct orifice or PU's orifice, and then into the seminal vesicle cavity through the ejaculatory duct; the same method is used to explore and process the seminal vesicle cavity.

Method C: If it is difficult to find the ejaculatory duct orifice or the ejaculatory duct orifice is occluded or cannot be recanaled at the PU, it can be penetrated into the seminal vesicle cavity through the side channel at the weak mucosa under the guidance of Zebra Urological Guidewire.

In all patients, the seminal vesicle flushing fluid was routinely sent for bacterial culture during the operation, and finally confirmed that there was no active bleeding in the operation cavity. A 16F three-chamber silicone urinary catheter was indwelled and 15ml of water was injected to end the operation.

**2.4 Statistical methods**

SPSS 26.0 software was used for statistical analysis of the data. Continuous variable data are expressed as mean ± standard deviation (x ± S), data of discontinuous variables are represented by median (25% interval, 75% interval). The postoperative recurrence rate of different methods was analyzed by Fisher's exact probability method. According to the postoperative outcome, a single-factor Logistic analysis was performed, and related factors were included. The effective predictors obtained by taking p < 0.05 were then included in the multivariate Logistic model analysis. If p was still less than 0.05, the predictors were considered effective. Take the bilateral p < 0.05 has statistically significant.

**3 Results**

**3.1 Surgical efficacy**

All 68 patients underwent the operation without obvious complications (such as bleeding, perineal pain and discomfort, ejaculation dysfunction, orchitis, epididymitis, etc.); Within one year after surgery, there were 11 patients with method A recurring (recurrence rate 24.44%), 7 patients with method B recurring (recurrence rate 50.00%), and 4 patients with method C recurring (recurrence rate 44.44%). There was no significant difference in the recurrence rate of each approach after operation. (p = 0.144). (Table 2)
Table 2
Comparison of the efficacy of three surgical approaches (n = 68)

<table>
<thead>
<tr>
<th>Surgical methods</th>
<th>recurrent</th>
<th>Non-recurrent</th>
<th>Recurrence rate (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method A</td>
<td>11</td>
<td>34</td>
<td>24.44</td>
<td>0.144</td>
</tr>
<tr>
<td>Method B</td>
<td>7</td>
<td>7</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>Method C</td>
<td>4</td>
<td>5</td>
<td>44.44</td>
<td></td>
</tr>
</tbody>
</table>

3.2 Analysis of predictive factors of good postoperative outcome (A method)

According to the outcome of hematospermia within one year after surgery, five factors including age, duration of disease, presence of stones/cysts in the seminal tract during the operation, unilateral/bilateral lesions, and whether the seminal vesicle MRI manifested fresh bleeding or non-fresh bleeding, due to a small quantity of B and C methods, the Single Logistic Analysis was performed on the A method showed that the factor of intraoperative complications of seminal tract stones/cysts was statistically significant \( p = 0.250, \) OR 0.022. After the inclusion of Multiple Logistic Analysis, it was still statistically significant \( p = 0.010, \) OR 0.244, there was no significant logistic regression correlation between other factors and good outcomes after surgery \( p > 0.05). \) (Table 3)

Table 3
Logistic Analysis of predictors of postoperative efficacy (n = 68)

<table>
<thead>
<tr>
<th></th>
<th>Single Logistic Analysis</th>
<th>Multiple Logistic Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95%CI)</td>
<td>p</td>
</tr>
<tr>
<td>age</td>
<td>1.032 (0.981, 1.085)</td>
<td>0.220</td>
</tr>
<tr>
<td>Duration of disease</td>
<td>1.008 (0.997, 1.019)</td>
<td>0.165</td>
</tr>
<tr>
<td>Unilateral/Bilateral lesions</td>
<td>0.582 (0.173, 1.954)</td>
<td>0.381</td>
</tr>
<tr>
<td>whether combined with seminal tract stones/cysts</td>
<td>0.250 (0.076, 0.821)</td>
<td>0.022</td>
</tr>
<tr>
<td>whether the seminal vesicle MRI manifested fresh bleeding or non-fresh bleeding</td>
<td>0.281 (0.026, 3.102)</td>
<td>0.300</td>
</tr>
</tbody>
</table>
4 Discussion

With the development of endoscopy and minimally invasive technology, more and more diseases that required open surgery or difficult to treat in the past have been treated with a new look; Although hematospermia will not bring serious consequences to men, however, its frequent appearance has a negative impact on male reproductive health and mental health, and even harms the relationship between couples; Recently, the seminal vesiculoscopy technique has played an essential role in the treatment of hematospermia, ejaculatory duct obstructive azoospermia and other diseases, and the popularity has gradually increased. This has brought significant benefits to related patients, meanwhile, it has also required higher standards for urologists. This study initially explores the comparison of the efficacy of different surgical approaches and disease conditions in the treatment of hematospermia with seminal vesiculoscopy.

