

AMSER Case of the Month

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29 year old male with left knee pain

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Patient Presentation

- 29-year-old male with no significant PMH
- Gradually worsening left knee pain in different areas for the last 4–5 months
- Unable to fully flex the knee; extension is normal
- Denies weakness, paresthesias, trauma, or prior knee pathology
- **Physical exam:**
- **MSK:**
 - Knees atraumatic without deformity, swelling, atrophy, or tenderness to palpation
 - Able to ambulate without difficulty. No limp, locking, or joint instability
 - Negative patellar grind, anterior/posterior drawer, valgus/varus stress, McMurray, and ballottement tests

Pertinent Labs

- No pertinent labs

What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

Variants					Documents
1. Adult or child greater than or equal to 5 years of age. Chronic knee pain. Initial imaging.					Documents
					Narrative
					Evidence Table
					Lit Search
					Appendix
Scenario	Scenario ID	Procedure	Adult RRL	Peds RRL	Appropriateness Category
Knee pain, chronic, initial exam	3148156	● Radiography knee	<0.1 mSv ☼	<0.03 mSv [ped] ☼	Usually appropriate
		● US knee	0 mSv O	0 mSv [ped] O	Usually not appropriate
		● Radiography hip ipsilateral	1-10 mSv ☼☼☼	0.3-3 mSv [ped] ☼☼☼	Usually not appropriate
		● Image-guided aspiration knee	Varies	Varies	Usually not appropriate
		● MR arthrography knee	0 mSv O	0 mSv [ped] O	Usually not appropriate
		● MRI knee without and with IV contrast	0 mSv O	0 mSv [ped] O	Usually not appropriate
		● MRI knee without IV contrast	0 mSv O	0 mSv [ped] O	Usually not appropriate
		● CT arthrography knee	<0.1 mSv ☼	0.03-0.3 mSv [ped] ☼☼☼	Usually not appropriate

This imaging modality was ordered by the family medicine physician

Left knee radiograph (unlabeled)



Left knee radiograph (labeled)

A large exophytic lobulated osseous mass along the posterior aspect of the distal femur



(Again) Select the applicable ACR Appropriateness Criteria

1. Adult or child. Suspected primary bone tumor. Lesion on radiographs. Indeterminate or aggressive appearance for malignancy. Next imaging study.

Documents

[Narrative](#)

[Evidence Table](#)

[Lit Search](#)

[Appendix](#)

Scenario	Scenario ID	Procedure	Adult RRL	Peds RRL	Appropriateness Category
Primary bone tumor suspected, femur, lesion on radiography, aggressive appearance for malignancy, next imaging study	3198837	● MRI thigh without and with IV contrast	0 mSv O	0 mSv [ped] O	Usually appropriate
		● MRI thigh without IV contrast	0 mSv O	0 mSv [ped] O	Usually appropriate
		● FDG-PET/CT whole body	10-30 mSv ⚡⚡⚡⚡	3-10 mSv [ped] ⚡⚡⚡⚡	Usually appropriate
		● CT thigh with IV contrast	0.1-1mSv ⚡⚡		May be appropriate
		● CT thigh without IV contrast	0.1-1mSv ⚡⚡		May be appropriate
		● Bone scan whole body with SPECT or SPECT/CT femur	1-10 mSv ⚡⚡⚡	3-10 mSv [ped] ⚡⚡⚡⚡	May be appropriate
		● CT thigh without and with IV contrast	1-10 mSv ⚡⚡⚡		May be appropriate

