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ORIGINAL RESEARCH ARTICLE

Clinical application of transurethral resection/electrocautery for urethral hemangiomas: two centers retrospective cohort study

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ABSTRACT

Background: We aimed to evaluate the safety and efficacy of transurethral resection/electrocautery for the treatment of urethral hemangiomas.

Methods: A retrospective analysis was conducted on clinical data from patients who underwent transurethral resection/electrocautery for urethral hemangiomas at two medical institutions between August 2018 and July 2025. Perioperative data, short-term and long-term complications, and tumor recurrence were assessed.

Results: In total, 42 patients were included in this study. All patients successfully underwent surgical treatment without any intraoperative complications and residual tumor. The procedures were completed in a median operative length of 10 min (interquartile range [IQR]: 10–15 min) and a median blood loss volume of 20 mL (IQR: 10–20 mL). Most patients (n = 39, 92%) presented multiple lesions, with a median size of 4 mm (IQR: 3–4 mm). The lesion range of the 31 patients (74%) was more than one-half of the circumferential diameter in cystourethroscopy. Postoperative complications occurred in five patients (12%), primarily consisting of difficult urination (n = 4, 10%) and gross hematuria (n = 1, 2%). The median follow-up times were 12.0 months (IQR: 8.0–38.5 months), and one patient developed recurrence 4 months after surgery. Long-term complications, such as urethral stricture, urinary incontinence, and retrograde ejaculation, were observed.

Conclusion: Transurethral resection/electrocautery provides a safe, effective, and feasible treatment for urethral hemangiomas, delivering swift hemostasis with very low rates of complications and recurrence. Although this study included the largest sample size currently available worldwide, the findings still need additional validation.

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Urethral hemangiomas; transurethral resection; transurethral electrocautery; recurrence; complications

Introduction

Urethral hemangioma is a rare and benign vascular malformation along the urethral tract. It is an under-recognized and treatable cause of persistent hematospermia or post-ejaculatory hematuria [1–4]. Population-level incidence or prevalence has not been reliably determined, and available evidence comes mainly from case reports and small series in adult men, with sporadic cases in women and children that broaden the demographic spectrum [5–8]. Since initial work-ups often prioritize infection, prostatitis, and calculi, small posterior-urethral vascular lesions may be overlooked, prolonging symptoms and anxiety [2, 9]. Conventional ultrasonography, computed tomography (CT) and magnetic resonance imaging (MRI) have limited sensitivity for superficial, low-volume vascular abnormalities, whereas cystourethroscopy enables definitive diagnosis by offering same-session management [1, 3, 4, 10].

Therapeutically, endoscopic management is the standard approach for most urethral hemangiomas. Transurethral electrocautery/resection is widely available and achieves rapid hemostasis when energy delivery is conservative and tactics are matched to lesion morphology [1, 2, 10, 11]. Laser ablation has been proposed as an alternative in small case series [12–15]. Diffuse or circumferential urethral hemangiomas is uncommon but still detected [16–20]. Despite encouraging results, available evidence remains heterogeneous and largely case-based.

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Comparison of effectiveness across modalities, links between endoscopic phenotype and recurrence, and standardized follow-up protocols remain poorly explored [3, 4, 12].

We aimed to (1) characterize symptom triggers, such as ejaculation; (2) assess immediate hemostasis, perioperative safety, and recurrence after electrosurgical treatment; and (3) contextualize these outcomes within the existing literature and outline pragmatic, phenotype-guided decision points for endoscopic management.

Materials and methods

Case collection

A retrospective analysis was conducted on clinical data from patients who underwent transurethral resection/electrocautery for urethral hemangiomas at the two hospitals between August 2018 and July 2025. The following data were included for analysis: demographic characteristics (gender, age, body mass index [BMI], reason for visit, predisposing factors [sexual activity, defecation]), comorbidities (vascular malformation, Klippel-Trenaunay syndrome, and Sturge-Weber syndrome), smoking history, alcohol consumption history, past medical history (chronic urinary tract infection, previous transurethral surgery, and coagulopathy), family history of hemangioma, recent medication use (anticoagulants and hormonal drugs), imaging results, and surgical parameters (preoperative hemoglobin, postoperative hemoglobin, surgery date, surgical approach, American Society of Anesthesiologists (ASA) grade, operation time, residual tumor status, intraoperative blood loss, intraoperative complications, duration of postoperative catheterization, ability to void normally after catheter removal, ICU admission in perioperative period, postoperative in-hospital complications and corresponding management, and the incidence of Clavien-Dindo grade II or higher complications). Follow-up data included the length of follow-up, recurrence (yes/no), time to recurrence, complications during follow-up, time of occurrence, management, and the incidence of Clavien-Dindo grade II or higher complications.

