Imaging of soft tissue tumors

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Learning objectives

- According to the WHO, the soft tissue tumors are issued from non-epithelial extra-skeletal tissues.

- Benign primary tumors of the soft parts are 100 times more common than malignant tumors. These represent approximately 1% of cancers.

- These tumors are located in 40% of cases at lower limbs and in 20% at upper limbs.

- On imaging, ultrasound is the first-line examination, demonstrating the existence of an expansive process in the soft parts.

- MRI comes second for better tissue characterization and to evaluate loco-regional extension and anatomical relationships.

- Plain radiography and CT assess the relationship with the bony skeleton.

- The objectives of our work are:

  * How to choose the appropriate imaging examination and specify the imaging protocol for a tumor of soft parts

  * To describe the radiological semiology of a tumor of the soft parts, to guide the surgeon in the therapeutic management

  * Do not throw on the easy diagnosis and have a collective assessment to avoid the delay of the therapeutic management
**Background**

**A) Classification:**
-The authors classify primary tumors of soft tissues by adult histological tissue to which they resemble (Table 1).

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Adenomatoid tumor

Others Mesenchymoma Alveolar cells sarcoma

Clear cells sarcoma

Table 1 : Classification of soft tissue tumors (Dr S.Baccar et Al.2003)

B) Diagnostic Approach:

Before a soft tissue mass, it is important to:
- Recognize the tumor type.
- To determine the origin (soft tissue tumor or bone tumor with invasion of soft tissues).
- Clarify its seat (inter-or intramuscular, juxta or intra-articular, subcutaneous, tendon or fascia located).
- Understand the relationship with the surrounding tissues.
- Search criteria for malignancy or items for the histological nature.
- Make an assessment of general extension of a malignant tumor (CT scan, scintigraphy).

C) Various types of soft tissue tumors:

1) Tumors with bone matrix:

a) The myositis ossificans: (Fig.1)

- Invades especially the quadriceps and the deltoid muscles.
- Plain radiographs:
  - In the acute phase, the radiograph is normal. In the chronic phase(maximum swelling), fuzzy and peripheral calcifications appear. In the regression phase, crown ossification will persist but may disappear gradually.
  - Ultrasound in the acute phase may show abnormalities of echogenicity in normal muscle, but with no specificity.
  - The CT shows calcifications before they are detectable on plain radiographs and a mass whose center is in the soft parts. The underlying bone is not invaded but may have a notch or periosteal reaction next. The presence of a clear border separating the bone from tumor is a common sign of great value and the organization of calcification as peripheral ring is earlier and more easily highlighted on clichés. In chronic phase, the appearance of compact bone shell is typical.
  - MRI can detect even earlier the injury before the onset of calcifications. In acute phase, there is a region whose signal is hardly perceptible in T1-weighted sequence,
increases markedly after gadolinium injection and becomes very intense in T2-weighted sequence. In the chronic phase, the peripheral zone holding calcifications is hypointense, surrounding in T2-weighted sequence, a hyperintense center which sometimes is slightly inhomogenous. In terminal phase, bone structure is acknowledged with its cortical and central fat around sometimes a hypointense fibrous nodule.

b) The extra-osseous osteoma:

Very rare, appears as a hard, painless mass. Plain radiographs show an ossified and dense. MRI if it is done, it shows a mixed signal either the T1 or T2 weighting (signal bone, fat, haem)

c) The extra-osseous osteosarcoma: (Fig.2)

- Very rare, is seen in the fifth decade of life.
- Predilection for the bones of the lower limbs (40%), upper limbs (20%) and lower limbs (15%).
- High mortality rate, 90% at 5 years to a size> 5 cm, with frequent lung metastases.
- Plain radiographs: osteogenic matrix mass with coarse calcifications. However, these are absent in 50% of cases. The affection of the surrounding bony structures is rare.

- Ultrasound: It is a hypoechoic mass compared to the surrounding tissue with the presence of several anatomical features suggesting malignancy. Areas of necrosis or hemorrhage can be observed.

- CT: interesting for identifying the mineralization of the tumor which has a highdensity, and for determining areas of intratumoral necrosis.
- MRI is little specific. It shows a well-defined mass with a mixed hypointensity on sequences T1-weighted sequences and mixed signal with predominance of hyperintensity in T2-weighted sequence.