Current status of hematospermia and operation methods

Hematospermia is defined as the appearance of blood during ejaculation. In most cases, hematospermia is painless, self-limiting and benign, but it often leads to considerable anxiety and fear in patients. Hematospermia is usually caused by inflammation, infection, as well as tumors or other systemic diseases. In many patients with hematospermia, ejaculatory duct stones have been found to be the root cause of hematospermia. For these patients with hematospermia combined with stones in the seminal vesicles or ejaculatory ducts, preoperative imaging is very crucial. Since seminal vesicle stones are usually not only small, but also low in hardness, Computerized Tomography (CT) is not a proper choice for detecting refractory hematospermia caused by such small stones, but merely large ones. The location of blood accumulation within the seminal vesicle can be determined and the presence of low signal shadow within the seminal vesicle can be clearly indicated by Magnetic Resonance Imaging (MRI), In addition, transrectal ultrasound screening (TRUS) has also been adopted to evaluate patients, and to detect ejaculatory duct stones in patients with hematospermia, nevertheless, compared with TRUS, MRI examination owns a better positive rate, moreover with the ability of detecting stones principally composed of protein materials. Therefore, our research routinely performs seminal vesicle MRI scan and enhanced examination before surgery. At present, the treatment of hematospermia mainly includes conservative treatment and surgical treatment. The surgical treatments mainly include open surgery, laparoscopic surgery, and transurethral seminal vesiculoscopy. Most open surgical approaches used to treat primary or secondary lesions of the seminal vesicle glands have inherent disadvantages and require a significant incision to enter. However, open surgery requires extensive anatomy, which may result in complications which are linked to exposed surgical fields, prolonged operation time and intraperitoneal rupture. To overcome these complications, laparoscopic and endoscopic methods are alternatives to standard surgical treatment. Laparoscopy is the first choice for surgery with large stones in seminal vesicles or ejaculatory ducts; Seminal vesiculoscopy technique has advantage in exploring the distal end of the seminal tract under direct vision, clarifying the etiology and the diagnosis of hematospermia,
and in performing treatment at the same time. Such treatment involves clearing the blood clots or stones, as well as the seminal vesicle fluid which is infected inside the seminal vesicle cavity,\(^4\,6\) hence, the seminal vesiculoscopy is the highly recommended technique at present. Liao et al.\(^20\) conducted a Meta-analysis on 584 patients and showed that the transurethral seminal vesiculoscopy technique is more effective than conventional drug therapy in treating hematospermia, with a lower recurrence rate; Compared with seminal vesicle puncture and catheterization, there is no difference in efficacy, but the incidence of postoperative complications and the recurrence rate of hematospermia is lower; Wang et al.\(^21\) found that in 64 cases of seminal vesiculitis treated with seminal vesiculoscopy, three months after the operation, 52 cases of hematospermia disappeared completely, 8 cases of hematospermia became weak, and 4 cases of hematospermia did not change. Therefore, it shows that the seminal vesiculoscopy has a definite effect in the treatment of hematospermic seminal vesiculitis, and can inspect the seminal vesicles, remove stones and inflammatory substances, no obvious complications were observed, and it is worthy of clinical promotion. In our data, the total recurrence rate of patients with hematospermia after seminal vesicle endoscopy is 30.61%, which also shows that seminal vesiculoscopy can achieve correspondingly satisfactory efficacy in the treatment of hematospermia. Of course, the operating space of the seminal vesicles is relatively small, and the surgeon needs to be trained in systematic intracavitary techniques, while the movements shall be gentle and delicate during the operation to avoid iatrogenic injuries and postoperative complications.