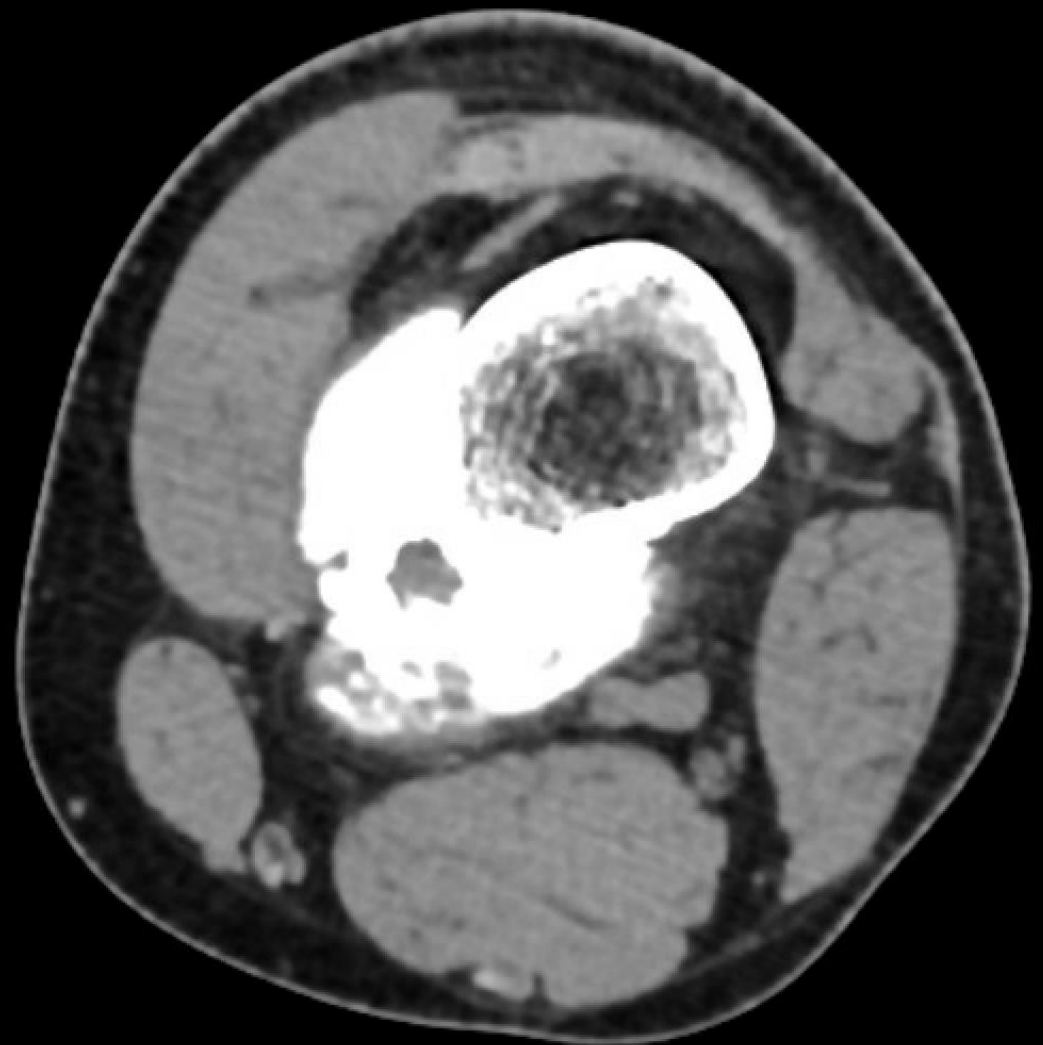
Based on the Xray findings, Both CT and MRI were ordered by the family medicine physician

Left knee and thigh CT w/o contrast: soft tissue window (unlabeled)

Coronal



Axial



Left knee and thigh CT w/o contrast: bone window (unlabeled)

Coronal



Axial



Left thigh MRI w/ and w/o contrast (unlabeled)

Sagittal proton density (PD)