2) Tumors with cartilage matrix:

a) Synovial chondromatosis: (Fig.3)

- Defined by the presence of monoarticular synovial proliferation which is characterized by cartilaginous then osseous metaplasia of the synovium with nodules that fall into the joint cavity and end by causing osteoarthritis.
- Occurs in middle age with a male predominance.
- Is seen in 50% of these cases at the knee and elbow.
Plain radiography: in more than 70% of cases, there are multiple juxta-articular dense opacities, with a variable size ranging from several millimeters to several centimeters with variable degrees of mineralization reaching sometimes wide peripheral calcifications. They are typically round or oval with a peripheral calcified shell which the center is clear.

CT or CT arthrography: allows a better appreciation especially when these lesions are not calcified.

-MRI has a little contribution.

b) Soft tissue chondroma:

Plain radiography shows a non-specific soft tissue mass, sometimes containing fine calcification. This mass can cause erosion of adjacent bone structures with scalloping and a marginal sclerosis.

CT: shows a hypodense mass with a chondroid matrix and calcifications. This mass takes not unlike the contrast with the surrounding muscular structures.

-MRI: MRI appearance is similar to that of peri-osteal chondroma, hyperintense on T2-weighted images and with intermediate signal on T1-weighted sequences with areas of low signal intensity on both sequences if calcifications are present.

c) Extra-skeletal myxoid chondrosarcoma:

It occurs in adult patients from the fifth decade with a male predominance. The preferred location is at the distal extremities especially in the foot with respect of upper limbs bones.

Survival of 65-85% at 5 years and 45% at 10 years.

However, local recurrence is common and metastases can be seen in 40% of cases even before the discovery of the primary tumor.

Plain radiography: soft tissue mass with or without calcification. Typically, there are no calcifications or affection of adjacent bone structures.

-MRI: typically, the mass is heterogeneous and poorly defined. Signal on T1-weighted sequences is variable but generally equal to the fat. On T2-weighted sequences, the signal is typically equal or superior to fat. Some authors have reported some homogeneous and lobular T2 hyper-signals. This "lobule" is defined by thick septa and is composed of fibrous and cellular tissue on both T1 and T2 sequences.

3) Tumors of common connective tissue:

a) The fibroma:

- Usually located in the arm, forearm and neck. It occurs between 50 and 60 years. Its size varies between 1 and 20cm.

-In MRI, the lesion has an appearance similar to that of desmoid tumor(given the collagen content) and sometimes differentiation between the two is difficult.
However, we note that the fibroma is well defined without sign of local aggressiveness (unlike desmoid tumor which is poorly defined and infiltrates the musculo-fascial planes).
- There are on both T1 and T2-weighted sequences, areas of low signal in relation to the collagen component in the tumor.

b) The superficial musculo-fascial fibromatosis: (Fig.4)

- Typically, there is a small tumor and slowly progressive. It includes plantar fibromatosis (Ledderhose disease), palmar fibromatosis (Dupuytren), fibromatosis of the penis (Peyronie’s disease), fascial juvenile fibroma and infantile digital fibroma.

- Of particular interest to the plantar fibromatosis which is the most common, up to 65% depending on the series. It appears in 30 and 50 years and usually manifest by one or more nodules fixed subcutaneously, at the inner portion foot and can spread and invade deep structures.

- Plain radiography: can sometimes show a non specific soft tissue mass. Calcifications are conventional in juvenile fascial fibromas.
- Ultrasound: it shows a hypoechoic mass with less defined limits.
- CT: it has little place in the current imaging fibromatosis.
- MRI: typically, plantar fibromatosis appears as a poorly defined mass, infiltrating the adhesive to deep fascial tissues adjacent to plantar muscle sat the inner part of the foot, with a heterogeneous signal equal to or lower than adjacent muscle on both T1 and T2-weighted sequences. Lesions with high signal intensity on T2-weighted sequences reflect poor collagen content. Enhancement after gadolinium injection is variable, it is observed in 50% of cases.

c) The deep musculo-fascial fibromatosis (desmoid tumor): (Fig.5)

- Typically, it's a large tumor rapidly scalable and much more aggressive. This group includes extra-abdominal desmoid tumors, infantile aggressive fibromatosis, Colli's fibromatosis and infanteile myofibromatosis.
- Is of particular interest to desmoid tumors, which are classified into 3 groups:
  * Extra-abdominal desmoid fibromatosis: it reaches young adulthood (peak to 30 years) without gender predominance. It is localized preferentially at the shoulder, thoracic wall, back, pelvis and thigh. There are some predisposing factors (history of trauma or surgery on the site of the lesion).
  * Abdominal desmoid fibromatosis (abdominal wall): favored by pregnancy, postpartum and the history of surgery on the site of the lesion.
  * Intra- abdominal mesenteric desmoid fibromatosis (more common in Gardner's syndrome) or pelvic (affecting young women).
- Plain radiography: it may be normal or show non specific mass of soft part. The calcifications are not common. A breach of the bony structures can be seen in 6-37 % of
cases, typically type of erosion or cortical scalloping without invasion of the medullary canal.

