

REVIEW ARTICLE

Prostatic stromal tumors with uncertain malignant potential: A scoping review of clinical challenges and management strategies

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Abstract

Prostatic stromal tumor of uncertain malignant potential (STUMP) is a rare neoplasm arising from specialized prostatic stromal cells with a broad range of histologic patterns and unpredictable clinical behavior. It is often challenging to distinguish STUMP from prostatic stromal sarcoma due to morphological similarities, necessitating specific microscopic criteria and immunohistochemical analysis. Owing to its rarity and variable presentation, there is no clear consensus on its classification, clinical course, or management. This review aims to analyze the demographic, clinical, and pathological features of STUMP, along with available treatment strategies and outcomes. This comprehensive literature review was conducted using PubMed and Google Scholar databases, focusing on cases of pure STUMP. Selected studies were assessed for clinical presentations, pathological findings, diagnostic procedures, and treatments. This scoping review was conducted following the Joanna Briggs Institute methodology and reported according to the PRISMA-ScR checklist. Case reports were further assessed using the Murad et al. quality assessment tool. An analysis of 84 patients across 14 studies revealed a mean age at diagnosis of 58.9 years. Common clinical presentations included lower urinary tract symptoms (39.3%) and urinary retention (29.8%). Immunohistochemical markers such as vimentin, estrogen receptor, smooth muscle actin (SMA), and progesterone receptor were frequently expressed. Initial management strategies varied: 34.5% of patients were managed with observation, while others underwent interventions such as transurethral resection of prostate (TURP) or prostatectomy. During follow-up, 19 patients (22%) experienced disease progression, with a higher recurrence rate observed in non-prostatectomy groups (34.5%). In contrast, no recurrence was noted among those who underwent prostatectomy or enucleation. Among the patients with progression, 89.5% required further intervention, most commonly repeat TURP or prostatectomy. In conclusion, Prostatic STUMP is a rare tumor with diverse histologic patterns and clinical behaviors. Given its potential for progression and risk of sarcomatous transformation, complete surgical excision is the recommended management strategy.

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KEYWORDS

clinical challenges, management strategies, prostatic stromal tumors, uncertain malignant potential

1 | INTRODUCTION

Prostatic stromal tumor of uncertain malignant potential (STUMP) is an exceedingly rare neoplasm arising from specialized prostatic stromal cells, characterized by a broad spectrum of histologic patterns and clinical behaviors. STUMP is widely considered to be a neoplastic lesion and often exhibits morphological similarities to prostatic stromal sarcoma^[1]. Its clinical course is highly unpredictable, ranging from incidental, non-progressive findings on biopsy to obstructive masses that recur after resection, and in rare instances, to aggressive lesions resulting in widespread metastases and death^[2]. STUMP is most frequently diagnosed in men during their sixth decade of life. Due to its rarity, the precise incidence remains difficult to determine, though it is estimated to account for less than 1% of all prostatic tumors^[2]. Given its variable behavior, long-term follow-up is essential, especially as some cases may progress to or coexist with malignant counterparts such as prostatic stromal sarcoma^[2].

STUMPs are categorized as stromal lesions of the prostate that do not meet the histological criteria for sarcoma yet exhibit a wide range of microscopic patterns^[2,3]. The term “STUMP” was first introduced by Gaudin et al. in 1998, as this entity has previously been classified under a variety of names, including phyllodes tumor of the prostate, atypical stromal hyperplasia, cystosarcoma phyllodes, and cystic epithelial-stromal tumor, reflecting the uncertain nature of the clinical course in affected patients^[2–4]. However, distinguishing STUMP from prostatic stromal sarcoma remains challenging due to overlapping morphological features, necessitating the use of specific histologic criteria and immunohistochemical stains^[5].

