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Case Report

Hidden Threats around the Knee When Cysts Are Not Just Cysts: A Case-Based Expert Review

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Abstract

Background: Soft tissue masses around the knee are commonly presumed to be benign cystic lesions. However, certain malignant tumors may mimic these entities, leading to delayed diagnosis and treatment. This case highlights the diagnostic challenges associated with malignant lesions presenting as common cysts.
Case Report: A 26-year-old woman presented with a painless mass in the posteromedial aspect of her left knee that had gradually enlarged over four months. Initial ultrasonography identified the lesion as a Baker's cyst. Owing to atypical clinical and imaging features, further evaluation was pursued. The case was discussed at ORTHOBIT 2025 Congress (Tehran, Iran), where the diagnostic pathway, differential diagnoses, imaging findings, and management options were reviewed. Advanced imaging raised suspicion for a malignant soft-tissue tumor, emphasizing the limitations of relying solely on conventional imaging modalities.
Conclusion: Malignant tumors such as synovial sarcoma can closely resemble benign cystic lesions around the knee. Careful clinical assessment, recognition of atypical features, advanced magnetic resonance imaging (MRI) evaluation, and multidisciplinary collaboration are essential to avoid misdiagnosis and ensure timely management.

Keywords: Synovial Sarcoma; Cyst; Knee; Soft Tissue Sarcoma; Magnetic Resonance Imaging

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Background

Soft tissue masses around the knee are frequently encountered in orthopedic practice, with cystic lesions often presumed benign. However, misdiagnosis of malignant tumors mimicking benign cysts may delay appropriate treatment (1). This report presents a case-based discussion from ORTHOBIT 2025 Congress (Tehran, Iran) highlighting diagnostic and management challenges.

Case Report

A 26-year-old woman presented with a painless, gradually enlarging mass in the posteromedial aspect of the left knee, persisting over 4 months. She reported mild restriction of range of motion (ROM), but no systemic symptoms. Examination showed normal overlying skin and intact neurovascular status.

Initial ultrasonography identified the lesion as a Baker's cyst.

Review of the Evidence

Imaging Features Differentiating Benign from Malignant Cystic-Appearing Lesions

Although many soft-tissue masses around the knee share a "cyst-like" appearance [T1-weighted (T1W) hypointense, T2-weighted (T2W) hyperintense], certain magnetic resonance imaging (MRI) features raise suspicion for malignancy (2). Larger size is the most robust discriminator: lesions with an average diameter ≥7 cm or a maximal diameter ≥10 cm are highly suggestive of malignancy and warrant further workup (3-5). In addition, malignant mimickers often demonstrate:

- **Internal nodularity or solid components** rather than simple fluid, seen as enhancing soft-tissue nodules on post-contrast images (4, 6),
- **Heterogeneous signal** on T1W images ("triple sign" in synovial sarcoma: intermixed low, intermediate, and high signals corresponding to fibrosis, cellular tissue, and cystic/hemorrhagic areas) (7),
- **Ill-defined or irregular margins**, peritumoral edema, and central necrosis more common in malignant peripheral nerve sheath tumors (size > 5 cm, heterogeneous post-contrast enhancement) (8, 9).

Approach When Diagnosis Is Uncertain

When routine MRI cannot definitively characterize a lesion, the following steps are recommended:

1. Advances in MRI techniques: The utilization of MRI has undergone significant technological evolution, with advanced MRI techniques providing unprecedented diagnostic insights compared to conventional approaches (10). While earlier clinical practice primarily relied on gadolinium-based contrast enhancement as the hallmark of advanced imaging, contemporary MRI encompasses a considerably broader spectrum of sophisticated modalities. Dynamic contrast-enhanced imaging (DCE), diffusion-weighted imaging (DWI), and blood oxygen level-dependent (BOLD) functional MRI have emerged as particularly valuable techniques, demonstrating robust diagnostic accuracy and reliability across diverse clinical applications (11, 12). Furthermore, the integration of radiomic analysis and modeling has introduced novel analytical capabilities, enabling the extraction and quantification of imaging features that extend beyond conventional visual assessment (13). Although these

advanced technologies may not yet be universally accessible across all healthcare settings, the trajectory toward widespread clinical implementation appears increasingly attainable, suggesting that comprehensive access to these sophisticated imaging modalities is within the foreseeable future.