- Ultrasound: shows a rounded solid mass of variable echogenicity. There may be small hyperechoic areas.
- CT: non-specific.
- MRI: the extra-abdominal desmoid tumor typically appears as an intermuscular lesion, invading adjacent muscular structures. Generally, the signal is intermediate (similar to the fat in T2-weighted sequences and similar to muscle signal in T1-weighted sequences), heterogeneous (depending on the proportion of myxoid cellular tissues, rich in water, and collagen). The areas of low signal in relation to the presence of collagen are characteristic of fibromatosis but non specific. There is a mild important enhancement after injection of gadolinium, especially when the lesion is poor of collagen and 10% of tumors have an insignificant enhancement.

d) The myxoma:

- The soft tissue myxoma is a rare variety of conjunctive benign tumors, it occurs generally at an average age of 60, equally in the two sexes. It is most often located in the extremities and it looks like an oval well-defined mass, large (7 cm on average).
- Conventional radiography is non specific.
- On ultrasound: the myxoma appears as an ovoid mass, well-defined, hypoechoic containing cystic areas. The Doppler is negative. Ultrasound is used to guide the biopsy when indicated.

- In CT, intra muscular myxoma appears as a well-circumscribed, homogeneous, low-density mass. The lesion has a slightly greater density than water but lower than the adjacent normal muscle, with values ranging between +10 and +60 HU.
- In MRI, the typical intramuscular myxoma is a well-defined ovoid mass with a fluid-like signal. On T1-weighted sequences, the lesion is homogeneously hypointense. We can highlight a peritumoral fatty border (65% of cases). This sign, better seen on longitudinal sections, is not observed in the myxoid liposarcoma.

e) Malignant histiocytotfibroma: (Fig.7)

- The malignant histiocytotfibroma is a pleomorphic sarcoma occurring most often at the ends. This is the most common malignant soft tissue tumors. Although its appearance is not specific, the diagnosis must be made before any invasive intramuscular mass, deeply located, in a matter of 50 years.
- In CT, the tumor has lobed edges more moderately defined with occasional calcifications and heterogeneous density enhanced after injection of iodine. The lymphophilic nature of this tumor should encourage, particularly when sitting at the proximal part of a member, to make some sections for lumbar lymphatic nodes.

- In MRI, malignant fibrous histiocytoma is a mass with irregular edges, showing areas of hypo and hyperintensity in T2-weighted sequences and sometimes bleeding beaches, without being specific. Note, however, that the nodular peripheral gadolinium enhancement of a lesion with a mixed component (fluid and fat) is suggestive of a malignant fibrous histiocytoma.

f) The fibrosarcoma:

- It is a rare tumor (about 6% of all soft tissue sarcomas).
- Fibrosarcoma occurs in young adults (between 20 and 40 years).

- The tumor is typically shallow (except when it is large and in this case it invades deeper layers) and is typically located at the knee (75%).
- Fibrosarcoma has no imaging specific character.

- The radiograph shows a non-calcified mass of soft tissues, sparing adjacent skeleton.
- In CT, fibrosarcoma usually presents as a well-defined lobular or nodular lesion with a density close to that of the muscles which sometimes only the injection of contrast medium allows them to dissociate. Calcifications are not standard but can be seen.
- MRI is non-specific and shows a long relaxation time on both T1 and T2-weighted sequences. There is an intense and rather marginal enhancement after gadolinium injection.

4) Synovial tumors:

a) The villonodular synovitis (VNS): (Fig.6)

- It occurs most often in young adults.

- It is most often monoarticular.
- The most common site is the knee and hip, the other locations are exceptional.
- The pigmented villonodular synovitis of the knee, unlike other sites, behaves like a tumor of the soft parts before appearing as articular, often during a puncture bringing a hematic liquid.

- Conventional radiography usually shows a non-calcified mass filling the popliteal hollow or latero-patellar spaces. The bone lesions are rare, late and discrete such as finger-prints.
on the periphery of the joint, epiphyseal erosions or symmetric polycyclic epiphyseal geode.

