DIAGNOSTIC WORKUP OF RETROPERITONEAL SARCOMA IN BANGLADESH

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ABSTRACT

Background: Retroperitoneal sarcoma is a rare and heterogeneous malignancy that often presents late due to its deep anatomical location and nonspecific symptoms. Preoperative diagnosis relies on imaging and, ideally, tissue sampling, though diagnostic pathways may differ substantially in resource-limited settings. **Methods:** This case series included 28 adult patients with histologically confirmed retroperitoneal sarcoma managed between July 2021 and June 2022. Data on demographics, imaging findings, diagnostic intervals, biopsy utilization, and concordance of preoperative modalities with final histopathology were analyzed descriptively. **Findings:** The mean age was 45.4 ± 16.4 years, with a slight male predominance (57.1%). The median diagnostic delay was 45 days and the median preoperative interval was 17.5 days. Liposarcoma was the predominant histological subtype, accounting for 50.0% of cases, followed by undifferentiated pleomorphic sarcoma (14.3%) and leiomyosarcoma (10.7%). Tumors had a median imaging size of 12.5 cm, with adjacent organ involvement in 35.7% of cases and rare distant metastasis (3.6%). CT scan was performed in all patients, while preoperative tissue sampling was undertaken in only 32.1%. Concordance with the final histopathological diagnosis for broad identification of RPS was 85.7% (24/28) for CT impression, 57.1% (4/7) for FNAC, and 100.0% (2/2) for core needle biopsy; however, the latter finding should be interpreted cautiously because it was based on only two patients. **Conclusion:** In this resource-limited setting, CT remains the cornerstone of preoperative evaluation for retroperitoneal sarcoma, while preoperative tissue diagnosis is infrequently performed. Expanding access to core needle biopsy and reducing diagnostic delays may enhance diagnostic accuracy and preoperative planning.

KEYWORDS: Retroperitoneal sarcoma; diagnostic delay; computed tomography; core needle biopsy; histopathology

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Introduction

Retroperitoneal sarcoma (RPS) is a rare yet clinically significant subset of soft tissue sarcomas, accounting for approximately 10–15% of all cases and affecting roughly 0.5–1 per 100,000 individuals annually (Álvarez Álvarez et al., 2023; de Bree et al., 2023). The disease encompasses a heterogeneous spectrum of histologic subtypes, most frequently liposarcoma and leiomyosarcoma, each demonstrating distinct biological behavior, recurrence risk, and treatment response (de Bree et al., 2023). Despite advances in oncologic imaging and surgery, RPS continues to be associated with high morbidity and mortality due to its anatomic concealment, frequent late presentation, and complex operative requirements (Porrello et al., 2023). The retroperitoneum provides a large, compliant potential space that allows tumors to reach considerable size before producing local compressive symptoms; consequently, diagnosis often occurs when the disease has already encased or displaced major visceral and vascular structures (Messiou et al., 2017).

Cross-sectional imaging, particularly contrast-enhanced computed tomography (CT), is regarded as the cornerstone of initial evaluation for retroperitoneal masses. CT reliably delineates tumor size, organ involvement, and resectability, serving as the primary tool for preoperative planning (Messiou et al., 2017; Porrello et al., 2023). Magnetic resonance imaging (MRI) and, less commonly, positron emission tomography (PET-CT) provide complementary information about soft-tissue characterization and vascular invasion, but are not universally available, especially in lower-resource healthcare environments (Álvarez Álvarez et al., 2023). Importantly, cross-sectional imaging alone cannot reliably distinguish RPS from other primary or metastatic retroperitoneal tumors due to overlapping radiologic appearances, underscoring the need for tissue confirmation prior to surgical intervention (Porrello et al., 2023).

