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Prostatic stromal tumor of uncertain malignant potential: a case report and literature review

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Abstract

Prostatic stromal tumors, encompassing prostatic sarcoma and stromal tumors of uncertain malignant potential (STUMP), represent an exceedingly rare category of prostatic diseases, with a prevalence of less than 1%. We present a rare case involving a man in his early 40s diagnosed with STUMP. Despite presenting with normal prostate-specific antigen (PSA) concentrations, the patient experienced persistent dysuria and gross hematuria for >7 months, leading to an initial misdiagnosis of benign prostatic hyperplasia. Persistent symptoms prompted further investigation, with magnetic resonance imaging (MRI) revealing a suspicious lesion on the left side of the prostate, initially thought to be malignant. Transrectal prostatic biopsy subsequently confirmed the presence of mucinous liposarcoma, with no medical history of diabetes, coronary heart disease, or hypertension. The treatment approach comprised robot-assisted laparoscopic radical prostatectomy, culminating in a postoperative pathological definitive diagnosis of STUMP. This case underscores the indispensable role of early MRI in the diagnostic process, highlighting the necessity of detailed pathological examination for a conclusive diagnosis. Our report aims to illuminate the diagnostic challenges and potential treatment pathways for STUMP, emphasizing its consideration in the differential diagnosis of prostatic tumors to advance clinical outcomes in this rare but important condition.

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Introduction

Prostatic stromal tumors are divided into prostatic sarcoma and stromal tumor of uncertain malignant potential (STUMP), which account for <1% of prostate cancers.[1] Prostatic stromal tumors are characterized mainly by atypical and distinctive mesenchymal cellular hyperplasia in the prostate gland and have been categorized as a specific mesenchymal tumor because of the unique development in prostatic tissue.[2] As a unique entity, these tumors include multiple subtypes. Early studies described STUMP as a prostate phyllodes tumor, atypical stromal hyperplasia, cystic liposarcoma, and cystic epithelial stromal tumor.[3] The age of patients with STUMP ranges widely from 23 to 81 years,[4–6] and occurs mainly in those aged 50 to 70 years (Table 1). Typical clinical manifestations comprise urinary tract obstruction, hematuria, elevated serum prostate-specific antigen (PSA) concentration, and abnormal digital rectal examination findings, and may even affect sexual function.[7] In rare cases, STUMP may present as a huge bladder mass.[8] Five STUMP patterns have been described, including degenerative atypia matrix, a high density of spindle cells, and mucus-like spindle cells. The remaining patterns are a phyllodes-like pattern[4,9,10] and a newly discovered round cell subtype,[11] of which degenerative atypia is the most common. However, the clinical presentation of STUMP varies widely, ranging from incidental findings to distant metastases and even death, and the great heterogeneity of its clinical behavior complicates the diagnosis.[12]

Case report

We present the case of a man in his early 40s who experienced frequent urination, urgency, thin urine stream, weak urination, and other symptoms of dysuria without apparent triggers. Occasional hematuria but no low back pain was described, and the patient's blood PSA concentration was normal. He had smoked for more than 20 years and denied drinking alcohol.

He was initially treated at the Social Welfare Hospital and underwent ultrasonography, which indicated prostatic hyperplasia. Although there was slight alleviation of the symptoms with medication, he continued to experience recurrent episodes of dysuria and eventually developed urinary retention, requiring an indwelling catheter. He was subsequently hospitalized, and upon rectal palpation, a firm nodule was detected in the left lobe of the prostate, with no obvious tenderness. Magnetic resonance imaging (MRI) revealed a left lateral prostatic mass (Figure 1) measuring approximately 24×22 mm, which was considered a malignant lesion. To clarify the diagnosis, we performed transurethral prostatic biopsy, and the pathology of the aspirate indicated prostatic mucinous liposarcoma, which was considered stage T2bN0M0. To obtain a precise diagnosis, we performed robot-assisted laparoscopic radical prostatectomy under general anesthesia.

The pathological examination of the postoperative specimens revealed an enlarged left lobe of the prostate, with a greyish-white mass evident in the section. The primary mass was localized within the left lobe of the prostate, with a portion

Table 1. Summary of previously reported cases of prostatic stromal tumors.