-Ultrasound confirms the presence of an effusion and thickening of the synovial membrane.

- Arthrography shows indirect signs of synovial hypertrophy with patchy images that can guide given the context. However, these images have no specificity.
- CT shows an irregular peri-articular mass peri-articular, often with high density places (hemosiderin deposits) localized or more often diffus. Arthrography demonstrates the intrasynovial origin.
- MRI studies the diffuse extension of the tumor in the various planes of space. The characters of the signal, especially in the forms already quite advanced, are extremely suggestive. The lobed mass has a heterogeneous signal, but variable and has a striped appearance due to the presence of hemosiderin deposits, always remaining hypointense on both T1 and T2-weighted sequences with coexistence in a variable amount of fat and vascular items. The gradient-echo sequences, the most sensitive to the presence of ferric pigments, are indicated.

b) Synovialosarcoma: (Fig.8)

- Synovialosarcoma represents 5-10% of soft tissue tumors. There is a discreet male predominance. He reached preferentially young subjects.
- In its classical description, the synovialosarcoma predominates in limbs and extremities, the knee being the joint most frequently affected. Its location is typically described as peri-articular within tendons, burses, capsules and fascia.
- Size > 5cm with common bone affection.
- Has a poor prognosis because the survival rate is estimated at 55% at 5 years for most authors.

-Plain radiographs will reveal a tumor of soft parts of water density containing calcifications in 15-35% of cases. In 20% of cases, the adjacent bone is affected either as a response to the pressure with osteosclerosis, or in the form of bone invasion with cortical erosions in 20% of cases.
- CT can better appreciate the presence of microcalcifications suggestive of the diagnosis.
- MRI: nearly 90% of synovialosarcomas are well defined with sometimes a capsule aspect. The presence of septa or lobulations is common. In 80% of cases, the tumors are heterogeneous in T2-weighted images with solid, liquid, fibrous or hemorrhagic signals.

5) Vascular tumors:

a) The hemangioma:
b) Arteriovenous malformations (AVM): (Fig.9)

- It is clinically a soft tissue mass, non-pulsatile, compressible and which expand when Valsalva maneuver. These malformations have sporadic distribution, although, familial cases have been reported.
- These are usually solitary tumors, localized in the 40% in the head and neck, in extremities in 40% of cases and in 20% of cases at the trunk.
- Thrombosis is a common complication.

- On plain radiographs, the AVM of soft tissue appears as a mass containing phleboliths occasionally and rarely causing abnormalities of adjacent skeleton.
- Ultrasound (Doppler) is essential to differentiate AVM of other vascular anomalies. AVM appears hypoechoic and heterogeneous in 80%. Doppler shows a slowing of the flow, and in 20% of cases, no flow is found (revealing a thrombosis).

- In CT, the AVM is presented as a heterogeneous hypodense lesion and slightly raising its periphery after injection of contrast. The phleboliths are better demonstrated.
- MRI: classically, the AVM is hypo- or isointense on T1-weighted sequences. If bleeding or thrombosis, a heterogeneous signal can be observed. It is also possible to identify the pathological veins of the AVM. On T2 images, there are hyperintense foci (reflecting...
thrombosis), the septa or phleboliths. This sequence also helps to assess the extension of the AVM. The gadolinium is used to evaluate the circulatory component of the tumor.

c) The hemangiosarcoma:

-The hemangiosarcoma is one of the rarest malignant tumors of soft parts. The predilection is at the superficial tissues especially in the skin.
-It typically occurs in middle-aged women who underwent radical mastectomy complicated by lymphedema for many years. Indeed, chronic lymphedema is considered a predisposing factor. Note that the malignant transformation of a benign vascular lesion is exceptional.

-In CT, the tumor has a characteristic fibrous thickening with fatty alterations and perimuscular liquid collections.
- On MRI, the lesion is expressed by a homogeneous signal, more hypointense than muscle on T1-weighted images and hyperintense and more or less homogeneous on T2-weighted sequences. There is a moderate enhancement of these lesions after gadolinium injection.

6- Fatty tumors:

a) The lipoma:

- This is the most common of all soft tissue benign tumors (16-50%) and the easiest to characterize in imaging. Lipoma is mostly unique and often occurs between 30 and 50 years.
- It is most often single (85% of cases) but may be multiple or within syndrome (Launois and Bensaude syndrome) (with more reserved prognosis).