Owing to the rarity of STUMP, with few case series or reports published, coupled with its broad spectrum of histologic patterns and variable clinical behaviors, there is no clear consensus on the classification, expected clinical course, or treatment recommendations. This review presents the first comprehensive synthesis of the demographic, clinical, and pathological characteristics of STUMP, with an emphasis on diagnostic immunohistochemical markers, thereby aiding in the establishment of a consensus for diagnosis and treatment. This review enhances our understanding of this rare entity and offers guidance for managing such cases. Additional reports and larger case series remain crucial for

advancing our understanding and improving the care of patients with prostatic STUMP.

2 | METHODS

This scoping review was conducted following the Joanna Briggs Institute (JBI) methodology and reported in accordance with the PRISMA-ScR checklist^[6,7].

Two authors, in collaboration with the institutional librarian, developed and optimized the search strategy to ensure comprehensive coverage of the relevant literature. In addition, the reference lists of all included studies were manually screened to identify further eligible articles. Given the rarity of the condition, all study types—including case reports—were considered to maximize data inclusion. The search terms used were “Prostatic stromal tumor of uncertain malignant potential” and “STUMP,” with no time restrictions applied. The search was limited to studies published in or translated into English.

2.1 | Eligibility and study selection

This review was guided by the PICO framework to address the following research question: Population (P): Adult males diagnosed with prostatic STUMP; Intervention (I): Surgical intervention (e.g., radical prostatectomy, transurethral resection of the prostate (TURP)); Comparison (C): Active surveillance or conservative management; and Outcome (O): Long-term outcomes including disease progression, recurrence rates, and overall survival.

The inclusion criterion was studies reporting on pure STUMP cases. To ensure that this review remained focused on pure STUMP, we excluded studies that included other types of prostatic stromal tumors or sarcomas unless they provided clearly identifiable and extractable data on pure STUMP cases. This decision was made to align with the specific aims of the review, as other prostatic stromal tumors and sarcomas are already well characterized in the literature, with established treatment strategies and outcomes. In contrast, pure STUMP represents a distinct and less understood clinical entity. Including mixed or non-stratified cohorts would have introduced heterogeneity and potentially compromised the accuracy of our findings. Therefore, only studies that clearly reported data on pure STUMP were included in the final analysis. Duplicate publications were excluded, and the remaining studies were

screened and analyzed based on relevance and data quality.

Two reviewers independently screened the full texts and applied the eligibility criteria using EndNote® X9. Any discrepancies were resolved through discussion with the senior author until consensus was reached.

2.2 | Quality assessment

Given the inherent risk of bias in case reports, the quality of each included study was assessed using a modified version of the standardized tool developed by Murad et al.^[8]. This tool, adapted from the Newcastle-Ottawa Scale, consists of six binary-response questions. A high-quality report is defined by a score of five or more, a moderate-quality report by a score of four, and a low-quality report by a score of three or less.

3 | RESULTS

The search yielded 55 studies, all of which underwent initial screening. Two independent reviewers assessed the titles and abstracts, resulting in the exclusion of 12 articles. Following full-text review, an additional 29 studies were excluded for not meeting the inclusion criteria. Data extraction was

performed for the remaining 14 studies, as illustrated in the PRISMA-ScR flowchart (Figure 1). Extracted parameters included patient demographics, clinical presentation, radiological findings, pathological and immunohistochemical features, treatment approaches, and follow-up information.

3.1 | Quality assessment

In accordance with the modified assessment tool by Murad et al.^[8], the quality appraisal identified two studies as high quality, six as moderate quality, and six as low quality (Table 1).

3.2 | Demographics and presentation

A total of 84 patients diagnosed with pure STUMP were included in this review. The mean age at presentation was 58.8 years, with a range of 27–83 years. Clinical presentation included lower urinary tract symptoms (LUTS) in 39.3% of patients, urinary retention in 29.8%, and hematuria in 17.9%. An abnormal digital rectal examination (DRE) was documented in 51.2% of cases. Prostate-specific antigen (PSA) levels were elevated in 30.1% of patients. Exact PSA values were available for 28 patients, with a mean level of 11.3 ng/mL (range: 1–90 ng/mL).