The inclusion criteria were as follows: (1) age ≥ 18 years; (2) treatment with transurethral resection/electrocautery; (3) endoscopic diagnosis of urethral hemangiomas; and (4) complete clinical and follow-up data.

The exclusion criteria were as follows: (1) age < 18 years; (2) severe cardiac, pulmonary, or cerebrovascular diseases deemed as contraindications for surgery; (3) undergoing treatments other than transurethral resection/electrocautery; (4) concurrent major surgery; and (5) incomplete clinical or follow-up data.

The study protocol was approved by the Institutional Ethics Review Boards of both participating hospitals, and written informed consent was obtained from all participants. This study conformed to the principles of the Declaration of Helsinki.

Data definitions

(1) Imaging examinations primarily included ultrasound, CT, and MRI. (2) Intraoperative blood loss was recorded as 5 mL in cases where no significant bleeding was documented. (3) Regarding postoperative complications, given that most patients experience frequency, urgency, and dysuria after catheter removal, symptoms that typically resolve within 3–5 days, such symptoms were not regarded as complications unless they persisted for more than 5 days after catheter removal. (4) The last follow-up date was uniformly set as September 23, 2025. Follow-up was conducted via outpatient visits, telephone calls, or WeChat communication. Recurrence was defined as the time from the surgery date to the recurrence of hemangioma.

Transurethral resection/electrocautery

Under general or intrathecal anesthesia, the procedure began at the external urethral orifice with continuous irrigation to maintain a clear surgical field. Particular attention was paid to the membranous urethra and the region surrounding the seminal vesicles. In cases with no obvious protrusion, a repeat pressure was applied using an electrocautery loop. Suspicious areas were treated with low-temperature electrocoagulation or electroresection. Throughout the resection process, optimal visibility was maintained, and the resection depth was restricted to the mucosal layer only, ensuring that the muscle layer was not compromised.

Statistical analysis

All statistical analyses were conducted using SPSS 25.0. Given the small sample size, the normality of data were assessed using the Shapiro–Wilk test, with a $p > 0.05$ suggesting normal distribution. Continuous variables with a normal distribution are presented as mean ± standard deviation (SD), while data without a normal distribution are expressed as median and interquartile range (IQR). Categorical variables are summarized as the number of cases (*n*) and percentage (%).

Results

Baseline characteristics

Initially, 47 patients with urethral hemangiomas were identified. Based on the exclusion criteria, five patients were excluded for the following reasons: not undergoing transurethral resection/electrocautery ($n = 2$), surgery performed at another institution ($n = 1$), unknown timing of catheter removal ($n = 1$), and missing postoperative hemoglobin level ($n = 1$). Therefore, 42 patients were included in the final analysis.

Table 1 summarizes the baseline clinical characteristics of 42 patients who were enrolled. The patients were predominantly male (91%), with a mean age of 40.8 ± 8.9 years. The median BMI was 25.2 kg/m^2. The most common symptom was gross hematuria (79%), followed by hematospermia (10%). The

Table 1. Baseline characteristics for 42 patients with urethral hemagioma diagnosed in August 2018 and July 2025 in Shijiazhuang and Chongqing.