- Plain radiography shows a mass of fat tonality with regular contours, which may contain some calcifications that are not necessarily a sign of malignancy.
- On ultrasound, it is more often a homogeneous mass, elongated, well-defined, iso or hyperechoic. However, a hypoechoic aspect can be seen.

- CT shows a regular mass of homogeneous density close to -100HU. Rarely, a fibrous capsule separates the fat from surrounding tissue. No enhancement after injection of contrast material is noted.
- MRI shows a signal identical to that of the fat whatever the sequence is: homogeneous and high signal in T1 and T2-weighted sequences. Some small and thin linear hypointense structures can be observed in the lesion.

b) The liposarcoma: (Fig.10)
- This tumor represents from 16 to 18% of all malignant soft tissue tumors, or the second frequency (behind malignant fibrous hystiocytoma). They occur in a higher age and locate in 75% of cases in the lower limb but can also be located in retroperitoneal.

- We can distinguish 5 histopathological varieties: well differentiated, round cell, myxoid, pleomorphic and dedifferentiated.

- CT shows high density such as fluids or tissues. It is necessary to inject the contrast agent since the apparent homogeneity before injection. After injection the mass becomes heterogeneous.
- MRI shows a hypointense masse on T1 images, with areas of signal enhancement after gadolinium injection and a hyperintense mass in T2 images. In some forms, there is T1 hyperintense foci within the spontaneous hypointense mass representing fatty areas (interest of STIR sequence with gadolinium injection).
- Greater than 10cm size, thickened septa, the presence of nodular outbreaks and fatty component of less than 75% of the volume of the mass are criteria suggestive of liposarcoma.

7) Muscle tumors:

Muscle tumors have no specificity and imaging primarily used for staging.

a) The leiomyoma:

- The superficial or cutaneous form is the most common and usually multifocal. The lesions appear as discrete papules measuring 1 to 2 cm. In the genital level, these rather diffuse lesions are small (<2 cm) in the form of areola.
- The soft tissue leiomyoma is not classical and located generally at the deep muscles of extremities or at the abdominal cavity.

b) The leiomyosarcoma:

- It represents 7% of soft tissue sarcomas and occurs usually in adults with a female predominance.
- Three groups are described:
  * Retroperitoneal and intra-abdominal leiomyosarcoma: the most common (> 50%), mostly occurs at age of 60 and has as a large mass with marginal contours. It is hypo- or moderately vascular and can bleed or necrotic.
  * Skin and subcutaneous leiomyosarcoma: uncommon (2-3%) occurs at any age (5 and 7 decade) with a preferred location for the scalp. It is usually solitary.
c) The rhabdomyoma:

- It represents 2% of tumors of striated muscles.
- Three types are described:
  * Adult type: located at the head and neck, occurs in the elderly. Usually solitary scalable, it presents itself as a rounded or polypoid mass or, which is compressive especially in laryngeal level and throat.
  * Fetal type: located at the head and neck, it occurs in less than 4 years of age.
  * Genital type: mass or cyst slowly evolving to the vagina or vulva of a young adult woman.

d) Rhabdomyosarcoma: (Fig.11)

- Represents 20% of soft tissue sarcomas, 3.4% of all malignant tumors of the child under 15 years and 2-3% of cases are present at birth.
- Three histological subtypes: embryonal, alveolar and pleomorphic.
- The radiograph shows a mass of soft parts with involvement of surrounding bony structures (destruction, periosteal reaction...). Calcifications within tumor can occur but are very rare.

- CT: before injection of contrast agent, the lesion is hypodense and badly-defined except for embryonic rhabdomyosarcoma. Ossification can be viewed as well as cortical destruction. After injection of iodine, the exact delineation of the tumor is always difficult.

- MRI: there is no specific sign of distinction between leiomyosarcoma or rhabdomyosarcoma. As with any malignant tumor, signal is heterogeneous, hyperintense on T2-weighted images with intense enhancement after gadolinium injection.

8) Nerve tumors:

a) Schwannoma and neurofibroma: (Fig.12 and Fig.13)

- Tumors of peripheral nerves are essentially represented by the neurilemmoma (benign schwannoma), usually solitary and neurofibroma, often multiple in neurofibromatosis (NF) type 1 (VonRecklinghausen) and neurofibromatosis type 2. These tumors adhere generally intimately to involved nerve and extend sometimes to the surrounding soft tissues. They appear well circumscribed but unencapsulated.
Plain radiographs can sometimes reveal calcifications in soft tissues, but the main interest is in the study of bone structures, looking for defects or other clues for a phacomatosis.