Preoperative tissue diagnosis has therefore emerged as a pivotal step in the modern management of retroperitoneal sarcoma. Image-guided core needle biopsy is now widely endorsed as the

preferred diagnostic approach, as it provides sufficient tissue for histologic subtyping, grading, and immunohistochemical evaluation (Álvarez Álvarez et al., 2023; Schmitz and Nessim, 2022). Multiple studies confirm its safety and diagnostic accuracy, with negligible risk of tumor seeding or adverse oncologic impact on recurrence or survival (Wilkinson et al., 2015). In comparison, fine-needle aspiration cytology, though less invasive, is limited by inadequate cellular yield and inability to define histologic subtype or grade, thereby restricting its value in multidisciplinary treatment planning (Schmitz and Nessim, 2022).

Nevertheless, the ideal diagnostic algorithms outlined in international sarcoma guidelines, emphasizing preoperative imaging, percutaneous core biopsy, and multidisciplinary tumor board review, largely reflect practice in high-volume sarcoma centers in high-income countries (Álvarez Álvarez et al., 2023; Carbone et al., 2021). These recommendations, while evidence-based, may not be fully applicable to resource-limited tertiary centers in developing nations, where access to advanced imaging modalities, interventional radiology, and specialized pathology remains inconsistent. As a result, diagnostic delays and incomplete preoperative workups are more likely in such settings, potentially influencing both surgical complexity and patient outcomes (Carbone et al., 2021).

The concept of diagnostic delay has gained increasing attention in soft tissue sarcoma literature as a clinically meaningful metric that influences tumor size at presentation, resectability, and prognosis (Fernández et al., 2025). For consistency in the present study, diagnostic delay was operationally defined as the interval from hospital presentation to diagnostic confirmation, while the preoperative interval was defined as the time from hospital admission to definitive surgery. These presentation-to-diagnosis and admission-to-surgery intervals were used as practical measures of diagnostic pathway efficiency in a tertiary hospital setting, where retrospective symptom-onset dates may be imprecise. However, quantification of these pathway intervals in RPS is rarely reported, particularly in low- and middle-income countries. A systematic analysis of cancer care barriers across LMICs demonstrated substantial diagnostic and treatment delays, highlighting deficiencies in infrastructure, referral systems, and diagnostic access (Brand et al., 2019). Yet, sarcoma-specific data from South Asia remain sparse, leaving a clear contextual evidence gap on real-world diagnostic pathways and delays in tertiary hospitals.

Another underexplored aspect of diagnostic reliability involves the concordance between preoperative diagnostic impressions and final histopathology. Even in expert centers, discrepancies between biopsy findings and definitive pathology are common, reflecting both sampling limitations and tumor heterogeneity. In one open-access analysis, preoperative biopsy and final histopathology showed concordance of approximately 61%, while a large population-based study of sarcoma cases found complete agreement in just over half of diagnoses (Ray-Coquard et al., 2012; Young et al., 2020). Such findings highlight the importance of assessing concordance as an indicator of diagnostic reliability within local system constraints rather than as a strict measure of test accuracy.

Given that most available evidence on RPS diagnosis originates from high-volume sarcoma centers in Europe and North America, these data may not reflect diagnostic realities in tertiary hospitals of low-resource countries such as Bangladesh, where clinical judgment often substitutes for advanced diagnostics. Documenting local diagnostic patterns, imaging uptake, biopsy utilization, and delay intervals therefore becomes essential to identify workflow gaps and improve diagnostic efficiency. Against this background, the present study was undertaken to describe the preoperative diagnostic workup of retroperitoneal sarcoma in a resource-limited tertiary center, to quantify diagnostic delay, and to assess agreement between preoperative investigations and final histopathology among patients managed in a high-volume public institution in Bangladesh.