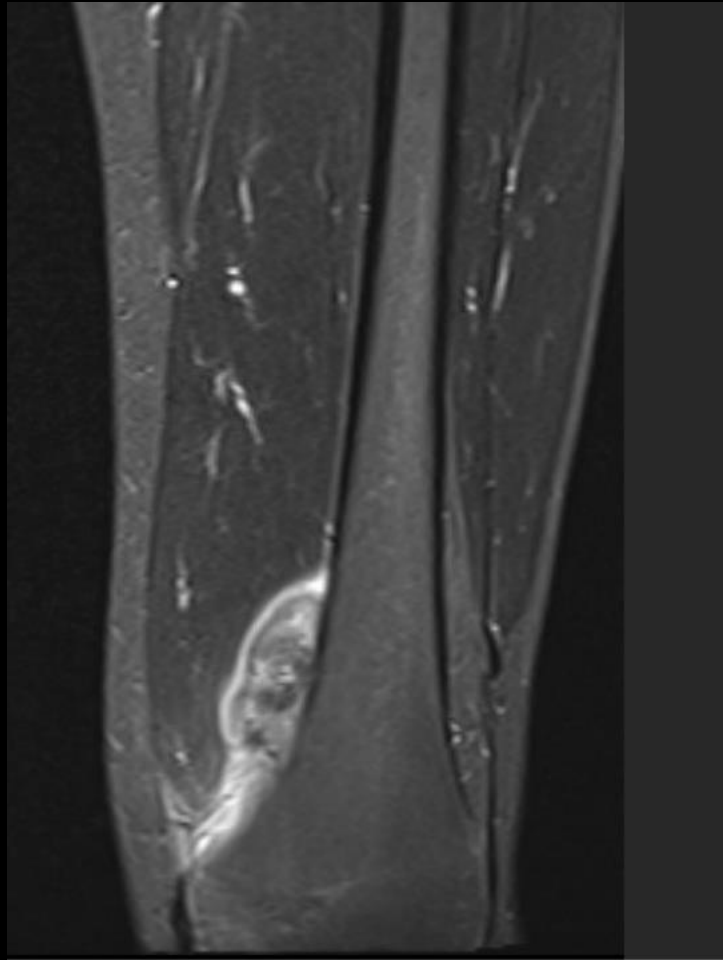


T1 axial pre-contrast

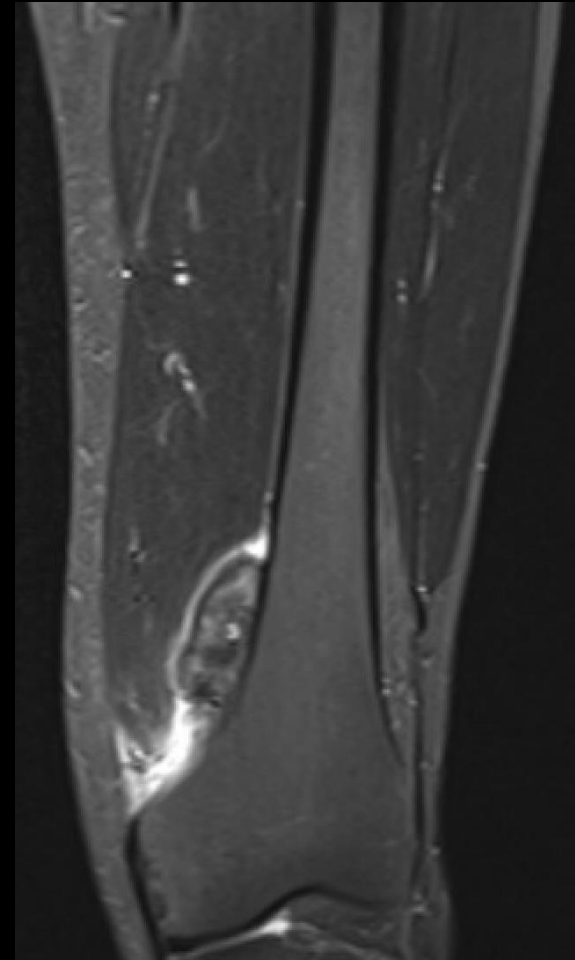


Left thigh MRI w/ and w/o contrast (unlabeled)