No.	Age (years)	Clinical features	Diagnostic specimen	Immunohistochemistry	Treatment	Follow-up time (months)	Outcome	Reference
1	27	Urinary retention, lower urinary tract symptoms, hematuria	TURP	Vimentin (+), CD34 (+), SMA (+)	TURP	78	Dysuria	Shen et al.[6] (2021)
2	31	Lower urinary tract symptoms	Biopsy	SMA (±), CD34 (+), ER (±), PR (±)	None	74	No recurrence or metastasis	Shen et al.[6] (2021)
3	73	Urinary retention, lower urinary tract symptoms	TURP		TURP	/	/	Shen et al.[6] (2021)
4	67	Urinary retention, lower urinary tract symptoms	Biopsy	Vimentin (+), SMA (+), CD34 (±), PR (±)	TURP	68	No recurrence or metastasis	Shen et al.[6] (2021)
5	66	Lower urinary tract symptoms, hematuria	RP	Vimentin (+), CD34 (+), PR (+)	RP	/	/	Shen et al.[6] (2021)
6	77	Lower urinary tract symptoms, hematuria	Biopsy		TURP	/	/	Shen et al.[6] (2021)
7	66	Lower urinary tract symptoms, hematuria	RP	Vimentin (+), SMA (+), CD34 (±)	RP	57	No recurrence or metastasis	Shen et al.[6] (2021)
8	73	Urinary retention, lower urinary tract symptoms	TURP		TURP	57	No recurrence or metastasis	Shen et al.[6] (2021)
9	81	Urinary retention, lower urinary tract symptoms	TURP		TURP	56	No recurrence or metastasis	Shen et al.[6] (2021)
10	71	Lower urinary tract symptoms	TURP	SMA (+), CD34 (+), ER (±), PR (+)	TURP	56	No recurrence or metastasis	Shen et al.[6] (2021)
11	71	Urinary retention, lower urinary tract symptoms	Biopsy	SMA (+)	None	/	/	Shen et al.[6] (2021)
12	51	No obvious symptoms	RP	Vimentin (+), SMA (+), ER (±), PR (+)	None	27	No recurrence or metastasis	Shen et al.[6] (2021)

(continued)

Table 1. Continued.

No.	Age (years)	Clinical features	Diagnostic specimen	Immunohistochemistry	Treatment	Follow-up time (months)	Outcome	Reference
13	39	Lower urinary tract symptoms, urinary retention	Biopsy	Vimentin (+), ER (+), PR (+)	None	10	No recurrence or metastasis	Shen et al.[6] (2021)
14	78	Lower urinary tract symptoms	RP	SMA (+), CD34 (+), PR (+)	RP	/	/	Shen et al.[6] (2021)
15	58	Lower urinary tract symptoms, urinary retention	Biopsy		None	/	/	Shen et al.[6] (2021)
16	53	No obvious symptoms	RP	CD34 (±), ER (±), PR (+)	RP	86	No recurrence or metastasis	Shen et al.[6] (2021)
17	75	Lower urinary tract symptoms	TURP	Vimentin (+), SMA (±), CD34 (+), ER (+), PR (+)	TURP	85	No recurrence or metastasis	Shen et al.[6] (2021)
18	33	Lower urinary tract symptoms, urinary retention	Biopsy		TURP	7	Dysuria	Shen et al.[6] (2021)
19	37	Hematuria, lower urinary tract symptoms	RP	CD34 (±)	RP	16	Recurrence and death	Shen et al.[6] (2021)
20	25	Lower urinary tract symptoms, urinary retention	Biopsy	Vimentin (+), SMA (±), CD34 (+)	Prostatectomy	/	/	Shen et al.[6] (2021)
21	61	Hematuria	RP	Vimentin (+), SMA (+), CD34 (+)	RP and total pelvic exenteration	6	Recurrence	Shen et al.[6] (2021)
22	40	Lower urinary tract symptoms, urinary retention	TURP	Vimentin (+), SMA (±), CD34 (±)	TURP and radical cystectomy	24	Recurrence	Shen et al.[6] (2021)
23	23	Lower urinary tract symptoms, urinary retention	TURP	Vimentin (+), SMA (+), CD34 (±)	TURP and radical cystectomy	/	/	Shen et al.[6] (2021)
24	29	Urinary emptying disorder and hematuria	Biopsy	Not available	TURP+RP	2	No recurrence or metastasis	Syarif et al.[7] (2023)
25	53	Left back pain and lower urinary tract symptoms	Biopsy	CD117 (+), CD34 (+), PR (+), Desmin (+), SMA (−)	RP	12	No recurrence or metastasis	Wang et al.[8] (2014)
26	62	Abnormal DRE	Biopsy	Not available	None	12	No recurrence or metastasis	Gaudin et al.[9] (1998)

(continued)

Table 1. Continued.