Methods

This is a hospital-based case series study conducted in the Department of General Surgery, Bangladesh Medical University (BMU), Dhaka, over one year from July 2021 to June 2022. Adult patients (≥18 years), of either sex, who were clinically and radiologically suggestive of a retroperitoneal tumor on admission and were subsequently confirmed as retroperitoneal sarcoma on histopathology were included, using a nonprobability convenience sampling technique, resulting in a final sample of 28 patients; recurrent retroperitoneal sarcoma and Kaposi's sarcoma, including AIDS-related disease, were excluded. Data were collected using a structured questionnaire and a faculty-approved data collection sheet, with participants enrolled after primary screening against eligibility criteria; on admission, a detailed clinical history and physical examination were recorded, relevant radiologic imaging and investigations were reviewed, and operative and histopathological details were extracted from hospital records and pathology reports. The preoperative diagnostic workup variables included the utilization of FNAC, core needle biopsy, CT scan, MRI, and immunohistochemistry. The diagnostic pathway intervals were prespecified as follows: diagnostic delay was defined as the interval from hospital presentation to diagnostic confirmation, and preoperative interval was defined as the interval from hospital admission to definitive surgery; both were summarized in days using medians and ranges. Agreement between preoperative diagnostic impressions and final histopathology was assessed at a broad diagnostic level by comparing, for each modality, whether it correctly identified retroperitoneal sarcoma before surgery against the definitive postoperative histopathology report; this measure was not intended to assess agreement on histological subtype, tumor grade, or immunohistochemical classification. After collection, all data were checked and edited in a master sheet, then processed and analyzed using SPSS (version 21.0). The analysis was descriptive only; results were presented as means, standard deviations, medians, ranges, frequencies, and percentages, without inferential testing because of the small case-series design and limited subgroup sizes. Ethical clearance was obtained from the BMU Institutional Review Board; the study followed the Helsinki Declaration principles described in the thesis, written informed consent was obtained from each participant, and confidentiality was maintained throughout data handling.

Results

Table 1. Baseline characteristics of patients with retroperitoneal sarcoma (N = 28)

Characteristic	n	%
Age		
Mean ± SD	45.4 ± 16.4	
Age, years, median (range)	45.0 (18-71)	
Sex		
Male	16	57.1
Female	12	42.9
Socioeconomic condition		
Middle	18	64.3
Low	8	28.6
High	2	7.1
Smoking status		
No	15	53.6
Yes	13	46.4
Family history of relevant malignancy		
Absent	27	96.4
Present	1	3.6

Table 1 summarizes the baseline demographic and clinical characteristics of the 28 patients with retroperitoneal sarcoma included in the study. The mean age of the cohort was 45.4 ± 16.4 years, with a median age of 45 years and a wide age range spanning from 18 to 71 years. Male patients constituted a slight majority, accounting for 57.1% of cases, while females represented 42.9%. Most patients belonged to the middle socioeconomic group (64.3%), followed by the low socioeconomic group (28.6%), with only a small proportion from a high socioeconomic background (7.1%). Slightly more than half of the patients were non-smokers (53.6%), while 46.4% reported a history of smoking. A family history of relevant malignancy was uncommon, being present in only one patient (3.6%), whereas the vast majority (96.4%) had no such history.

Table 2. Time intervals related to diagnosis and surgery in retroperitoneal sarcoma (n = 28)

Time interval	Median (range), days
Diagnostic delay	45 (31–92)
Preoperative interval	17.5 (14–33)

Table 2 presents the time intervals related to diagnosis and surgical management. The median diagnostic delay, defined as the interval from hospital presentation to diagnostic confirmation, was 45 days, with delays ranging from 31 to 92 days. The median preoperative interval, representing the time from hospital admission to definitive surgery, was 17.5 days, with a range of 14 to 33 days.

Table 3. Imaging characteristics at presentation (N = 28)

Characteristic	n (%) or median (range)
Tumor localization, left lower quadrant	9 (32.1)
Tumor localization, pelvis	5 (17.9)
Tumor localization, right upper quadrant	5 (17.9)
Tumor localization, left upper quadrant	4 (14.3)
Tumor localization, right lower quadrant	5 (17.9)

Tumor size on imaging, cm	12.5 (4.90 to 48.00)
Organ involvement on imaging	10 (35.7)
Distant metastasis on imaging	1 (3.6)

Table 3 describes the imaging profile of retroperitoneal sarcoma at initial presentation. Tumor location was distributed across multiple abdominal and pelvic regions, with the left lower quadrant being the most frequent site, reported in 9 patients (32.1%). Pelvic tumors were identified in 5 patients (17.9%), while right upper quadrant and right lower quadrant localizations were each observed in 5 patients (17.9%). Left upper quadrant involvement was comparatively less common, noted in 4 patients (14.3%). The median tumor size on imaging was 12.5 cm, with a broad range from 4.90 cm to 48.00 cm, indicating substantial variability in tumor burden at diagnosis. Imaging evidence of adjacent organ involvement was present in 10 patients (35.7%), whereas distant metastasis at presentation was uncommon, detected in only 1 patient (3.6%).