Coronal STIR



T1 coronal post-contrast



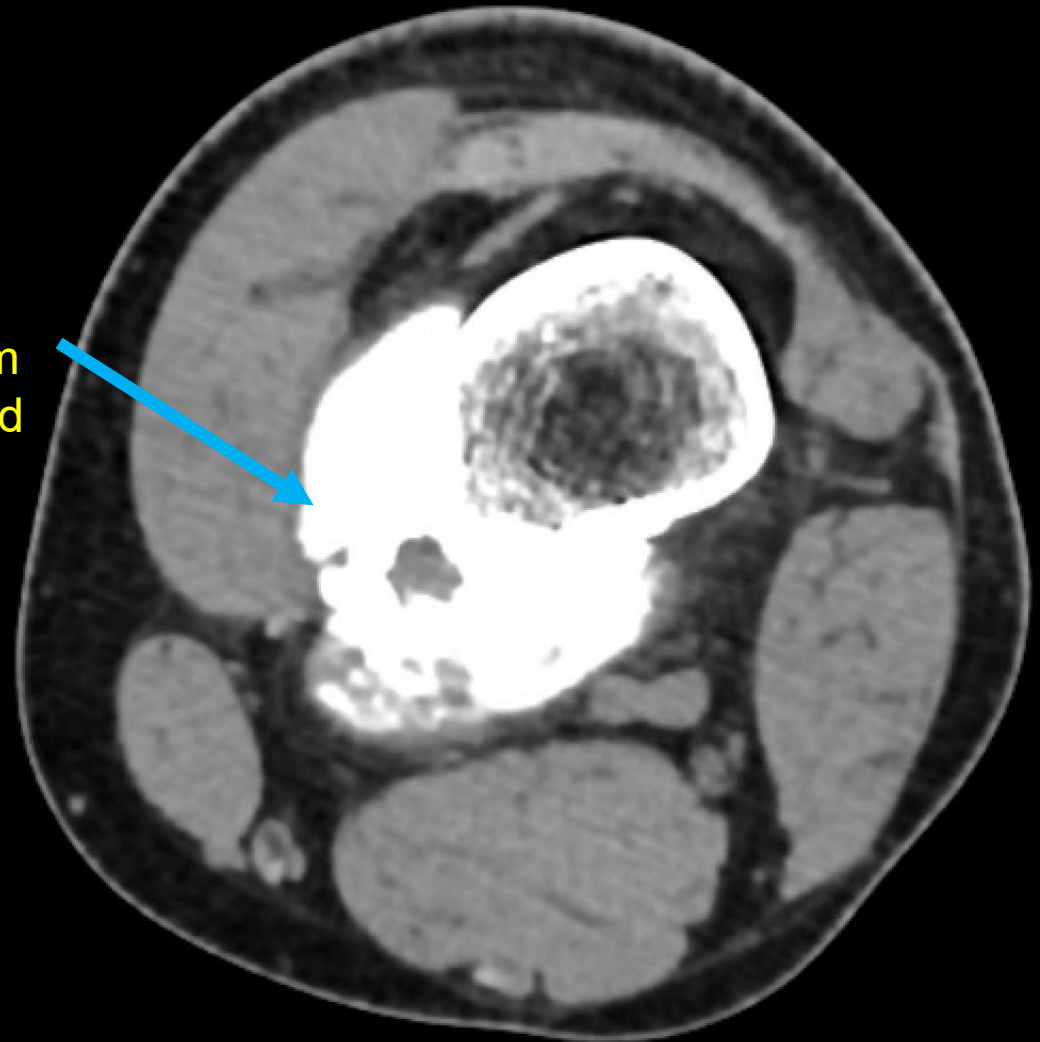
Left knee and thigh CT w/o contrast: soft tissue window (labeled)