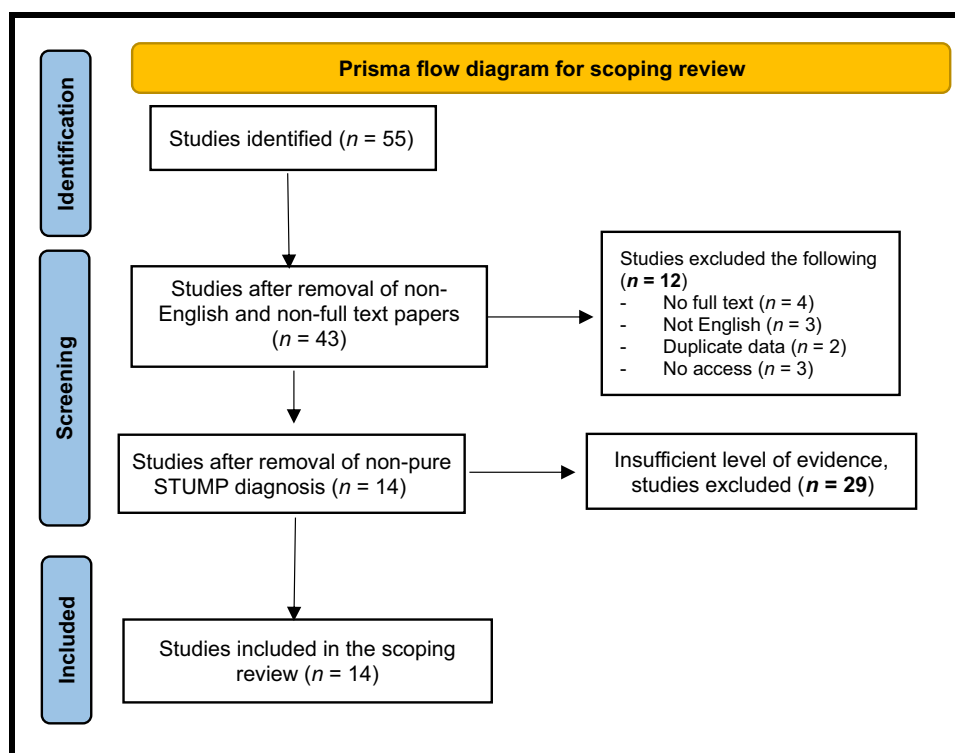


FIGURE 1 PRISMA search strategy flowchart.

TABLE 1 Outcomes of Murad's tool for methodological qualities assessment of case reports and case series.

Author	Selection 1 ^a	Ascertainment		Causality 4 ^d	Reporting 5 ^e	Assessment 6 ^f	Quality
		Exposure 2 ^b	Outcome 3 ^c				
Gaudin et al. ^[3]	No	Yes	Yes	No	Yes	Yes	Moderate
Berardinis et al. ^[5]	No	Yes	Yes	Yes	No	No	Low
Dokubo et al. ^[9]	No	Yes	Yes	Yes	Yes	No	Moderate
Suzuki et al. ^[10]	No	Yes	Yes	Yes	Yes	Yes	Good
Brockway et al. ^[11]	Yes	Yes	Yes	Yes	No	No	Moderate
Yamazaki et al. ^[12]	Yes	Yes	Yes	No	No	No	Low
Kabarriti et al. ^[13]	No	No	Yes	No	No	No	Low
Roos et al. ^[14]	No	Yes	Yes	Yes	Yes	No	Moderate
Matsuyama et al. ^[15]	Yes	Yes	Yes	No	Yes	Yes	Good
Shen et al. ^[16]	Yes	Yes	Yes	No	Yes	No	Moderate
Herawi et al. ^[17]	Yes	No	Yes	No	Yes	No	Low
Kwak et al. ^[18]	Yes	No	Yes	No	Yes	Yes	Moderate
Leong et al. ^[19]	No	No	No	No	Yes	No	Low
Johnson et al. ^[20]	No	No	Yes	No	No	Yes	Low

^aDoes the patient(s) represent(s) the whole case(s) of the medical center?