Table 4. Preoperative diagnostic workup and biopsy uptake (N = 28)

Modality	**Performed, n (%)**
CT scan	28 (100.0)
FNAC	7 (25.0)
Core needle biopsy	2 (7.1)
MRI	2 (7.1)
Immunohistochemistry	2 (7.1)
Any preoperative tissue sampling (FNAC or core biopsy)	9 (32.1)
No preoperative tissue sampling (CT only)	19 (67.9)

` *Note. FNAC, fine-needle aspiration cytology; MRI, magnetic resonance imaging.*

Table 4 summarizes the pattern of preoperative diagnostic workup and biopsy uptake among the 28 patients. Contrast-enhanced CT scan was performed in all patients (100.0%), indicating universal reliance on cross-sectional imaging at baseline. In contrast, preoperative tissue sampling was undertaken in a minority of cases: FNAC was performed in 7 patients (25.0%) and core needle biopsy in 2 patients (7.1%). MRI was infrequently used, performed in 2 patients (7.1%), and immunohistochemistry was similarly documented in 2 patients (7.1%). Overall, any form of preoperative tissue sampling, either FNAC or core biopsy, was completed in 9 patients (32.1%), whereas the majority, 19 patients (67.9%), proceeded without preoperative tissue confirmation, relying on CT-based assessment alone.

Table 5. Histological subtype distribution of retroperitoneal sarcoma (N = 28)

Histological subtype	**n**	**%**
Dedifferentiated liposarcoma	7	25.0
Well-differentiated liposarcoma	7	25.0
Leiomyosarcoma	3	10.7
Undifferentiated pleomorphic sarcoma (UPS)/Malignant fibrous histiocytoma (MFH)	4	14.3
Malignant peripheral nerve sheath tumour	2	7.1
Other histological subtypes	5	17.9
Total	**28**	**100.0**

Table 5 presents the histopathological subtype distribution of the 28 patients included in the study. Liposarcoma was the predominant histological subtype, accounting for 14 patients (50.0%), comprising 7 patients (25.0%) with dedifferentiated liposarcoma and 7 patients (25.0%) with well-differentiated liposarcoma. Undifferentiated pleomorphic sarcoma (UPS)/malignant fibrous histiocytoma (MFH) was identified in 4 patients (14.3%), while leiomyosarcoma was observed in 3 patients (10.7%). Malignant peripheral nerve sheath tumour (MPNST) was diagnosed in 2 patients (7.1%), and the remaining 5 patients (17.9%) had other histological subtypes.

Table 6. Concordance of preoperative modality with final histopathology for broad identification of retroperitoneal sarcoma

Modality	Tested (n)	Correctly identified RPS (n)	Concordance, n/N (%)
FNAC	7	4	4/7 (57.1)
Core needle biopsy	2	2	2/2 (100.0)
CT scan impression	28	24	24/28 (85.7)

Note. RPS, retroperitoneal sarcoma; concordance is presented as the proportion correctly identified among those tested. Concordance refers to broad identification of RPS and does not indicate agreement on histological subtype, tumor grade, or immunohistochemical classification. The 100.0% core needle biopsy concordance should be interpreted cautiously because it is based on only two patients.

Table 6 presents the broad concordance between preoperative diagnostic impressions and the final postoperative histopathology for identifying retroperitoneal sarcoma among patients who underwent each modality. This measure indicates correct preoperative identification of RPS only and should not be interpreted as full histological subtype or grade agreement. FNAC was performed in 7 patients, of whom 4 were correctly identified as having retroperitoneal sarcoma, yielding a concordance of 57.1% (4/7). Core needle biopsy was used in 2 patients and correctly identified retroperitoneal sarcoma in both cases, corresponding to a concordance of 100.0% (2/2), although this reflects a very small tested subgroup and should be interpreted cautiously. CT scan impression was available for all 28 patients and correctly suggested retroperitoneal sarcoma in 24 cases, resulting in a concordance of 85.7% (24/28).

