Multimodality Imaging Of Soft Tissue Tumor

by Hermina Sukmaningtyas

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Hermina Sukmaningtyas
Musculoskeletal Divion, Department of Radiology, Faculty of Medicine, Diponegoro University- dr Kariadi Hospital Semarang

ABSTRACT

Accurate diagnosis of soft tissue tumor with subsequent appropriate treatment is crucial for the clinical outcome. Most of soft tissue tumors are benign lesion, which outnumber malignant by 100:1 nearly. Determining of malignancy is the initial and most important factor in evaluating soft tissue tumor. Imaging of soft tissue tumor, have a big role to evaluating these masses, in diagnosis and staging. Advanced Imaging (MRI and CT) improved the ability to detect and characterized the soft tissue tumor component. Radiography as initial assessment may add information about matrix calcification and osseous involvement. Ultrasonography has proved to be most useful when applied to evaluation of small superficial lesions, typically those superficial to the deep fascia, also be useful in distinguishing between cystic and solid masses.

I. Pendahuluan

Soft tissue tumor (STT) sering dijumpai pada praktek radiologi. Kesulitan membedakan karakteristik secara imaging masih merupakan problem meskipun dengan pemeriksaan radiologi terkini. STT bervariasi dari non neoplasia, benigna sampai maligna. Tujuan utama pemeriksaan radiologi adalah memastikan ada tidaknya STT, serta menilai perluasan lesi. Pada beberapa subset kasus, karakteristik klinis dan imaging sangat membantu mengarahkan diagnosis. Karakteristik ini meliputi:

1. Riwayat klinis
2. Lokasi lesi
3. Mineralisasi
4. Karateristik Sinyal Intensity (SI) pada pemeriksaan MRI

II. Spektrum STT

Histologic type	Benign	Intermediate, locally aggressive	Intermediate, rarely metastasizing	Malignant
Adipocytic	Lipoma and its variants (lipoblastoma, hibernoma, lipomatosis)	Atypical lipomatous tumor, well-differentiated liposarcoma	...	Liposarcoma
Fibroblastic/ myofibroblastic	Fibromatosis colli, myofibroma, giant cell angiofibroma	Desmoid-type fibromatosis	Solitary fibrous tumor hemangio-pericytoma, inflammatory myofibroblastic tumor (inflammatory pseudotumor)	Fibrosarcoma
So-called fibrohistiocytic	Benign fibrous histiocytoma, diffuse-type giant cell tumor (pigmented villonodular synovitis)	...	Giant cell tumor of soft tissues	Malignant fibrous histiocytoma (undifferentiated pleomorphic sarcoma)
Skeletal muscle	Rhabdomyoma	...	...	Rhabdomyosarcoma
Smooth muscle	Leiomyoma, angioleiomyoma	...	...	Leiomyosarcoma
Vascular	Hemangioma, lymphangioma	Kaposiform hemangioendothelioma	Kaposi sarcoma	Angiosarcoma
Perivascular	Glomus tumor, myopericytoma	...	...	Malignant glomus tumor
Chondro-osseous	Soft tissue chondroma	...	...	Mesenchymal chondrosarcoma, extraskeletal osteosarcoma
Uncertain differentiation	Myxoma	...	Ossifying fibro-myxoid tumor	Synovial sarcoma, alveolar soft part sarcoma, primitive neuroectodermal tumor, Ewing sarcoma

III. Imaging Finding dan Reporting

1. USG

USG merupakan modalitas primer yang penting pada kasus STT, dengan kelebihan mampu membedakan lesi solid atau kistik, menilai kalsifikasi, udara, darah, otot skeletal atau komponen vaskuler. USG Doppler pada kasus malformasi vaskuler mampu menilai high atau low flow, atau komponen limfatik avaskuler. USG juga sangat membantu pada guided drainage. Kelemahan USG adalah pada kasus-kasus STT yang letaknya profunda dan pasien obese, serta operator dependent. Dalam melakukan pemeriksaan USG STT perlu dilaporkan

i. Hubungan dengan fascia (superfisial/profunda)
j. Lokasi anatomi lesi (kompartemen yang terlibat)
k. Hubungan/ infiltrasi dengan vaskuler/ nerve dan sendi/ tulang serta struktur penting sekitarnya
l. Ukuran (dalam 3 dimensi)
m. Morfologi: kistik, solid (echotexture intralesi, vaskularisasi, ada tidaknya nekrosis, bleeding, posterior acoustic enhancement/ shadowing, kalsifikasi, bentuk, border/ margin)

Kriteria Lesi Benigna

a. Simple cyst, bursa, synovial/ganglion cyst: lesi kistik murni, batas tegas, tanpa komponen solid, anekoik dengan posterior enhancement, tidak tampak vaskularisasi intralesi.
b. Superficial lipoma: homogeny, batas tegas, encapsulated, compressible
c. Vascular malformation, tanpa keluhan klinis dan stabil pada USG (minimal 6 bulan follow up)
d. Foreign body "granuloma" with a compatible history.
e. Superficial fibromatosis (e.g., palmar and plantar fibromatosis, infantile digit fibromatosis).
f. Muscle hernia
g. Morton neuroma
h. Neurofibromatosis for the detection and monitoring of typical neurofibromas. (bila nyeri, perlu pemeriksaan lanjutan)

2. Radiografi

Radiografi bermanfaat untuk membedakan apakah massa berasal dari tulang atau soft tissue. Pemeriksaan ini juga sangat berguna dalam menilai kalsifikasi

3. CT scan

CT scan berperan dalam menilai lemak atau elemen darah serta mengevaluasi kalsifikasi dan morfologi. Penggunaan media kontras akan meningkatkan detail soft tissue.