Ultrasound shows a hypoechoic mass with a heterogeneous echogenicity, a well-defined contours and a large oval axis parallel to the bone axis.

CT: shows a well-defined lesion, with spherical oval or fusiform form, a regular contours and a low density before injection of contrast iodine.
- The MRI is the most contributory, particularly through the longitudinal sections showing a fusiform mass developed along a nerve trunk particularly in sciatic nerve. The contours of the mass are in good standing with well-drawn hypointense peripheral border evoking a capsule. T2-weighted sequence is more contributive to the majority of cases, allowing specifying the histologic type.

The "target sign" hyperintense in periphery, hypo or isointense in its center observed on T2-weighted images is characteristic of neurofibroma, whereas schwannoma is generally heterogeneous or rarely homogeneous on both sequences. This aspect is found in the target up to 70% of cases according to some authors.
- Another sign that should suggest the nervous origin is the aspect of "fascicular sign": presence of multiple fine arcuate or circular structures, hyperintense on T2-weighted or proton density.

b) Morton's Neuroma:
- Morton's neuroma is characterized by degenerative changes in vessels and nerve fibers with fibrosis of endoneurium and perineurium. 
It reaches women in 80% of cases, to the fifties. The third inter-metatarsal space is most often interested. Bilateral forms are relatively rare, 10 to 30% according to the authors. 
- Plain radiographs search(cavus, claw toes, signs of rheumatoid arthritis, hallux-valgus).
- Ultrasound: it is always a bilateral study. The canal syndrome of Morton typically presents as a hypoechoic picture, well limited, rounded or oval, oriented parallel to the major axis of the metatarsals. Only nodules more than 5mm are retained. 
- MRI: classically, on T1-weighted sequences, the hypointense nodule is clearly visible in a hyperintense fat. The sequence T2 and injection of gadolinium are not absolutely necessary.

c) The neurofibrosarcoma:
- Classically presents as a large mass (> 5cm), which is fusiform and eccentric around a large nerve trunk. The neurofibrosarcoma may be the result of malignant transformation of a preexisting neurofibroma (between 3 and 13%) usually after a latency time of 10 to 20 years. The evaluation criteria of malignant neurogenic tumors are not specific enough
to distinguish them from other malignant soft tissue tumors, so that neither CT nor MRI are able to establish final diagnosis.

- MRI: as neurilemmomas, the neurofibrosarcoma appears hyperintense more or less heterogeneous in T2 images. Neither aspect of the contours nor the volume of the tumor can be concluded either the diagnostics.
- The CT-scan is less efficient.

9) Neuroectodermal tumors:

a) The paraganglioma: (Fig.14)

- On MRI, the paraganglioma typically presents as a hypointense lesion on T1-weighted and proton density sequences. On T2-weighted images, hyperintense lesion is present and, when supra-centimetric, a very characteristic appearance known as "salt and pepper". This is however not pathognomonic.
- The enhancement of the tumor after injection of gadolinium is intense and homogeneous (as in the CT).

b) Neuroblastoma:

- It is also a tumor of the sympathetic nervous system. It represents 8 to 10% of tumors of childhood. It is an aggressive tumor with a mortality rate of 15%. It conventionally locates in the adrenal gland in 35% of cases, in the retroperitoneum in 30% of cases and in the neck and pelvis in 1-5% of cases.
- The radiograph shows a mass in mediastinal level or neck. Calcifications are found in 30% of cases. Plain radiography can also search a bone disease linked with the tumor but also metastatic locations.

- With the ultrasound, the tumor is in the form of a heterogeneous echogenic mass with multiple areas of necrosis and hemorrhage. Doppler allows the study of tumor vasculature.
- MRI: the tumor is generally heterogeneous, hypointense on T1-weighted sequences and hyperintense on T2-weighted sequences, the calcifications are difficult to analyze as opposed to hemorrhagic foci and cystic alterations. This examination is the most sensitive to assess intra-foraminal and musculo-fascial extension especially when the tumor is located in the neck.
- Scintigraphy is useful for finding primary tumor.
Findings and procedure details

Ultrasonography is the first line test before a soft tissue tumor. CT-scan and especially MRI allows better definition for this tumors and also helps staging and controlling after treatment.
Conclusion

Imaging plays an important role in the diagnosis and monitoring of soft tissue tumors.

MRI is the most performing tool of imaging and choosing an appropriate imaging protocol is important.

Overall assessment is necessary in so many cases and cooperation between radiologist and surgeon must exist.
References


