Unusual and atypical chest wall lesions

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Learning objectives

The purpose of this exhibit is:

- Review infrequent and atypical lesions of the chest wall, excluding primary bone lesions.
- Describe the radiological findings that help in the etiological diagnosis.
- Discuss the utility of the various imaging techniques in the study of these lesions, with special dedication to multidetector CT.

Background

Soft tissue lesions and tumour-like lesions of the chest wall are uncommon. Among the pathologic processes that may involve the chest wall are included congenital and developmental, post-traumatic or post-treatment (surgery, radiotherapy or pharmacological treatment), infectious/inflammatory (rare infections in developed countries, e.g. hydatid cyst or tuberculosis) and neoplastic (atypical lipomas, elastofibroma dorsi, hypervascular metastasis in hypernephroma or thyroid neoplasm, and unusual primary malignant tumours e.g. primary alveolar soft part sarcoma of chest wall). Although most of these conditions have nonspecific radiologic appearances, knowledge of the radiologic findings may sometimes allow for a specific diagnosis to be suggested and narrow differential diagnosis in most of cases.

Imaging findings OR Procedure details

Anatomic considerations and MDCT imaging

The musculoskeletal structure of the chest wall serves a critical role in the protection of thoracic viscera and provides the anatomic basis for respiratory function.

The complex relationships of blood vessels, nerves, bone, cartilage, and muscle allow the chest wall to serve its function but also make it susceptible to a wide spectrum of pathology.

Radiologic imaging is important in the assessment of all these disorders, particularly for determining anatomic origin and extent, response to therapy, and recurrence. Computed tomography (CT) imaging plays an important role in the evaluation of these chest wall...
abnormalities due to its excellent spatial resolution, including depiction of both osseous and soft-tissue structures. MDCT enables imaging of a large tissue volume in a short acquisition time, reducing the effect of respiratory motion in the thorax. On the other hand, CT may reveal mineralization and bony involvement with a higher sensibility and specificity when compared to MRI or ultrasound with a significant impact in the differential of these conditions.

Routine CT examination of the chest wall usually entails acquisition of thin-section images with a multislice CT (slice collimation 0.75 -2 mm with last generation scanners) with or without intravenous injection of contrast material.

Intravenous injection of contrast material is encouraged whenever suspicion of a neoplastic condition is present. The contrast material is administered with a power injector (90-120 mL of iodinated contrast material at 2 mL/sec rate with a start delay ranging from 30 to 50 seconds). Contrast enhanced images are usually helpful in establishing the relationship of the lesion with surrounding vessels, depicting enhancing patterns and delineate the extent of chest wall lesions.

Noncontrast CT previous to contrast injection is mainly required for the evaluation of hemorrhage and calcifications.

In order to present the wide spectrum of diseases considered, the pathological conditions affecting the chest wall have been divided by etiology into:

- Congenital
- Post-traumatic or post-treatment conditions
- Infectious-inflammatory conditions
- Neoplastic (benign and malignant tumours)

**CONGENITAL**

- Polandsyndrome
- Esternalis muscle

**POLAND SYNDROME Fig. 1 on page 13**

Polandsyndrome is an uncommon congenital disease of the chest wall characterized by partial or total absence of the greater pectoral muscle and ipsilateral syndactyly and brachidactily.

With higher frequency among males (2:1 - 3:1), affects in 60-75% of cases the right side of the thorax and may be associated with other anomalies: absence of ipsilateral adjacent muscles (in most cases, the pectoralis minor), aplasia of the ipsilateral breast or
nipple, deficiency of subcutaneous fat, and single transverse palmar crease (also known as simian crease) of the affected extremity.

Despite being an abnormality with a quite specific appearance on chest X-ray, CT depicts more clearly the absence of the greater pectoral muscle and allows better assessment of other nearby associated anomalies.