Discussion

The present study provides an observational overview of the preoperative diagnostic workup of retroperitoneal sarcoma (RPS) in a resource-limited tertiary center, highlighting demographic distribution, diagnostic delay, imaging characteristics, biopsy uptake, and concordance between preoperative impressions and final histopathology. The mean age of patients in this series was 45.4 years, notably younger than the fifth to sixth decade peak typically reported in population-based and institutional analyses from high-income settings, where mean ages often exceed 55–60 years (Buja et al., 2023). The sex distribution in this cohort showed a slight male predominance (57.1%), consistent with reports describing no definitive sex predilection, with near-equal incidence across genders (Schmitz and Nessim, 2022). The rarity of familial malignancy in the present study also aligns with existing evidence that RPS is largely sporadic, with hereditary associations being uncommon (de Bree et al., 2023).

Diagnostic delay remains an important factor influencing outcomes in soft-tissue sarcomas, particularly retroperitoneal subtypes that grow silently until late stages. In this study, the median interval from hospital presentation to diagnostic confirmation was 45 days, shorter than the median delays of several months reported in broader sarcoma cohorts but still representing a meaningful delay in clinical evaluation (Soomers et al., 2020). Similar systematic reviews demonstrate that diagnostic intervals for soft-tissue sarcomas can vary from 4 to over 600 weeks, depending on the healthcare context and patient pathway (Fernández et al., 2025). The additional preoperative interval of 17.5 days in this cohort underscores that even after hospital admission, procedural and scheduling delays persist, a phenomenon also described in low- and middle-income settings where limited diagnostic infrastructure and surgical capacity constrain timely management (Campos et al., 2025).

Radiologically, tumors in this study demonstrated wide anatomic distribution within the retroperitoneum, with the left lower quadrant being the most common site, and a median imaging size of 12.5 cm, reflecting substantial tumor burden at presentation. This finding parallels earlier multi-institutional and imaging-based analyses reporting median tumor sizes ranging from 15 to 20 cm at diagnosis (Toulmonde et al., 2014). As described in recent imaging reviews, RPS typically present as large, heterogeneous masses that expand within the retroperitoneal potential space, explaining the frequency of organ displacement or invasion rather than distant spread (Porrello et al., 2023). In this series, 35.7% of cases showed adjacent organ involvement and only one patient (3.6%) had distant metastasis, consistent with the literature consensus that local extension is the dominant mode of progression in RPS (Schmitz and Nessim, 2022).

Regarding diagnostic modalities, the universal use of contrast-enhanced CT in all cases reflects the established global reliance on CT as the cornerstone of RPS evaluation, given its accessibility and diagnostic versatility (Porrello et al., 2023). MRI and immunohistochemistry were each employed in only 7.1% of cases, mirroring real-world patterns in resource-limited centers where advanced modalities are selectively available (Carbone et al., 2021). The overall rate of preoperative tissue sampling in this study (32.1%) was substantially lower than in reports from specialized sarcoma units, where core needle biopsy is standard practice for diagnosis and treatment planning (Carbone et al., 2021). The limited use of FNAC (25%) and core biopsy (7.1%) may reflect logistic barriers, clinician preference for direct resection, or reliance on imaging features for surgical decision-making.

Histopathological evaluation showed that liposarcoma was the predominant subtype, accounting for half of all cases, with equal proportions of dedifferentiated and well-differentiated liposarcoma. This distribution is consistent with contemporary epidemiological studies identifying liposarcoma as the most common histological subtype of retroperitoneal sarcoma (de Bree et al., 2023). Leiomyosarcoma and undifferentiated pleomorphic sarcoma were the next most frequent subtypes, reflecting the recognised histological heterogeneity of this disease.