Coronal



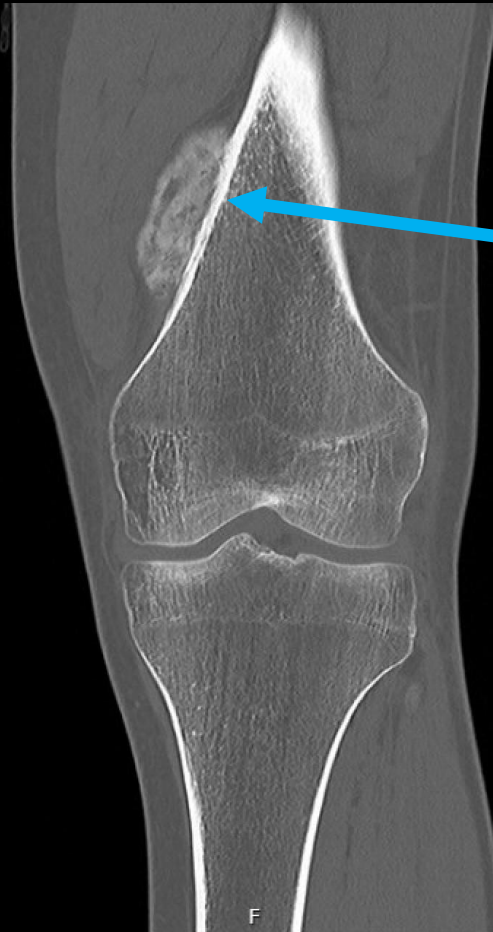
Soft tissue window CT shows a 6-7 cm partially ossified exophytic juxtacortical mass arising from the posteromedial distal femur

Axial



Left knee and thigh CT w/o contrast: bone window (labeled)

Coronal



Bone window CT shows a partially ossified lobulated juxtacortical mass with broad cortical attachment

Axial

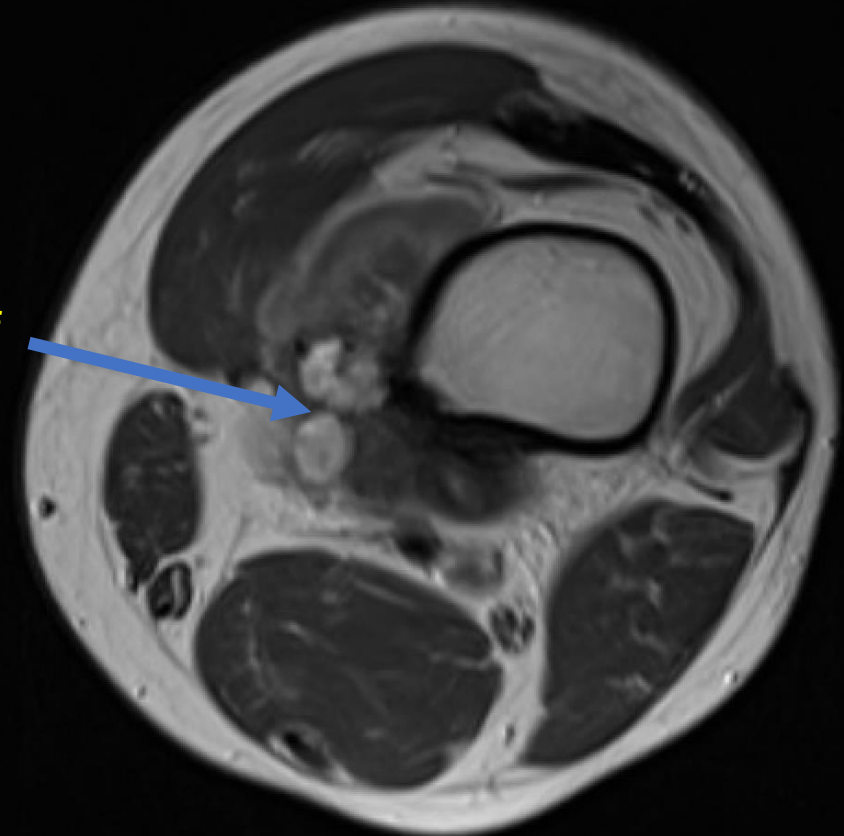


Left thigh MRI w/ and w/o contrast (labeled)