No.	Age (years)	Clinical features	Diagnostic specimen	Immunohistochemistry	Treatment	Follow-up time (months)	Outcome	Reference
27	64	Abnormal DRE	Biopsy	Not available	None	34	No recurrence or metastasis	Gaudin et al.[9] (1998)
28	67	Abnormal DRE	Biopsy	Not available	TURP	86	No recurrence or metastasis	Gaudin et al.[9] (1998)
29	63	Urinary retention	TURP	Not available	TURP	11	Death of other cause	Gaudin et al.[9] (1998)
30	51	Urinary retention	SP	Vimentin (+), CD34 (+), Desmin (±), PR (+)	SP	60	No recurrence or metastasis	Gaudin et al.[9] (1998)
31	47	Constipation, nocturia, palpable prostate mass	TUB	Not available	Exploratory laparotomy, partial prostatectomy and excision of mass	/	Not available	Gaudin et al.[9] (1998)
32	48	Gross hematuria	TUB	Not available	TUB	6.5	No recurrence or metastasis	Gaudin et al.[9] (1998)
33	65	Abnormal DRE	Biopsy	Not available	None	2	No recurrence or metastasis	Gaudin et al.[9] (1998)
34	27	Rectal fullness, prostate mass	Biopsy	Not available	Hormones, RCP	35	No recurrence or metastasis	Gaudin et al.[9] (1998)
35	43	Urinary retention, prostate mass	TURP	Vimentin (+), CD34 (±), SMA (+)	TURP	18	No recurrence or metastasis	Gaudin et al.[9] (1998)
36	52	Palpable rectal mass	TURP	Vimentin (+), CD34 (+), Desmin (+), PR (±)	TURP and modified pelvic exenteration	76	No recurrence or metastasis	Gaudin et al.[9] (1998)
37	53	No obvious symptoms	RP for PCa	Not available	RP	10	No recurrence or metastasis	Gaudin et al.[9] (1998)

(continued)

Table 1. Continued.

No.	Age (years)	Clinical features	Diagnostic specimen	Immunohistochemistry	Treatment	Follow-up time (months)	Outcome	Reference
38	51	Urinary retention, hematuria	Biopsy	Vimentin (+), CD34 (+), SMA (+), Desmin (+), PR (+)	TURP	136	No recurrence or metastasis	Gaudin et al.[9] (1998)
39	39	Urinary retention	TURP	Vimentin (+), CD34 (±), ER (+), PR (+)	TURP, finasteride, and RP	71	No recurrence or metastasis	Gaudin et al.[9] (1998)
40	65	Urinary retention	TURP	Not available	TURP	6	Death of other cause	Gaudin et al.[9] (1998)
41	71	Urinary retention, hematuria	Biopsy	Not available	RP	0.5	No recurrence or metastasis	Gaudin et al.[9] (1998)
42	55	Urinary retention	TURP	Vimentin (+), CD34 (±), PR (+)	TURP+RP	21	No recurrence or metastasis	Gaudin et al.[9] (1998)
43	60	Urinary retention	Biopsy	Desmin (+), CD34 (−), PR (−)	RARP	103	No recurrence or metastasis	Dokubo et al.[12] (2023)
44	65	Abnormal DRE	Biopsy	Desmin (+), CD34 (−)	RARP	57	No recurrence or metastasis	Dokubo et al.[12] (2023)
45	64	Mild obstructive voiding symptoms	Biopsy	Vimentin (+), Desmin (+), PR (+)	RARP	6	No recurrence or metastasis	Chan et al.[13] (2022)
46	71	Mild obstructive voiding symptoms	Biopsy	Not available	RP	17	No recurrence or metastasis	Ladner et al.[14] (2021)
47	52	Progressive urinary retention	Biopsy	Not available	RP	18	Death	Muglia et al.[16] (2011)
48	63	No obvious symptoms	Biopsy	CD34 (+), PR (−), Desmin (+)	Not available	Not available	Not available	Johnson and Carter[17] (2015)
49	67	Urinary retention	TURP	Not available	TURP	60	No recurrence or metastasis	De Berardinis et al.[18] (2012)

(continued)

Table 1. Continued.