**STERNALIS MUSCLE** Fig. 2 on page 14

The sternalis muscle is a rather unusual variant of the chest wall musculature. Its incidence is around 2-8% of the population, and has been coupled with variations in the greater pectoral muscle, adrenal glands, and skull (e.g., high frequency in anencephalic fetuses).

Unilateral distribution is more common than bilateral involvement, and the size of the muscle is larger in males. It typically appears as a flat muscle whose thickness ranges from a narrow ribbon to a broad strap, occasionally with tendinous insertions. It runs from the infraclavicular region to approximately the caudal aspect of the sternum and is located subcutaneously over the greater pectoral with parallel course to the sternum.

**POST-TRAUMATIC OR POST-TREATMENT CONDITIONS**

- Chest wall hematoma
- Foreign bodies in chest wall
- Transdiaphragmatic intercostal hernia
- Chest wall calcifications post- RT treatment
- Gynecomastia
- Empyema necessitans postpneumonectomy

**CHEST WALL HEMATOMA** Fig. 3 on page 14

Subcutaneous hematomas are produced by accumulation of blood in the soft tissues. Hematoma in the thoracic wall is a well-known complication in patients receiving anticoagulants who undergo thoracic or shoulder surgery. This condition may result from damage to thoracic vessels, muscles, or ribs during blunt or penetrating chest trauma.

Chest wall hematomas usually appear as areas of high density in unenhanced CT. In cases of active bleeding within the hematoma it may appear as spots of active extravasation of the contrast material at dual phase CT.

The presence of an enhancing soft-tissue component is not an expected feature of acute chest wall hematoma and should raise suspicion of hemorrhage of a neoplastic lesion.
Hematomas that do not resolve may calcify peripherally or may continue to bleed, forming a chronic expanding hematoma.

**FOREIGN BODIES IN CHEST WALL** [Fig. 4 on page 15][Fig. 5 on page 15]

Leaving foreign bodies in the chest wall predisposes to a potential infection at some future time, resulting in some patients in a full-blown empyema; in others patients in smaller collections of pus or in draining sinuses. However, most of the small and clean objects located in the periphery are fairly well-tolerated and can be left behind.

**TRANS DIAPHRAGMATIC INTERCOSTAL HERNIA** [Fig. 6 on page 16]

Intercostal transdiaphragmatic hernia is a rare but clinically recognizable entity.

The formation of a transdiaphragmatic intercostal hernia requires a chain of anatomical events. First, a defect in the diaphragm allows abdominal contents to enter the chest. Next, a weakness in the thoracic wall allows protrusion of the abdominal contents. Herniations through the chest wall are associated with increases in intrathoracic pressure and have a predilection for areas of potential weakness. These areas occur anteriorly from the costochondral junction to the sternum because of the absence of external intercostal muscles and posteriorly from the costal angle to the vertebrae as a result of the absence of internal intercostal muscles. Therefore, the combination of a disruption of the diaphragm and a chest wall defect affords the formation of an intercostal transdiaphragmatic hernia.

Thoracoabdominal computed tomography is currently the imaging modality of choice for the diagnosis of diaphragmatic rupture, with a reported overall sensitivity and specificity of 70-100%. Direct discontinuity of the ruptured hemidiaphragm, intrathoracic herniation of abdominal contents, the collar sign (a waistlike constriction of the herniating hollow viscus at the site of the diaphragmatic tear) and the dependent viscera sign (viscera lying against the posterior chest wall in the supine patient), are considered diagnostic CT findings.

**CHEST WALL CALCIFICATIONS POST-RT TREATMENT** [Fig. 7 on page 16]

Patients receive radiation therapy as part of their treatment with curative or palliative intention. Radiation therapy may be used alone or in combination with surgery, chemotherapy, or both.

Calcification of soft tissue following irradiation is an extremely rare after-effect, appearing as a late complication in previous malignant tissue or in surrounding normal tissues without gross neoplastic involvement (heterotopic calcification).
The incidence of late complications after chest wall irradiation is related to many factors including total dose, fraction size, patient age, extent of disease and pre-existing abnormalities.