Sagittal proton density (PD)



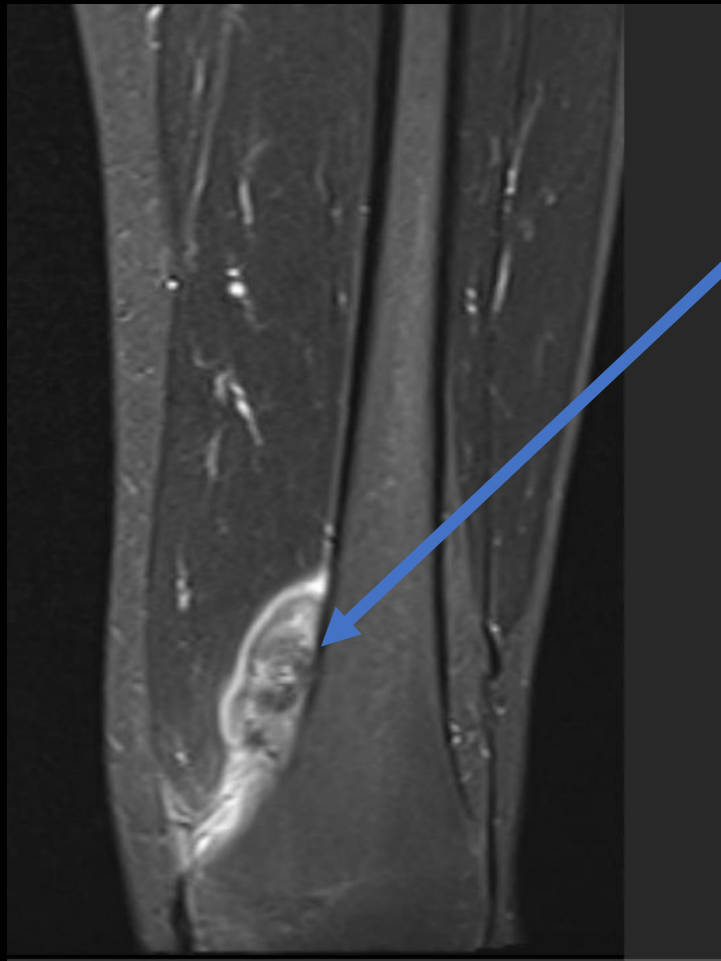
T1 axial pre-contrast



Sagittal PD and T1 axial pre-contrast images show a lobulated tumor along the surface of the distal posteromedial femur with mixed signal intensity and periosteal involvement

Left thigh MRI w/ and w/o contrast (labeled)