Concordance analysis, defined here as broad preoperative identification of RPS rather than histological subtype or grade agreement, demonstrated that CT-based impressions accurately suggested retroperitoneal sarcoma in 85.7% of cases, FNAC correctly identified the diagnosis in 57.1%, and core biopsy achieved 100% concordance in two tested patients; therefore, the core biopsy result should be considered exploratory and

should not be used alone to infer superiority over other modalities in this cohort. Although the present core-biopsy subgroup was too small for meaningful comparison, the direction of findings is compatible with previously reported accuracy rates of approximately 61% for percutaneous biopsy in RPS and over 85% for core needle biopsy in large cohorts (Nardi et al., 2024; Young et al., 2020). Prior comparative studies have shown that FNAC provides reasonable sensitivity for detecting malignancy but reduced specificity for histologic subtyping, while core biopsy yields higher diagnostic precision (Ariizumi et al., 2022). The moderate FNAC agreement in this study is therefore consistent with published findings that emphasize the limitations of cytology alone in complex mesenchymal tumors. Overall, the high CT concordance, coupled with modest biopsy uptake, underscores both the reliance on imaging-based diagnosis and the opportunity for expanding biopsy-guided pathways to improve histologic accuracy and multidisciplinary treatment planning.

Collectively, these findings reinforce that, even in a resource-limited context, CT-based evaluation remains the diagnostic mainstay for RPS, while the limited core needle biopsy findings support expanding access to image-guided biopsy but do not establish comparative superiority in this cohort because only two patients underwent the procedure. Diagnostic delays remain moderate but clinically relevant, emphasizing the need for streamlined referral, image-guided biopsy capacity, and multidisciplinary collaboration to optimize preoperative diagnostic reliability in retroperitoneal sarcoma.

Strength of The Study

This study has several important strengths. It provides one of the few contemporary descriptions of the real-world diagnostic pathway for retroperitoneal sarcoma in a resource-limited South Asian tertiary referral center. The study comprehensively evaluated demographic characteristics, diagnostic intervals, imaging utilisation, biopsy practices, histological subtype distribution, and concordance between preoperative diagnostic impressions and final histopathological diagnosis using a well-defined cohort of histopathologically confirmed cases. These findings offer valuable baseline data that may inform future improvements in diagnostic pathways and multidisciplinary sarcoma care in similar low- and middle-income healthcare settings.

Limitations of The Study

This study was conducted as a single-center case series with a relatively small sample size, which limits the generalizability of the findings and precludes robust inferential statistical comparisons between diagnostic modalities. Additionally, the low uptake of preoperative tissue sampling restricted more detailed analysis of diagnostic accuracy across biopsy techniques and histologic subtypes. Concordance was assessed only at the broad level of RPS identification and did not evaluate agreement for histological subtype, tumor grade, or immunohistochemical classification. Histological subtype and grade distribution were not reported in the present manuscript; inclusion of these variables would strengthen interpretation of diagnostic modality performance in future analyses.

Conclusion

This study demonstrates that, in a resource-limited tertiary center, contrast-enhanced CT remains the universal and primary modality for the preoperative evaluation of retroperitoneal sarcoma, while preoperative tissue diagnosis is underutilized. Diagnostic delays were moderate but consistent, and tumors frequently presented with large size and local organ involvement, reflecting the silent progression characteristic of retroperitoneal disease. Although CT impressions showed high concordance with final histopathology for identifying RPS at a broad diagnostic level, this should not be interpreted as full histological subtype or grade agreement. FNAC demonstrated only moderate agreement, whereas core needle biopsy showed complete concordance in only two patients and therefore requires cautious interpretation. These findings highlight existing gaps between guideline-recommended diagnostic pathways and real-world practice in resource-constrained settings.

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Ethical approval: The study was approved by the Institutional Ethics Committee

Recommendation

Strengthening access to image-guided core needle biopsy and expanding multidisciplinary diagnostic pathways may improve preoperative histologic confirmation and diagnostic reliability in retroperitoneal sarcoma. Efforts to streamline referral systems and reduce diagnostic delays are warranted, particularly in tertiary public hospitals. Future multicenter studies with larger cohorts are recommended to better define diagnostic performance across modalities and to assess the impact of optimized diagnostic pathways on surgical outcomes.

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