**The birth of seminal vesiculoscopy technique and its surgical approach**

Ozgok et al. was first reported to remove the seminal vesicle stones through transurethral endoscopy in 2005. The patient was placed in the lithotomy position. After successful anesthesia, the 6.9 F flexible ureteroscope was used to enter the seminal vesicle through the guide wire, and then the stones were crushed with forceps. The following year, Cuda et al and Modi announced the clinical application of seminal vesiculoscopy lithotripsy,\(^16\,18\,22\) with both achieving satisfactory results, and the Transurethral seminal vesiculoscopy technique has been gradually developed. At present, the comparisons of the efficacy between different surgical approaches of seminal vesiculoscopy are rather limited. It is reported by Chen et al. that among 419 patients, 8 (1.9%), 32 (7.6%), and 341 (81.4%) patients were treated with three methods A, D, and C, respectively, and the remaining patients 38 cases (9.1%) failed the operation.\(^23\) Liao et al.\(^24\) implemented A, B, and C methods in 7 (2.3%), 229 (75.1%), and 38 (12.5%) patients among 305 patients. The remaining 9 cases (3.0%) failed the operation. Besides, Hu et al.\(^25\) performed seminal vesiculoscopy surgery in 38 patients with hematospermia, of which method A accounted for 3. 21%, the C method accounted for 88. 89%. In summary, it can be shown that fewer patients have successfully undergone seminal vesiculoscopy examination and treatment through the natural orifices, and most of them are successfully performed by the method of establishing a side channel at the bottom of the PU. In addition, there are still a few patients who had failed the operation due to seminal vesicle gland atrophy or deformities and other reasons.\(^26\) However, the above cases were all performed when the natural
orifices of the ejaculatory duct could not be successfully entered, and there is still a lack of comparison of the postoperative effects of different approaches; Even so, natural orifices approach is still the mainstream, and various incisions and local invasive operations should be avoided as much as possible; Our conclusion is that the recurrence rate of patients after the natural orifices approach is the lowest. Let’s analyze the reasons: 1. In terms of the severity of the disease, the method of Fenestration in prostatic uricle (PU) and the method of transurethral resection to expose the ejaculatory duct orifice is applicable to the obstruction of the ejaculatory duct or the disease of the spermary duct. Both approaches are performed when the natural orifices cannot be accessed normally. Since various pathological changes have changed the original natural anatomical cavity, compared with the patients who can enter and operate through the natural orifices, the degree of changes in each stage of the seminal tract is also more serious. The author suspects that compared with various incisions, it may indicate that the pathological changes in the seminal tract or seminal vesicle involving the ejaculatory duct orifices are milder. When pathological factors such as seminal tract stones/cysts are removed, the recurrence rate of hematospermia is significantly reduced. 2. The effect of intraoperative operation on the efficacy: We supposed that surgery can enter the endoscope through the natural orifices without incision, and it’s analyzed that it retained the original anatomical structure to the greatest extent and reduced the interference to the entire seminal tract. And it can buffer the pressurization effect of the seminal tract smooth muscle contraction on the seminal vesicles during ejaculation, offset (inhibit) the reverse conduction force, and avoid the re-invasion of the seminal vesicles; However, due to the structural changes of the TURED/TUIED and Fenestration in prostatic uricle(PU), the fluid mechanics of the seminal tract may be changed, which will have an adverse effect on the seminal tract or seminal vesicle; Similar to the formation of turbulence when blood flows through the area of the artery dissection, it is easy to form thrombus. In addition, it changes the relatively smooth and straight anatomical structure of the original ejaculatory duct and is prone to pressure impact at its end corners, which in turn changes the semen fluid mechanics. Local incision or the establishment of new channels may form edema zone, scars, chronic inflammation and even cause local narrowing of the seminal tract, which may increase the chance of bleeding caused by the reoccurrence of related lesions.

The influence of anatomical factors on the approach of seminal vesicles endoscopy

It is worth mentioning that our data lacks a comparison with anatomy-related influencing factors. At present, scholars at home and abroad are still in the exploratory stage of understanding the anatomy of the ejaculatory duct; the distribution of the ejaculatory duct may directly affect the design of the surgical approach. Li et al. 27 first proposed that the ejaculatory duct opening is because the surface is covered with a one-way valve, which causes the ejaculatory duct orifices to be hidden and difficult to find; Shao et al.28 conducted a statistical analysis of the ejaculatory duct orifices of 56 patients with seminal vesicles surgery, It cuts the edge of the PU from the top of the seminal verumontanum midline, and divides the
ejaculatory duct orifice into three types. The success rate of different access channels for different types is different.

Through the analysis of the predictive factors of the efficacy of the natural orifices approach, it is found that the combined seminal tract stones/cysts are effective predictors of non-recurrence after hematospermia surgery. According to the foregoing discussion: The predictive factor for this stone is based on entering through a natural orifice. Let's discuss and analyze the reasons: Many cases of seminal vesicle stones are related to urinary tract infection, abnormalities, obstruction and ejaculatory reflux. 