2. Ultrasound correlation: particularly for superficial or meniscal cysts, to distinguish simple fluid collections from myxoid or solid masses (14).

3. Image-guided biopsy (core-needle or excisional), since fine-needle cytology and imaging may overlap in myxoid lesions; definitive histopathology with immunohistochemistry (IHC) [e.g., epithelial membrane antigen (EMA), SS18 fluorescent in situ hybridization (FISH) for synovial sarcoma] clinches the diagnosis (6).

Preventing Misdiagnosis of Rare Malignancies

To avoid overlooking uncommon tumors mimicking cysts:

- Maintain a high index of suspicion for any cystic-appearing lesion with atypical features (e.g., deep peri-articular location, patient age < 40, lack of joint communication) (15, 16).
- Send all aspirates for histopathology, even if imaging suggests a simple ganglion; published series report unexpected synovial sarcomas presenting as "meniscal cysts" (17).
- Convene a multidisciplinary tumor board early when findings are equivocal, integrating radiology, pathology, and orthopedic oncology input (18).

Management Strategies Following Misdiagnosis

If a malignant lesion is discovered after an unplanned excision or delayed diagnosis, management principles include:

- Wide local re-excision with negative margins to reduce local recurrence, often combined with adjuvant radiotherapy for high-grade or residual disease (19),
- Neoadjuvant chemotherapy or radiotherapy for large, high-grade sarcomas to shrink tumors and improve resectability (20, 21),
- Long-term follow-up, since synovial sarcomas and other soft-tissue sarcomas can recur or metastasize after several years (22).

Discussion

This case underscores the significant discrepancies that can arise between clinical presentation and imaging findings. Although initial ultrasonography classified the lesion as a Baker's cyst, the panel highlighted the necessity of advanced imaging when the clinical scenario deviates from typical presentations. In this instance, the painless, progressively enlarging mass located in the posteromedial aspect of the knee, which persisted for four months and was accompanied by mild ROM restrictions but no systemic symptoms, warranted further diagnostic evaluation.

Central to the discussion was the consensus that MRI with gadolinium contrast was imperative for elucidating the diagnosis. The panel meticulously considered differential diagnoses extending beyond benign cystic formations, including synovial sarcoma, dedifferentiated sarcoma, and myxoid liposarcoma. Notable imaging features such as gadolinium enhancement, central necrosis, and cystic degeneration may heighten suspicion for malignancy. It was particularly noted that small synovial sarcomas measuring less than 5 cm could present with deceptively benign characteristics.

A comprehensive staging workup, encompassing chest computed tomography (CT) and abdominal/pelvic ultrasound, yielded normal results in this case. The panel deliberated various management strategies, including neoadjuvant chemotherapy followed by surgical intervention, preoperative radiotherapy followed by surgery, a combination of neoadjuvant chemotherapy and radiotherapy prior to surgical resection, or primary surgical excision followed by adjuvant radiotherapy or chemotherapy.

Common pitfalls identified during the discussion included the misidentification of malignant soft tissue tumors as benign cysts such as Baker's cysts, an overreliance on ultrasonography for definitive diagnosis, delays in obtaining MRI and expert radiologic evaluations, and a failure to consider malignancy in the presence of atypical features such as persistent growth or restricted ROM.

Certain sarcomas can mimic benign lesions, while benign conditions may present with characteristics suggestive of malignancy. A thorough clinical assessment and advanced imaging techniques, particularly MRI with gadolinium, are essential in these cases. Clinicians should maintain a high index of suspicion for malignancy in atypical presentations of common cystic lesions. A multidisciplinary approach is recommended to ensure accurate diagnosis and appropriate therapeutic interventions. Furthermore, it is critical for clinicians to remain informed about sarcoma variants and pertinent imaging red flags to enhance diagnostic accuracy.

Conclusion

This case highlights the diagnostic challenges posed by malignant soft-tissue tumors that mimic benign cystic lesions around the knee. Although initially interpreted as a Baker's cyst, further evaluation revealed features warranting suspicion for malignancy. Careful clinical assessment, recognition of atypical imaging characteristics, and the use of advanced MRI techniques are essential for accurate diagnosis. Early multidisciplinary evaluation can help prevent delayed treatment and optimize outcomes in patients with uncommon malignancies such as synovial sarcoma.

Conflict of Interest

The authors declare no conflict of interest in this study.

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