Imaging soft-tissue masses of the foot and ankle

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WHO classification of soft tissue tumours

ADIPOCYTIC TUMOURS

Benign
Lipoma 8850/0*
Lipomatosis 8850/0
Lipomatosis of nerve 8850/0
Lipoblastoma / Lipoblastomatosis 8881/0
Angiolipoma 8861/0
Myolipoma 8890/0
Chondroid lipoma 8862/0
Extrarenal angiomyolipoma 8860/0
Extra-adrenal myelolipoma 8870/0
Spindle cell/ 8857/0
Pleomorphic lipoma 8854/0
Hibernoma 8880/0

Intermediate (locally aggressive)
Atypical lipomatous tumour/ 8851/3
Well differentiated liposarcoma

Malignant
Dedifferentiated liposarcoma 8858/3
Myxoid liposarcoma 8852/3
Round cell liposarcoma 8853/3
Pleomorphic liposarcoma 8854/3
Mixed-type liposarcoma 8855/3
Liposarcoma, not otherwise specified 8850/3

FIBROBLASTIC / MYOFIBROBLASTIC TUMOURS

Benign
Nodular fasciitis
Proliferative fasciitis
Proliferative myositis
Myositis ossificans
fibro-osseous pseudotumour of digits
Ischaemic fasciitis
Elastofibroma 8820/0
Fibrous hamartoma of infancy
Myofibroma / Myofibromatosis 8824/0
Fibromatosis colli
Juvenile hyaline fibromatosis
Inclusion body fibromatosis
Fibroma of tendon sheath 8810/0
Desmoplastic fibroblastoma 8810/0
Mammary-type myofibroblastoma 8825/0

Calcifying aponeurotic fibroma 8810/0
Angiomyofibroblastoma 8826/0
Cellular angiofibroma 9160/0
Nuchal-type fibroma 8810/0
Gardner fibroma 8810/0
Calcifying fibrous tumour
Giant cell angiofibroma 9160/0

Intermediate (locally aggressive)
Superficial fibromatoses (palmar / plantar)
Desmoid-type fibromatoses 8821/1
Lipofibromatosis

Intermediate (rarely metastasizing)
Solitary fibrous tumour 8815/1
and haemangiopericytoma 9150/1
(incl. lipomatous haemangiopericytoma)
Inflammatory myofibroblastic tumour 8825/1
Low grade myofibroblastic sarcoma 8825/3
Myxoinflammatory
fibroblastic sarcoma 8811/3
Infantile fibrosarcoma 8814/3

Malignant
Adult fibrosarcoma 8810/3
Myxofibrosarcoma 8811/3
Low grade fibromyxoid sarcoma 8811/3
hyalinizing spindle cell tumour
Sclerosing epithelioid fibrosarcoma 8810/3

SO-CALLED FIBROHISTIOCYTIC TUMOURS

Benign
Giant cell tumour of tendon sheath 9252/0
Diffuse-type giant cell tumour 9251/0
Deep benign fibrous histiocytoma 8830/0

Intermediate (rarely metastasizing)
Plexiform fibrohistiocytic tumour 8835/1
Giant cell tumour of soft tissues 9251/1

Malignant
Pleomorphic 'MFH' / Undifferentiated
pleomorphic sarcoma 8830/3
Giant cell 'MFH' / Undifferentiated
pleomorphic sarcoma
with giant cells 8830/3
Inflammatory 'MFH' / Undifferentiated
pleomorphic sarcoma with
prominent inflammation 8830/3

* Morphology code of the International Classification of Diseases for Oncology (ICD-O) (TM) and the Systematized Nomenclature of Medicine (http://snomed.org).

SMOOTH MUSCLE TUMOURS
Angioleiomyoma 8894/0
Deep leiomyoma 8890/0
Genital leiomyoma 8890/0
Leiomyosarcoma (excluding skin) 8890/3

PERICYTIC (PERIVASCULAR) TUMOURS
Glomus tumour (and variants) 8711/0
malignant glomus tumour 8711/3
Myopericytoma 8713/1

SKELETAL MUSCLE TUMOURS

Benign
Rhabdomyoma 8900/0
adult type 8904/0
fetal type 8903/0
genital type 8905/0

Malignant
Embryonal rhabdomyosarcoma 8910/3
(incl. spindle cell, 8912/3
botryoid, anaplastic) 8910/3
Alveolar rhabdomyosarcoma
(incl. solid, anaplastic) 8920/3
Pleomorphic rhabdomyosarcoma 8901/3

VASCULAR TUMOURS

Benign
Haemangiomas of
subcut/deep soft tissue: 9120/0
capillary 9131/0
cavernous 9121/0
arteriovenous 9123/0
venous 9122/0
intramuscular 9132/0
synovial 9120/0
Epithelioid haemangioma 9125/0
Angiomatosis
Lymphangioma 9170/0