^bWas the exposure adequately ascertained?

^cWas the outcome adequately ascertained?

^dWere other alternative causes ruled out?

^eWas follow-up long enough for outcomes to occur?

^fIs the case(s) described with sufficient details to allow other investigators to replicate the research or to allow practitioners to make inferences related to their own practice?

3.3 | Radiology

Magnetic resonance imaging (MRI) of the prostate was performed in 11 cases, all of which demonstrated a heterogeneous mass with variable signal intensities on T2-weighted sequences, ranging from hypointense to hyperintense. Ultrasound was conducted in 4 cases, all of which showed an enlarged prostate; a retropubic mass was noted in 2 of these cases. Computed tomography (CT) scans were performed in 5 cases, all revealing prostatic enlargement. Among these, 2 cases demonstrated a heterogeneous mass, and 1 case showed an enlarged obturator lymph node.

3.4 | Location

The anatomical location of the tumor within the prostate was reported in 29 cases. The most frequently involved region was the peripheral zone, observed in 10 cases. This was followed by the posterior zone and the transition zone, involved in 8 and 7 cases, respectively. The left lobe of the prostate was affected in 2 cases. Additionally, involvement of the median lobe and extra-prostatic extension was each reported in 1 case.

3.5 | Volume

Prostate volume was reported in 62 cases, with a mean volume of 139.8 mL, ranging from 11 mL to 450 mL.

3.6 | Diagnosis

Table 2 summarizes the diagnostic modalities used to confirm the diagnosis. The majority of patients were diagnosed via needle biopsy, while others were diagnosed incidentally during surgical procedures for lower urinary tract symptoms (including enucleation, TURP, or simple prostatectomy). Additionally, seven patients were diagnosed following radical prostatectomy.

3.7 | Management, follow-up, and prognosis

Initial management strategies are summarized in Table 3. Approximately one-third of patients were managed with active surveillance, while the remaining cases underwent invasive interventions ranging from TURP to radical prostatectomy.

A total of 14 patients (16.6%) were lost to follow-up: 9 from the observation group, 3 from the radical prostatectomy group, and 1 each from the partial prostatectomy and the enucleation groups.

A total of 19 patients experienced disease progression during follow-up. The overall recurrence rate was 22%, which increased to 34.5% when excluding patients who underwent prostatectomy. Among those with progression, 11 patients were initially managed with observation, accounting for 37.9% of the observation group, while 8 patients were initially managed with TURP, representing 38% of the TURP group. The mean time to progression was 33.8 months (range: 6 months–96 months).

In contrast, no disease progression or recurrence was observed in patients who underwent prostatectomy

(radical, simple, or partial) or enucleation, with a mean follow-up duration of 35.2 months. Figure 2 summarizes the initial treatments and corresponding outcomes.

Of the 19 patients with progression, 17 (89.5%) eventually underwent a second intervention. These included 11 patients who underwent a second TURP, 5 who underwent radical prostatectomy, and 1 who underwent partial prostatectomy. Two patients deferred further intervention despite documented disease progression.

During follow-up, 9 of the 11 patients who underwent a second TURP experienced continued tumor growth and recurrence of LUTS. Of these, 7 required multiple TURP procedures, 1 subsequently underwent radical prostatectomy, and 1 underwent TURP followed by pelvic exenteration. Notably, none of the patients who underwent prostatectomy as a second-line intervention experienced further progression or recurrence. Figure 3 illustrates the management and outcomes of patients with disease progression.

TABLE 2 Diagnostic procedures.

Diagnosis procedure	Patients, N (%)
Needle biopsy	46 (54.8)
TURP	22 (26.2)
Radical prostatectomy	7 (8.3)
Enucleation of prostate	6 (7.1)
Transurethral biopsy	2 (2.4)
Simple prostatectomy	1 (1.2)

TABLE 3 Initial management.