4. MRI

MRI merupakan teknik terbaik dalam menggambarkan karakteristik STT, ekstensi tumor (pada lokasi superfisial maupun profunda), mendeteksi komponen STT (lemak, darah kalsium).

Protokol MRI pada STT

MR Protocols for Soft-Tissue Lesions

Sequence	Repetition Time (msec)	Echo Time (msec)	Echo Train Length	Flip Angle (degrees)	Matrix	No. of Signals Acquired
Axial T1-weighted SE	600	15	...	...	256 × 256	1
Axial T2-weighted fast SE	2500	80	17	...	256 × 192	2
Axial STIR	4000	60	12	...	256 × 192	2
Coronal, sagittal, or oblique longitudinal T1-weighted SE	600	15	...	...	256 × 192	1
Coronal, sagittal, or oblique longitudinal STIR	4000	60	8	...	256 × 192	2
Axial nonenhanced fat-suppressed T1-weighted SE	700	15	...	...	256 × 192	1
Axial contrast-enhanced fat-suppressed T1-weighted SE	700	15	...	...	256 × 192	1
Coronal, sagittal, or oblique longitudinal contrast-enhanced fat-suppressed T1-weighted SE	700	15	...	...	256 × 256	1
T2*-weighted gradient-echo*	600	20	...	15	256 × 192	1
Dynamic contrast-enhanced fat-suppressed three-dimensional T1-weighted SPGR*	8	4	...	10	320 × 192	1

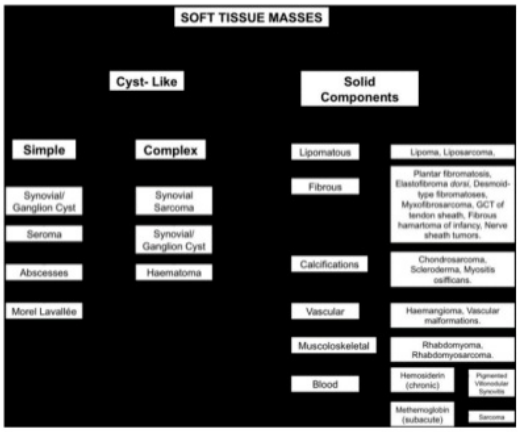
Note.—Generally, a coil that is close in field of view to the area of interest is selected. Surface coils offer the advantage of a relatively high signal-to-noise ratio, while volume coils offer more homogeneous signal over the volume of tissue imaged. Field of view and section thickness are selected to maximize spatial resolution but vary depending on the anatomic area, mass size, coil quality, and field strength. STIR = short inversion time inversion recovery.
* Optional sequences.

Penilaian MRI STT

1. Lokasi lesi dan ekstensi (hubungan dengan fascia (superfisial/profunda), lokasi anatomi, dengan hubungan/ infiltrasi ke vaskuler/ nerve, sendi, tulang, otot/ kompartemen.
2. Jarak dari landmark eksternal ukuran 3 dimensi
3. Morfologi Lesi: Cystic, solid (matrix signal intensity, homogeneity, vascularity, enhancement, with and without necrosis, bleeding).
4. Borders, lobularity, pseudocapsule, perifocal edema, and surrounding alterations
5. Multiplicity and satellite lesions, abnormal proximal lymph nodes.

Gambaran MRI STT Maligna

1. Batas tak tegas
2. Ukuran > 5 cm
3. Infiltrasi struktur sekitarnya (tulang atau neurovascular bundle)
4. Lokasi profunda
5. Perifocal edema
6. Nekrosis atau hemorrhage intramass
7. SI T1 dan T2 heterogen
8. Early dan heterogenous enhancement atau peripheral, nodular atau enhancement internal heterogenous



Location-specific Soft-Tissue Lesions

Lesion	Location
Elastofibroma	Inferior tip of scapula
Glomus tumor	Tufts of finger at nail bed
Baker cyst	Posterior medial aspect of knee, between gastrocnemius and semimembranosus tendons
Plantar fibroma	Associated with plantar fascia
Morton neuroma	Second and third metatarsal interspace

Lesion Characterization on the Basis of SI on MR Images

Appearance	Lesion
T1 hyperintense	
Lesion containing fat	Lipoma, lipoma variant, well-differentiated liposarcoma, hemangioma, myositis ossificans (mature)
Lesion containing methemoglobin	Hematoma
Lesion containing proteinaceous material	Ganglion, abscess
Lesion containing melanin	Melanoma
T2 hypointense	
Lesion containing fibrosis	Scar tissue, plantar fibroma, elastofibroma, desmoid, fibrosarcoma, GCT of tendon sheath, lymphoma (occasionally)
Lesion containing dense calcification	Gouty tophi, dystrophic calcification
Lesion containing hemosiderin	GCT of tendon sheath
T2 hyperintense (cystlike)	
Fluid-filled lesion	Ganglia, seroma, abscess, epidermoid inclusion cyst
Solid tumor	Myxoid lesion: intramuscular myxoma, myxoid liposarcoma; PNST; synovial sarcoma

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