Intermediate (locally aggressive)
Kaposiform haemangioendothelioma 9130/1

Intermediate (rarely metastasizing)
Retiform haemangioendothelioma 9135/1
Papillary intralymphatic angioendothelioma 9135/1
Composite haemangioendothelioma 9130/1
Kaposi sarcoma 9140/3

Malignant
Epithelioid haemangioendothelioma 9133/3
Angiosarcoma of soft tissue 9120/3

CHONDRO-OSSEOUS TUMOURS
Soft tissue chondroma 9220/0
Mesenchymal chondrosarcoma 9240/3
Extraskeletal osteosarcoma 9180/3

TUMOURS OF UNCERTAIN DIFFERENTIATION

Benign
Intramuscular myxoma 8840/0
(incl. cellular variant)
Juxta-articular myxoma 8840/0
Deep ('aggressive') angiomyxoma 8841/0
Pleomorphic hyalinizing
angiectatic tumour
Ectopic hamartomatous thymoma 8587/0

Intermediate (rarely metastasizing)
Angiomatoid fibrous histiocytoma 8836/1
Ossifying fibromyxoid tumour 8842/0
(incl. atypical / malignant)
Mixed tumour/ 8940/1
Myoepithelioma/ 8982/1
Parachordoma 9373/1

Malignant
Synovial sarcoma 9040/3
Epithelioid sarcoma 8804/3
Alveolar soft part sarcoma 9581/3
Clear cell sarcoma of soft tissue 9044/3
Extraskeletal myxoid chondrosarcoma 9231/3
("chordoid" type)
PNET / Extraskeletal Ewing tumour
pPNET 9364/3
extraskeletal Ewing tumour 9260/3
Desmoplastic small round cell tumour 8806/3
Extra-renal rhabdoid tumour 8963/3
Malignant mesenchymoma 8990/3
Neoplasms with perivascular epithelioid
cell differentiation (PEComa)
clear cell myomelanocytic tumour
Intimal sarcoma 8800/3

Scope

- Approach
- Review of conditions
- Conclusion

Imaging characteristics

- Cystic/solid
- Location
- Appearance

Cystic mass

- **Ganglion/synovial cyst**
- **Bursitis**
- **Tenosynovitis**
- **Cystic neurogenic tumour**

Ganglion

- Uni/multi-loculated cystic lesion - round, oval, lobulated or septated mass
- May communicate with fibrous tendon sheaths or joint capsule
- Occur most frequently in the hand and wrist
- Clinical presentation - swelling or pain

Bursitis

- Bursa
  - Fluid-filled sac
  - Allow for smooth movement
- Normally not visualised unless distended with fluid
- Inflammation of bursa
- Excessive pressure or repetitive movement

Imaging characteristics

- **Cystic/solid**
- **Location**
- **Appearance**

Plantar fibromatosis

- M>F
- Nodular thickening of plantar fascia - medial (60%) or mid-portion (40%) of fascia
- Several nodules may co-exist in same fascia.
  ~ 1/3 are bilateral
- Majority located within mid-substance or plantar aspect of plantar fascia

Morton's neuroma

- Not true neuroma
- Related to repetitive trauma
- Most commonly 3rd inter-metatarsal space
- Young women, atheletes
- Clinical presentation

Gout

- Asymmetric distribution
- Erosions
  - Para-articular
  - Sharp sclerotic margins and overhanging edge
- Osteopenia – usu absent
- Joint space narrowing - not usually present

Imaging characteristics

- **Cystic/solid**
- **Location**
- **Appearance**

Lesion appearance

- **Lipoma, neurogenic**
- **Vascular tumours**
- **Synovial chondromatosis**
- **PVNS**
- **GCT tendon sheath**

Haemangiomas

- Most frequent benign foot tumors of vascular origin
- Can be superficial or deep-seated
- XR
  - Phleboliths
- MRI
  - T1W – look for fat signal
  - T2W – high SI, multilobulated, septated
  - Phleboliths
  - Contrast-enhancement

Synovial chondromatosis

- Benign condition involving synovial lining of joints, bursae or tendon sheaths
- Synovium undergoes metaplasia, forms cartilaginous loose bodies (may ossify)
- Monoarticular
- Knee, elbow, shoulder and hip
- MR – variable signal

PVNS

- Benign proliferative disorder of synovium
- Joint, tendon sheath & bursa
- Diffuse or nodular (localised)
- C/F
  - swelling +/- pain
  - 3-4th decade

GCT tendon sheath

- Benign synovial proliferation within tendon sheath
- Lobulated soft tissue mass immediately adjacent to tendon
- May or may not be painful
- Features :
  - soft-tissue mass adjacent to tendon
  - ~ 20% of cases show cortical erosion
  - MRI – low to intermediate T1W, T2W
  - +/- blooming

Conclusion

- Common cause for referral for imaging
- Imaging useful for
  - Confirmation
  - Assessment – extent and characterization
- Approach
- Benign neoplasms constitute the majority of soft-tissues masses around ankle and foot