Management	Patients, N (%)
Observation	29 (34.5)
Radical prostatectomy	26 (31.0)
TURP	21 (25.0)
Enucleation of prostate	5 (6.0)
Partial prostatectomy	2 (2.4)
Simple prostatectomy	1 (1.2)

3.8 | Immunohistochemistry

Immunohistochemical analysis was reported in 24 patients. The most frequently expressed markers were vimentin (100%), estrogen receptor (100%), smooth muscle actin (SMA) (91.6%), progesterone receptor (88.8%), actin (85.7%), CD34 (66.7%), and desmin (54.5%). High Ki-67 expression (>5%) was observed in 55.5% of cases. Other markers, including Bcl-2, androgen receptor, caldesmon, CD99, and CD68, were reported in only a few cases. A detailed breakdown of immunohistochemical findings is provided in Table 4.

4 | DISCUSSION

STUMP is a rare prostatic neoplasm exhibiting a variety of forms with distinct histopathological features. It has been referred to by several terms in the literature, including atypical stromal hyperplasia, phylloides type of atypical stromal hyperplasia, cystic epithelial-stromal

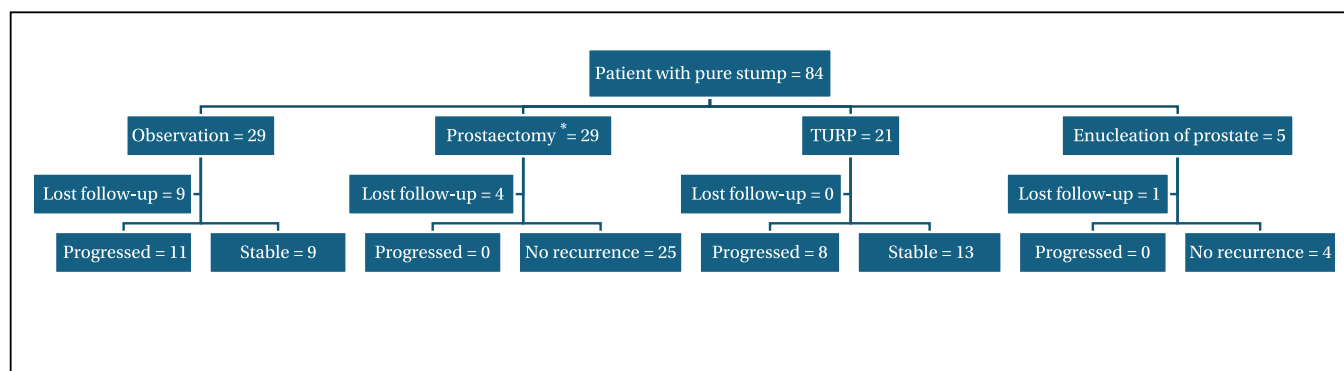


FIGURE 2 Flowchart of patients' initial management and outcomes. *Includes patients who underwent radical, simple, or partial prostatectomy.