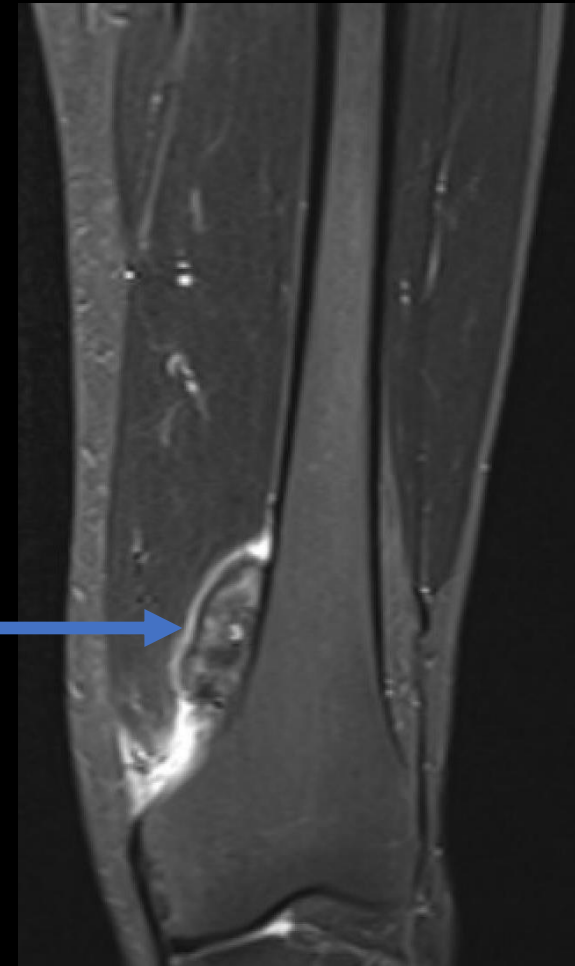
Coronal STIR



STIR shows heterogeneous signal within the tumor with hyperintense non-mineralized tissue and hypointense ossified matrix

T1 post-contrast shows enhancement of the soft tissue component of the tumor, while the densely ossified matrix is relatively non-enhancing

T1 coronal post-contrast with fat sat



Final diagnosis:
Parosteal Osteosarcoma

Case Discussion

- Basics of parosteal osteosarcoma^{1,2,3}:
 - Definition: Low-grade surface osteosarcoma arising from the outer fibrous layer of periosteum
 - Typically affects patients in early adulthood and middle age with highest incidence in the third decade of life
 - Accounts for approximately 4% of all osteosarcomas
- Imaging features^{2,3,4}:
 - Dense, lobulated, ossified mass attached to the cortex
 - Usually arises from the posterior distal femur (~70% of cases)
 - String sign: thin radiolucent line separating the tumor from the cortex, best appreciated on CT. Seen in ~30% of cases
 - Exhibits predominantly low signal intensity on T1 and T2 MRI; however, MRI signal can often be heterogeneous because tumors contain varying amounts of mineralized bone, cartilage, fibrous stroma, and non-mineralized osteoid

Case Discussion (cont)

- Differential Diagnosis^{3,5}:
 - Osteochondroma
 - Myositis ossificans
 - Cortical desmoid
 - Periosteal osteosarcoma
- Prognosis^{6,7}:
 - Good. Estimated 5-year disease-free survival of 80-95%
- Management^{1,3,5}:
 - Biopsy required to confirm the diagnosis
 - Standard management is wide surgical excision
 - No chemotherapy typically indicated as this is usually a low-grade lesion
 - However, dedifferentiation can occur in the tumor. It is important to identify this as it indicates a worse prognosis and requires systemic therapy

References:

1. Greenwood, Anna C., Rahul D. Arora, and Hira Shaikh. "Osteosarcoma (osteogenic sarcoma)." *StatPearls [Internet]*. StatPearls Publishing, 2024.
2. Wines A., Bonar F., Lam P., McCarthy S., Stalley P. Telangiectatic dedifferentiation of a parosteal osteosarcoma. *Skeletal Radiology*. 2000;29(10):597–600. doi: 10.1007/s002560000247 (prognosis)
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4. Dönmez, Fuldem Yildirim, et al. "MRI findings in parosteal osteosarcoma: correlation with histopathology." *Diagnostic and Interventional Radiology* 14.3 (2008): 147.
5. Kumar VS, Barwar N, Khan SA. Surface osteosarcomas: Diagnosis, treatment and outcome. *Indian J Orthop*. 2014;48(3):255-261. doi:10.4103/0019-5413.132503
6. Crombé, Amandine, et al. "Imaging of osteosarcoma: presenting findings, metastatic patterns, and features related to prognosis." *Journal of Clinical Medicine* 13.19 (2024): 5710.
7. Damron, Timothy A., William G. Ward, and Andrew Stewart. "Osteosarcoma, chondrosarcoma, and Ewing's sarcoma: national cancer data base report." *Clinical Orthopaedics and Related Research*® 459 (2007): 40-47.