Basic characteristic	*n* = 42
Gender (*n*, %)	
Male	38 (91%)
Female	4 (10%)
Age, mean (SD), years	40.8 ± 8.9
BMI, median (IQR), kg/m^2	25.2 (22.9–26.1)
Reason for visit (*n*, %)	
Gross hematuria	33 (79%)
Hematospermia	4 (10%)
Hematospermia/hematuria	2 (5%)
Dribbling	3 (7%)
Incentive (*n*, %)	
None	2 (5%)
Sexual life	37 (88%)
Stool	3 (7%)
Combined disease (*n*)	
Abnormally developed vessels	0
Klippel-Trenaunay syndrome	0
Sturge-Weber syndrome	0
Post-traumatic stress	0
First/Recurrence (*n*, %)	
First	40 (95%)
Recurrence	2 (5%)
History of smoking (*n*, %)	19 (45%)
History of alcohol consumption (*n*, %)	22 (52%)
Past medical history (*n*, %)	
History of urinary tract chronic infection	13 (31%)
History of transurethral procedures	1 (2%)
History of coagulation disorder	0
Family history of hemangioma (*n*)	0
Anticoagulation used prior to urethral hemangioma onset (*n*)	0
Hormone therapy prior to urethral hemangioma onset (*n*)	0

BMI: body mass index; SD: standard deviation; IQR: interquartile range.

symptoms were primarily triggered by sexual activity in most cases (88%), while defecation was a trigger in three patients. Most presentations were primary (95%), with only two (5%) being recurrent. Approximately half of the patients had a history of smoking (45%) or alcohol drinking (52%). Thirteen patients (31%) reported a history of chronic urinary tract infection and one patient (2%) had a prior history of transurethral surgery. Notably, no patients had associated systemic diseases (e.g. vascular malformations, Klippel-Trenaunay syndrome, or Sturge-Weber syndrome), a family history of hemangioma, coagulopathy, or a history of anticoagulant/hormonal medication use. Furthermore, preoperative imaging studies, including ultrasound, CT, or MRI, revealed no abnormalities in any of the patients.

Treatment and follow-up

All 42 patients successfully underwent surgical treatment without any intraoperative complications, such as hemorrhage, urethral perforation, bladder injury, or damage to adjacent organs.

Table 2. Treatment details of urethral hemangioma (*n* = 42).

Procedure	(*n*, %)
Transurethral electrocautery	37 (88%)
Transurethral resection	5 (12%)
Preoperative hemoglobin, mean (SD), g/L	135.8 ± 12.4
Postoperative hemoglobin, mean (SD), g/L	129.7 ± 9.9
△ hemoglobin (Postoperative vs. Preoperative), mean (SD), g/L	6.2 ± 4.8
ASA grade (*n*, %)	
I	3 (7%)
II	39 (93%)
Procedure time, median (IQR), min	10 (10–15)
Intraoperative blood loss, median (IQR), mL	20 (10–20)
Tumor size, median (IQR), mm	4 (3–4)
Location (*n*, %)	
Posterior urethra	38 (91%)
Anterior urethra	2 (5%)
Anterior urethra + posterior urethra	2 (5%)
Range (*n*, %)	
Ring	15 (36%)
Half ring	16 (38%)
Local	9 (21%)
Other	2 (5%)
Number (*n*, %)	
Solitary	3 (7%)
Multiple	39 (93%)
Residual tumor after surgery (*n*)	0
Intraoperative complications (*n*)	0
Indwelling urinary catheter time, median (IQR), days	6 (5–7)
Transferred to ICU during hospitalization (*n*)	0
Postoperative complications (*n*, %)	
Total complications	5 (12%)
No patency when urinating	4 (10%)
Gross hematuria	1 (2%)
Urethral stricture	0
Urinary incontinence	0
Retrograde ejaculation	0
Urethral hemorrhage	0
Ejaculation pain	0
Clavien grade ≥ II	0

ASA: ; SD: standard deviation; IQR: interquartile range.

Furthermore, no residual tumor was observed. Most patients (88%) were treated with electrocautery, while the remainder (12%) underwent transurethral resection (Table 2). The procedures were characterized by short operative times, with a median of 10 min (IQR: 10–15 min), and minimal blood loss, with a median of 20 mL (IQR: 10–20 mL). In total patients, lesions of 91% patients were located within posterior urethra; lesions of 5% patients were located beyond anterior urethra; lesions of 5% patients were located both within anterior urethra and posterior urethra. Most patients (*n* = 39, 93%) had multiple lesions, with a median size of 4 mm (IQR: 3–4 mm). The lesion range of 31 patients (74%) was more than one-half of the circumferential diameter in cystourethroscopy. The mean preoperative hemoglobin level was 135.8 ± 12.4 g/L, which decreased to 129.7 ± 9.9 g/L postoperatively, resulting in a mean reduction of 6.2 ± 4.8 g/L. Figure 1 shows histological microphotography of urethral hemangiomas and Figure 2 shows cystourethroscopy

Table 3. Follow-up details of urethral hemangioma ($n = 42$).