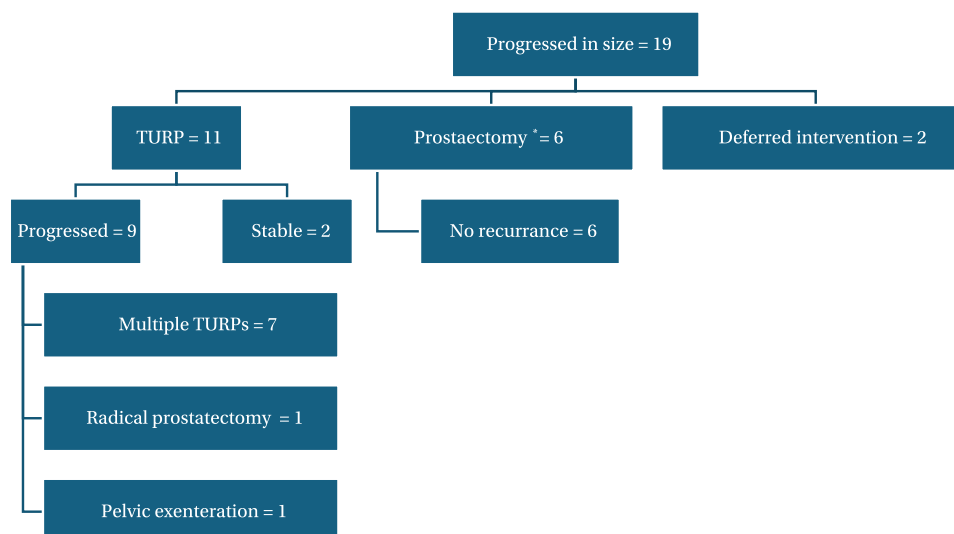


FIGURE 3 Flowchart of patients with progression after initial management. *Includes patients who underwent radical or partial prostatectomy. **Indicates further management of patients who experienced a progression following treatment of their initial progression.

tumor, prostatic STUMP, and cystosarcoma phyllodes^[21]. Pure prostatic STUMP is particularly rare and lacks specific clinical manifestations, though it commonly presents with progressive LUTS and other urinary disturbances^[1]. These tumors typically present with normal or mildly elevated prostate-specific antigen (PSA) levels and are often associated with rapid prostate enlargement^[16]. Due to the limited number of published cases, which are primarily small case series or isolated reports, the objective of our review was to consolidate current knowledge on the demographics, clinical presentation, diagnostic approaches, treatment modalities, and natural history of prostatic STUMP.

In our review, the mean age at diagnosis was 58.8 years, with a reported range of 27 to 83 years. Common clinical presentations included abnormal DRE, LUTS, urinary retention, and hematuria, reflecting the tendency of these tumors to grow rapidly, causing bladder outlet obstruction and prostatic enlargement detectable on DRE^[12,15]. Although MRI often reveals a well-defined prostatic lesion, the definitive diagnosis relies on histopathological evaluation^[16]. Most cases in our review were diagnosed via needle biopsy or incidentally during surgical procedures performed for LUTS in the setting of prostatic enlargement.

Histologically, STUMP exhibits considerable variability but is most commonly characterized by stromal spindle cell proliferation, with some cells showing degenerative nuclear atypia and smudged chromatin^[3,17]. Mitotic activity is typically absent or rare, and tumor cell necrosis is not observed. Additional histologic variants include phyllodes-like patterns, featuring leaf-like stromal projections around benign glands, and myxoid stroma^[3,17,22]. The differential diagnosis includes other spindle cell lesions of the prostate, such

as atypical leiomyoma, leiomyosarcoma, sarcomatoid carcinoma, and stromal sarcoma^[3,17,23].

Figure 4 illustrates a representative case of STUMP with typical histopathological features drawn from your own institutional case. Immunohistochemical staining can assist in distinguishing STUMP and stromal sarcoma from smooth muscle tumors. STUMP and stromal sarcoma typically express CD34, whereas smooth muscle tumors such as leiomyoma and leiomyosarcoma are positive for h-caldesmon and calponin but negative for CD34. Sarcomatoid carcinoma must be excluded through epithelial markers such as cytokeratin AE1/AE3. Furthermore, the presence of high mitotic activity, tumor necrosis, and an elevated Ki-67 index would favor a diagnosis of stromal sarcoma over STUMP^[24].

In addition to the aforementioned differential diagnoses, it is important to avoid overdiagnosing hypercellular stromal nodules associated with nodular prostatic hyperplasia as STUMP. A key distinguishing feature of STUMP is the presence of stromal cells exhibiting degenerative atypia and smudged chromatin, which is not observed in hypercellular stromal nodules.