No.	Age (years)	Clinical features	Diagnostic specimen	Immunohistochemistry	Treatment	Follow-up time (months)	Outcome	Reference
50	53	Febrile prostatitis, urinary retention	Biopsy	Not available	TURP	13	STUMP still detectable, but no signs of sarcoma	Laturnus et al.[23] (2010)
51	77	Weak urinary stream	Biopsy	CD34 (+), Desmin (+), SMA (−)	RP	19	No recurrence or metastasis	Inagaki et al.[24] (2015)
52	56	Urinary retention	Not available	Not available	TURP	Not available	Not available	Wee et al.[26] (2005)
53	56	Urinary frequency	Biopsy	Not available	RP	12	No recurrence	Okada et al.[28] (2013)
54	60	No obvious symptoms	Biopsy	CD34 (+), PR (+), SMA (+)	RARP	6	No recurrence or metastasis	Suzuki et al.[32] (2020)

CD117, cluster of differentiation 117; CD34, cluster of differentiation 34; DRE, digital rectal examination; ER, estrogen receptor; PCa, prostate cancer; PR, progesterone receptor; PSA, prostate-specific antigen; RARP, robot-assisted radical prostatectomy; RCP, radical cyst prostatectomy; RP, radical prostatectomy; SMA, smooth muscle actin; SP, suprapubic prostatectomy; STUMP, stromal tumors of unknown malignant potential; TUB, transurethral biopsy; TURP, transurethral resection of the prostate.

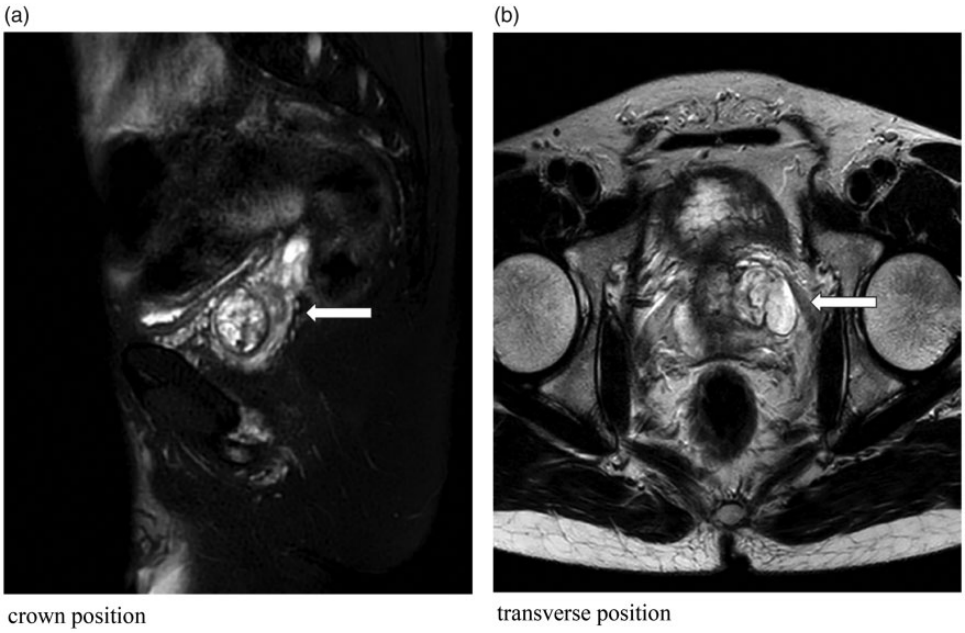

Figure 1. Magnetic resonance images; ((a) coronal view and (b) transverse view): The prostatic volume is increased above normal, and the images show mixed signals dominated by slightly high-intensity signals surrounded by a low-signal-intensity capsule. No obviously abnormal signals are evident in the remaining prostatic tissue, and the prostatic capsule is intact (arrows).

displaying a jelly-like and soft texture. The mass measured approximately 3.5 cm × 2.7 cm × 2.0 cm. Microscopic examination revealed the presence of heterogeneous round and spindle-shaped cells in a mucus background. Notably, a subset of these heterogeneous cells exhibited markedly increased nuclear-staining depth, consistent with the morphological characteristics of STUMP. Furthermore, immunohistochemical analysis revealed negative staining for smooth muscle actin (SMA), MyoD1, myogenin, S-100, and pan-cytokeratin , and the MDM2 gene was amplified. Conversely, there was some positive staining for progesterone receptors (PR), and staining was diffusely positive for cyclin D-dependent kinase 4, desmin, and cluster of differentiation 34 (CD34) (Figure 2). These findings further supported the diagnosis of STUMP.