Follow-up	$n = 42$
Follow-up time, median (IQR), months	12.0 (8.0–38.5)
Recurrence (*n*, %)	1 (2%)
Complications (*n*, %)	
Total complications	1 (2%)
Clavien grade ≥ II	0
Urinary tract infection	1 (2%)
Urinary incontinence	0
Urethral stricture	0
Hematuria	0

IQR: interquartile range.

findings of urethral hemangiomas: dilated blood vessels and slightly protuberant before seminal colliculus.

The median use of indwelling catheterization was 6 days (IQR: 5–7 days), and all catheters were successfully removed. After removing the catheters, five patients reported transient dysuria, and one patient experienced urinary frequency. These symptoms resolved spontaneously. Postoperative complications occurred in five patients (12%), primarily comprising difficult urination ($n = 4$, 10%) and gross hematuria ($n = 1$, 2%). All complications were mild and resolved with conservative management or observation alone. None of the complications met the criteria for Clavien-Dindo grade ≥ II. The median follow-up time was 12.0 months (IQR: 8.0–38.5 months; Table 3). One patient developed urinary tract infection 3 days after discharge from the hospital and was treated with antibiotics. One patient developed recurrence 4 months after surgery. No long-term complications, such as urethral stricture, urinary incontinence, or retrograde ejaculation, were observed.

Discussion

To our knowledge, this study reported the largest cohort of adult patients with urethral hemangiomas treated by transurethral electrocautery/resection and we found that the immediate hemostasis rates were high, perioperative events were uncommon and low-grade, and recurrence was infrequent. Taken together, these findings support the efficacy of a conservative, morphology-matched electrosurgical strategy for non-diffuse urethral hemangiomas [12–15]. In this cohort, durable control appeared to depend primarily on disciplined technique and complete lesion coverage, rather than on the specific energy device, which aligns with the pragmatic emphasis of contemporary endoscopic practice.

Electrosurgery was performed well across typical clinical scenarios in this condition [1, 2, 12–15]. Procedures were short and blood loss was minimal, with no intraoperative complications. Postoperative symptoms consisted mainly of transient dysuria or self-limited hematuria, and we observed no Clavien ≥ II events. Two practical attributes likely explain this performance. Firstly, availability and cost-effectiveness: electrosurgical units and loop electrodes are ubiquitous in urologic operating rooms. They enable timely and definitive therapy even in centers where holmium, KTP, or Nd:YAG systems are not available. Secondly, technical versatility allows phenotype-matched energy delivery, using low power, short activations, continuous electrode motion, and ample irrigation to achieve wide, paint-style coagulation for reticular or superficial networks and precise point control for nodular foci. In this cohort, intraoperative inspection revealed no visible residual at the end of the procedure, and lesions were predominantly small, non-diffuse, and circumferential, and multiplicity was a common finding. This profile is compatible with a coverage-oriented endoscopic strategy and is consistent with the high rate of immediate hemostasis observed in our cohort. These attributes support durable outcomes when treatment depth is conservative and coverage is complete.