Regarding the natural history of the disease, our review revealed a tendency for STUMP to progress in size during observation or to recur following incomplete excision, particularly in cases managed with TURP. Specifically, 38% of patients who were initially treated with either observation or TURP exhibited tumor growth during follow-up. In contrast, none of the patients who underwent complete surgical excision—including radical, simple, or partial prostatectomy, or enucleation—experienced recurrence.

Notably, patients who progressed after initial TURP frequently required multiple subsequent TURPs, whereas those who underwent radical prostatectomy

TABLE 4 Detailed analysis of the patient with data about immunohistochemical studies.

Author	Number of cases ^a	Vimentin	SMA	Progesterone	Actin	CD34	Desmin	Ki-67 ^b	Pankeratin	Caldesmon	CD99	PSA	Bcl2	CD117	Androgens	Estrogen	CD68
Dokubo et al. ^[9]	2	/	/	/	/	/	+	/	/	+	/	/	/	/	/	/	/
Suzuki et al. ^[10]	1	/	/	/	+	/	+	/	/	/	/	/	/	/	/	/	/
Brockway et al. ^[10]	1	/	/	+	+	+	/	/	/	/	/	/	/	/	/	/	/
Roos et al. ^[14]	1	/	/	+	+	/	/	/	/	/	+	/	+	/	/	+	/
Shen et al. ^[16]	12	+	+	/	/	+	/	<1%	/	/	/	/	/	/	/	/	/
		/	+	+	+	+	/	<3%	/	/	/	/	/	/	/	+	/
		+	+	+	/	-	/	/	/	/	/	/	/	/	/	/	+
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		+	-	+	/	+	/	5%	/	/	/	/	/	/	/	+	/
Gaudin et al. ^[3]	6	+	/	+	/	+	-	/	/	/	/	/	/	/	/	/	/
		+	+	/	/	-	+	/	/	/	/	/	/	/	/	/	/
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		+	/	+	/	-	/	/	/	/	/	/	/	/	/	/	/
Johnson et al. ^[20]	1	/	/	-	-	+	-	/	-	/	/	/	/	/	/	/	/

Abbreviations: +, positive; -, negative; /, no data reported.
^aNumber of cases in which immunohistochemical studies were reported.
^bKi-67 expression ≥ 5% is considered high.

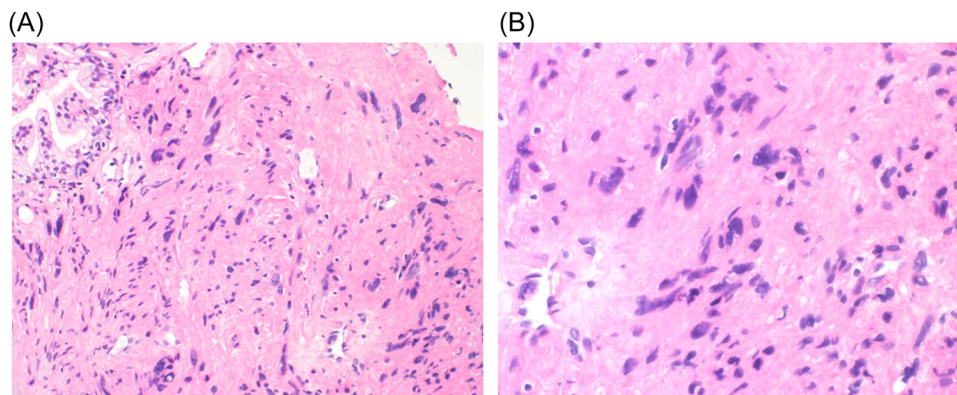


FIGURE 4 Histopathological features of prostatic STUMP from our series. (A) Moderately cellular stroma containing atypical stromal cells adjacent to benign prostatic acini (hematoxylin and eosin stain, ×200). (B) Atypical stromal cells exhibiting degenerative-type atypia characterized by smudged chromatin (hematoxylin and eosin stain, ×400).

after progression remained stable and did not require further intervention. Given the lack of a universally accepted treatment protocol, management should be individualized based on factors such as patient age, tumor size, growth pattern, and degree of invasion^[25,26].