Liu et al. used seminal vesiculoscopy to diagnose and treat patients with persistent and recurrent hematospermia and found that the infection may first stimulate the thickening of the ejaculatory duct membranous wall, leading to stenosis, and aggravating the infection due to impaired drainage. In some cases, infection and stenosis can also lead to the formation of stones. Conversely, stones can also cause obstruction and frequent recurrence of infections. In short, stenosis, infection and stones form a vicious circle, leading to infection, it cannot be improved or eradicated even if antibiotics are used, and eventually leading to persistent or recurrent hematospermia. Removing the stones is equivalent to breaking the vicious circle chain and restoring the patency of the fine tract. Urine reflux may also be the cause of the formation of stones in the seminal tract. When the discharge of ejaculatory duct secretions is blocked, urine reflux, siltation and subsequent debris, coupled with urinary tract infection and seminal vesiculitis, can lead to the occurrence and formation of seminal vesicle stones and ejaculatory duct stones. This makes the ejaculatory duct and the entrance of the seminal vesicles become a one-way valve, through the natural orifice to crush and take the stones, to relieve the obstruction of the stones, and directly dredge the spermatic tract. It reduces the possibility of bleeding due to increased pressure of the seminal vesicles or ejaculatory ducts in the later stage.

Clinically, there are also cases of urine reflux after transurethral ejaculectomy, which may also be related to entering the ejaculatory duct through an unnatural orifice; Since the ejaculatory duct has no sphincter function, such as peristalsis or contraction, only an acute angle between the ejaculatory duct and the prostatic urethra can prevent urine reflux; Animal experiments have found that the relationship between the seminal vesicle and the ejaculatory duct is similar to the relationship between the bladder and the urethra. When we open a hole to enter the ejaculatory duct, theoretically it is a fake channel; if the size of the hole is too large, it may cause reflux, if the size of the hole is too small, it may lead to recurrent stenosis or even occlusion after surgery, and the two results also form the inducement of hematospermia recurrence.

Some studies have found that stones can be formed due to blockage of cysts or poor drainage of secretions during ejaculation. When cysts and stones persist, drainage is blocked; Moreover, the thickness of the walls of the seminal vesicle glands and ejaculatory ducts in patients with seminal vesicle stones increases, which will cause the discharge of secretions to be blocked. Therefore, only by removing the cause of the stones can it be relieved or returned to normal, thereby improving the state of hypertension in the seminal vesicle glands, and no hematospermia will appear after the operation.
Besides, when the physiological state of the seminal vesicle glands is disturbed, stones may also form, causing hematospermia; the seminal vesicle glands work together with other reproductive organs to produce and excrete semen containing mature sperm.\textsuperscript{2, 41} However, the seminal vesicle is not a reservoir of semen; its main function is to secrete a liquid, which is composed of protein, fructose and various enzymes that provide nutrition for sperm,\textsuperscript{2, 42} These substances indirectly form the basis of the stone composition. When the semen is not discharged smoothly, the concentration of these mixtures accelerates the formation of the stone.

There are some limitations in this study. Retrospective study itself exists bias. With the comparison of the efficacy of each influencing factor and the analysis of the difference in the surgical approach, in the foreseeable future, with the expansion of the case numbers, as well as further research and statistical analysis on the technical level,

It is believed that the surgical indications for the treatment of hematospermia with seminal vesiculoscopy will be more clearly, the efficacy of surgery will be further improved, and more discoveries will be made to provide guidance for the in-depth application of seminal vesiculoscopy, so as to better solve the problems of patients.

\textbf{5 Conclusion}

The postoperative recurrence rate of hematospermia treated by Transurethral seminal vesiculoscopy technique is low, and the intraoperative natural orifices approach through the ejaculatory duct has the lowest recurrence rate. Complicated with seminal tract stones/cysts can be an effective predictor of good postoperative outcome.

\textbf{Declarations}

\textbf{Ethics approval and consent to participate}

Ethics approval was obtained from Ethics Committee of the First Affiliated Hospital of Fujian Medical University (MTCA,ECFAH of FMU [2015] No.084). Written informed consent was obtained from all patients for participating in this study. All methods were carried out in accordance with relevant guidelines and regulations.

\textbf{Consent for publication}

Consent for publication was obtained from all individual participants included in the study.

\textbf{Availability of data and materials}

All data generated or analyzed during this study are included in this published article [and its supplementary information files].
Competing interests

The authors declare that they have no competing interests.

Funding

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Author's contributions

Rui-Jie Yao, Hui-Liang Zhou, and Song-Xi Tang initiated and designed this article. Xi Chen, Yi-Lang Ding and Hong Xiao were responsible for literature search and data acquisition. Shu-Shen Chen, Xi Chen and Hong Xiao executed analysis and interpretation of data; Rui-Jie Yao, Zhi-Hao Feng and Shu-Shen Chen wrote the first draft of the manuscript, Yi-Lang Ding Hui-Liang Zhou and Song-Xi Tang provided critical revision for important intellectual content. Rui-Jie Yao, Hui-Liang Zhou, and Zhi-Hao Feng provided the English writing improvement. All authors were given input to the final manuscript and approved the version to be published.

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References


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- data.xlsx