The high proportion of multiple lesions (93%) suggests a field effect in the posterior urethral vascular plexus, which may account for occasional satellite recurrences despite complete treatment of the dominant focus. Patterns of recurrence and methods of prevention need specific attention. Small satellite foci outside the visible nidus, recanalization within the perilesional plexus, and incomplete coverage in anatomically constrained zones may explain bleeding recurrence after complete treatment. Our technical approach addresses all etiologies. For extensive overlapping lesions, low-energy passes expand the effective margin of treatment. For nodular or clustered lesions, meticulous point-by-point coverage decreases the chance of residual islands. In sites where anatomy limits exposure or where the risk of thermal spread is high, a staged plan is preferred over deeper coagulation. The low recurrence is consistent with this phenotype-specific, coverage-oriented approach [20]. Laser ablation has been employed in small series with a high primary hemostasis rate and a low morbidity rate when energy density was conservative and margins were fully treated [12–15, 20]. For rare diffuse or circumferential involvement, previous studies adopted staged endoscopic sessions, and in selected cases, they conducted selective arterial embolization after multidisciplinary review [10, 16–18, 20]. In selected sphincter-adjacent lesions, imaging modalities, such as narrow-band imaging, have been reported to contribute to margin delineation [21]. Building on these findings, the implications for procedural planning are clear. Evaluation is best applicable to clinically enriched cohorts, not to unselected screening populations. Posterior-urethral vascular lesions are more likely to be found in men with persistent hematospermia or post-ejaculatory hematuria after an unsuccessful routine work-up, particularly when bleeding is linked to ejaculation [22]. In such patients, early cystourethroscopy shortens time to diagnosis and allows same-session treatment when feasible, minimizing the need for repeated evaluations and alleviating patient anxiety. After identifying a vascular lesion, the procedural target is complete coverage at a conservative depth, using the technique described above to limit thermal deposition and maintain visualization.

Safety outcomes in our cohort were favorable with judicious technique. During follow-up, we did not observe urethral stricture in the electrosurgical group, although the absence of events in a two-center retrospective series does not preclude

risk. Published laser series also reported a low incidence of stricture [12–15, 23]. The safety profile likely reflects consistent application of key safety considerations, notably avoidance of deep coagulation in sphincter-adjacent zones and conservative energy delivery. These elements can be readily reproduced across centers and can be incorporated into standard operating protocols. For most phenotypes, transurethral electrocautery/resection provides rapid symptom relief with a low risk of significant morbidity. Recurrence is typically manageable with a planned endoscopic re-intervention that follows the same phenotype-matched principles. Since evidence remains heterogeneous and largely case-based, we advise realistic expectations about additional treatments in cases with diffuse or anatomically challenging disease, while emphasizing the overall favorable risk-benefit profile of an electrosurgical first approach.

Several limitations should be considered when interpreting these results. The study design was retrospective. In addition, energy parameters and photographic documentation showed some heterogeneity, which is common in practice-based series of rare diseases [10, 15]. Finally, while our cohort predominantly included adult men, previous studies have shown that urethral hemangiomas can occur in women and children, warranting cautious generalization and necessitating the development of phenotype descriptors that can be applied across demographics [5–8].

Conclusion

Transurethral electrocautery/resection is a safe and effective first-line treatment for urethral hemangiomas. It offers rapid and reliable hemostasis with minimal blood loss and short operative time. Perioperative complications are uncommon, typically mild, and self-limited. Long-term complications, including urethral stricture, appear uncommon, suggesting favorable functional outcomes. Taken together, these findings indicate that transurethral electrocautery/resection offers durable symptom control with a low complication rate and high practicality in routine clinical practice. It should be considered the preferred endoscopic option for the majority of urethral hemangiomas.

Disclosure statement

Jian-Feng Huang, Rong-Hua Wu, Jin-Chun Qi, Tao Guo, Fan He, Yan-Yang Jin, and Liang Liu have no conflicts of interest or financial ties to disclose.

Authors' contributions

All authors have read and approved the final manuscript.
Jian-Feng Huang: conceptualization, methodology, formal analysis, writing – review & editing.
Rong-Hua Wu: methodology, formal analysis, writing – original draft preparation, writing – review & editing.
Jin-Chun Qi: writing – original draft preparation, writing – review & editing.
Tao Guo: conceptualization, methodology, formal analysis.
Fan He: conceptualization, methodology, formal analysis.
Yan-Yang Jin: methodology, formal analysis, writing – original draft preparation, writing – review & editing.
Liang Liu: methodology, formal analysis, writing – original draft preparation, writing – review & editing.

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Ethical approval

Ethics approval was obtained from the Institutional Ethics Review Boards of both participating hospitals.

Informed consent

All participants in the cohort submitted their written informed consent.

Use of large language models, AI and machine learning tools

None declared.

Data availability statement

The data can be made available on reasonable request.

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