Discussion

Initially, this patient's prostatic puncture biopsy was diagnosed as mucinous liposarcoma of the prostate. This condition is often confused with STUMP, likely owing to the limited volume of a puncture biopsy specimen. Subsequently, after a postoperative pathological examination, the patient's diagnosis was revised to STUMP. Most reported STUMP cases are solitary, with only a tiny fraction co-occurring with prostatic adenocarcinomas.[13,14] Early clinical symptoms in patients with STUMP are unremarkable. When the tumor is large, it may exert pressure on the bladder, and patients may have symptoms such as frequent urination, urgency, and dysuria. Compression of the lower ureter can cause hydronephrosis, and compression of the

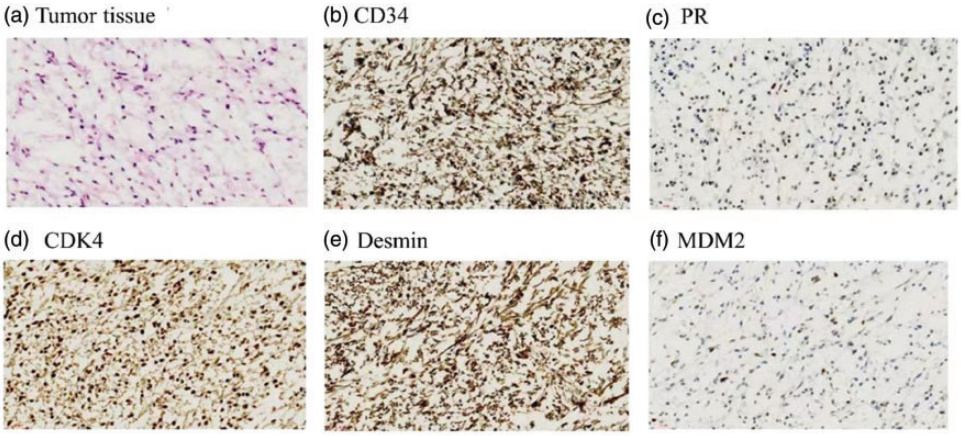

Figure 2. Pathological and immunohistochemical findings; (a–f) Biopsy-obtained pathological sections (×400) showing heterogeneous round and spindle-shaped cells in a mucus background. Positive staining for (b) CD34, (c) PR, (d) CDK4, (e) desmin, and (f) MDM2 is widespread among the tumor cells. Staining in panel (a): hematoxylin and eosin. CD34, cluster of differentiation 34; PR, progesterone receptor; CDK4, cyclin D-dependent kinase 4.

rectum leads to difficult bowel movements or an anal bulge, and scrotal and inguinal radiating pain. Rectal palpation of the prostate mainly reveals apparent prostatic enlargement, disappearance of the central sulcus, uneven surface, medium texture, and tenderness.

The primary imaging modality for evaluating STUMP is MRI, which typically reveals a solid appearance of the tumor with occasional findings of small focal cystic changes or minor focal hemorrhages.[15] These lesions show a consistent pattern, characterized by uniform low signal intensity on T1-weighted images, heterogeneous signal intensity on T2-weighted images,[16] slight hyperintensity on diffusion-weighted imaging, slight hyperintensity on apparent diffusion coefficient mapping, and specific features of continuous or gradual enhancement.[15] It is important to note that PSA is produced by prostatic epithelial cells, whereas stromal tumors originate from mesenchymal tissue, which may not result in a marked elevation of PSA concentrations. However, in a previous case report of STUMP, the PSA concentration was >14.7 nmol/L,[17] which required differentiation from prostate cancer. Immunohistochemical analysis of STUMP typically reveals positive expression of markers such as CD34 and vimentin,[18] with varying degrees of positive staining for myogenic markers, such as SMA, desmin, and muscle-specific actin.[15] Given their origin in the hormone-dependent specialized mesenchyme, these tumors usually express PRs, while exhibiting lower expression of estrogen receptors.[19] Additionally, S100 protein and c-kit (CD117) are generally not detected in STUMP.[9]