Although STUMP is considered a tumor of uncertain malignant potential, it can demonstrate locally aggressive behavior over time, with some cases progressing to sarcomatous transformation, particularly in the setting of repeated recurrence^[22]. Based on the findings of this review, complete surgical excision is the recommended management approach. However, in select cases where the tumor remains stable, a period of observation may be appropriate to avoid unnecessary surgical intervention.

5 | STRENGTH AND LIMITATION

A key strength of this study is its provision of a comprehensive guide to critical clinical aspects of the diagnosis, management, and follow-up of patients with STUMP. Beyond serving as a clinical reference, this study also integrates detailed pathological data, making it a valuable resource for both urologists and pathologists. This dual focus addresses a notable gap in literature, where no inclusive guide combining clinical and pathological perspectives currently exists. Furthermore, the study's adherence to the established Joanna Briggs Institute (JBI) Scoping Review guidelines ensure methodological rigor and standardization, allowing for the approach to be replicated in future investigations.

However, several limitations should be acknowledged. First, this review relied exclusively on case reports and small case series, which limits the level of evidence and generalizability of the findings due to inconsistent diagnostic criteria, variable follow-up durations, and heterogeneous outcome reporting. The

absence of larger observational studies or randomized controlled trials is primarily due to the rarity of prostatic STUMP. Furthermore, publication bias is a concern, as unusual or aggressive cases are more likely to be reported, potentially skewing the overall understanding of the disease's behavior. While the deliberate focus on pure STUMP cases enhances the specificity of our analysis, it also limits broader insight, as STUMP can sometimes coexist with other prostatic stromal or epithelial malignancies. Including such cases in future research could provide valuable information on overlapping features and biological associations. To address these limitations, future efforts should aim to establish multicenter registries and collaborative data sets to collect standardized, high-quality data on prostatic STUMP cases. These registries would facilitate more robust analyses of clinical patterns, immunohistochemical and molecular characteristics, and long-term outcomes, ultimately contributing to evidence-based diagnostic and management guidelines. Additionally, prospective and translational studies are warranted to explore the biological underpinnings of prostatic STUMP and its relationship with other prostatic tumor subtypes.

6 | CONCLUSION

Prostatic STUMP is a rare neoplasm arising from specialized prostatic stromal cells, characterized by a broad spectrum of histologic patterns and variable clinical behavior. Complete surgical excision is the recommended treatment, given the tumor's potential for progressive growth and risk of sarcomatous transformation. Further research is needed to enhance our understanding of this rare entity and to expand the limited body of literature available on its diagnosis, management, and long-term outcomes.

AUTHOR CONTRIBUTIONS

Ibrahim A. Khalil and Abdullah M. Al-Jubouri contributed to the conceptualization of the study. Methodology was developed by Ibrahim A. Khalil, Majd Alkabbani, and Ahmad R. Al-Qudimat. Investigation was carried out by Ibrahim A. Khalil and Majd Alkabbani, while data curation was performed by Ibrahim A. Khalil and Abdullah M. Al-Jubouri. The original draft was written by Ibrahim A. Khalil and Abdullah M. Al-Jubouri, and all authors (Ibrahim A. Khalil, Abdullah M. Al-Jubouri, Majd Alkabbani, Ahmad R. Al-Qudimat, Khalid Al Jalham, and Khalid Al Rumaihi) participated in the review and editing of the manuscript. Visualization was prepared by Ibrahim A. Khalil and Ahmad R. Al-Qudimat. Supervision was provided by Khalid Al Jalham and Khalid Al Rumaihi, and project administration was managed by Ibrahim A. Khalil and Khalid Al Rumaihi. All authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data sets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

ETHICS STATEMENT

This study is a review based solely on previously published data and did not involve any direct research with human participants or the use of identifiable personal information. In accordance with institutional and international guidelines, ethical approval was not required, and a formal waiver was obtained.

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