Both STUMP and prostatic stromal sarcoma (PSS) are derived from the prostatic mesenchyme, making the distinction between them complicated. These tumors share clinical similarities and both express PRs, while both lack estrogen receptor expression.[19] However, PSS typically exhibits a higher diffusion-weighted imaging signal and lower apparent diffusion coefficient signal in MRI compared with STUMP.[15] Notably, this difference is

insufficient to clearly distinguish the two. Therefore, the differential diagnosis of STUMP and PSS relies mainly on histopathological characteristics and immunohistochemical markers.[20] For PSS patients, positive staining for myogenic antibodies such as desmin, SMA, and MyoD1[4,21] is common, whereas STUMP generally involves positive CD34 and vimentin expression.[21] Although the genetic characteristics of STUMP have not been fully elucidated, the literature reports chromosomal alterations across all histological subtypes of STUMP. The most common alteration is the loss of chromosome 10, followed by loss of chromosomes 9 and 7.[22]

Currently, a unified and clear STUMP treatment plan has not been established, as the clinical manifestations of STUMP vary from individual to individual, and the patient's age, tumor size, tumor growth pattern, and degree of invasion affect the treatment choice. Therefore, treatment must be individualized, Additionally the tumor can remain stable for many years without treatment;[23,24] however, some STUMP patients may have local recurrence,[25] and a very small number of tumors may evolve into PSS. It is worth noting that compared with radical resection, patients who undergo transurethral resection of the prostate appear to be more prone to recurrence,[5,26] and radical resection of the prostate provides hope for patients with early STUMP.[27,28]

We opted for Da Vinci robot-assisted total prostatectomy (RARP) as our surgical approach, driven by its multifaceted benefits.[12] RARP affords superior surgical visualization owing to its high-definition three-dimensional optics, enhancing intraoperative anatomical discernment and thereby minimizing surgery-associated adverse events. The ergonomic design of the robotic system allows for intuitive surgeon hand movements, mitigating surgeon fatigue and enhancing surgical precision and consistency.[29] Additionally, the RARP technique harnesses the principles of fascial anatomy, facilitating meticulous dissection of the prostate from adjacent structures; thus, diminishing the likelihood of leaving behind malignant tissue.[30] This precise dissection preserves vital structures, notably, the urethral sphincter and neurovascular bundles pertinent to erectile function; thereby, attenuating the risks of postoperative complications, such as urinary incontinence and sexual dysfunction.[31] Fluorodeoxyglucose-positron emission tomography may help assess the malignant potential of STUMP, as the accumulation of fluorodeoxyglucose in these tumors is usually low, which may help in the development of surgical plans.[32] Therefore, in the treatment and follow-up of STUMP, these factors must be considered comprehensively while considering individual patient conditions to achieve the best therapeutic effect.

Conclusion

The clinical presentations of STUMP vary widely, often leading to potential misdiagnosis as prostatic hyperplasia if the diagnosis is based solely on clinical symptoms. Although MRI is beneficial in the early diagnosis of prostatic stromal tumors, a definitive diagnosis remains reliant on pathological examination. Regarding the differential diagnosis, particular emphasis should be placed on distinguishing STUMP from prostatic mesenchymal sarcoma. Treatment strategies should be meticulously customized to each patient's unique profile, necessitating long-term follow-up to optimize the overall prognosis for individuals affected by STUMP.

The reporting of this study conforms to the CARE guidelines.[33]

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Author contributions

Tao Zhu conceived and designed the study. Cen Liufu and Jiahao Jiang provided administrative support. Junhua Luo provided study materials or patient data. Yan Wang collected evidence and supervised the study. Tao Zhu and Cong Yin analyzed and interpreted the data. All authors wrote the manuscript and provided final approval of the manuscript to be submitted.

Data availability statement

The data that support the findings of this study are available from the corresponding author (Junhua Luo) upon reasonable request.

Ethics statement

We obtained written informed consent from the patient described in this report. Institutional review board approval was not required because of the retrospective nature of the study.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

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