Radiation therapy to the breast or the chest wall and the nodal areas often presents a technical problem to match the glancing fields with the axillary and supraclavicular fields. Overlap between these fields will result in underlying tissues receiving a larger dose than intended. In reported cases the area of dense calcification appeared to lie in the region where overlap of the matching fields could have easily occurred in view of a minor position change between fields. It is generally accepted that fraction sizes significantly over 2.0 Gy may lead to increased late side effects.

The pathogenesis of the formation of calcium deposits in the soft tissue remains poorly understood. It is possible that hypoxia created by the late effects of radiation cause calcification by a cellular mechanism.

The radiological appearance leaves little room for differential diagnosis and the presence of areas of calcification coupled with a history of previous radiation of the chest allow a straightforward diagnosis.

**GYNECOMASTIA Fig. 8 on page 16**

Gynecomastia represents excessive development of the male breast and clinically manifests as tender, firm subareolar nodules. It results from hyperplasia of the ductal and stromal elements due to either intrinsic or ductal hormonal stimulation.

Gynecomastia is commonly seen in neonates, adolescents during puberty, and elderly men who may have increased estrogen and decreased testosterone levels. Some other causes of gynecomastia include endocrine and hormonal disorders, neoplasms, certain drugs, and obesity. In post-adolescent adults, medications are responsible for up to 20% of cases. These medications include antiandrogens and gonadotropin-releasing hormone analogs used to treat prostate cancer and highly active antiretroviral therapy to treat HIV.

At CT, dense fibroglandular tissue is noted with a usually bilateral distribution though rarely it may be asymmetric and in a few cases unilateral.

**EMPYEMA NECESSITATIS POSTPNEUMONECTOMY Fig. 9 on page 17**

Empyema postpneumonectomy is a serious but uncommon complication of pulmonary resection and is associated with high mortality.

In the early postoperative period, it is attributed to intraoperative contamination or residual infection in the pleural cavity, whereas hematogenous spread is the usual cause of infections that occur at a later time after surgery. Empyema may also occur secondly
to bronchopleural fistula. These postsurgical empyemas rarely progress to empyema necessitatis.

So, empyema necessitatis postpneumonectomy is a very unusual complication after surgery and is characterized on CT scans by fluid collecting at the subcutaneous space and communicating with the postpneumonectomy space.

Open drainage (Eloesser flap) is performed for long-term drainage of chronic empyema, and involves creation of a fistula between the skin and pleural space, via a thoracotomy defect. Fig. 10 on page 17

**INFECTIONOUS-INFLAMMATORY CONDITIONS**

- Tuberculosis
- Hydatid cyst
- Actinomycosis
- Aspergillosis

**TUBERCULOSIS Fig. 11 on page 18 Fig. 12 on page 18**

Chest wall involvement is an uncommon manifestation of tuberculosis that may be due to hematogenous seeding without active pulmonary disease or, less commonly, to contiguous spread from underlying pleural or pulmonary lesions.

At radiography and CT, chest wall involvement typically manifests as osseous and cartilaginous destruction and soft-tissue masses with calcification and rim enhancement following intravenous administration of contrast material with or without evidence of underlying lung or pleural disease at CT. Chest wall abscess and sinus tract formation may be seen in about 25% of patients.

When spontaneous discharge of empyema through the parietal pleura into the chest wall forms a subcutaneous abscess, it is termed *empyema necessitatis*. It is a collection of fluid in the extrapleural space resulting from direct extension from pulmonary or pleural lesions following dissection of the parietal pleura and chest wall. It is a rare complication of a chronic pleural empyema, usually becoming clinically apparent many years after the acute infection. *M. tuberculosis* is responsible for up to 75% of cases. Fig. 13 on page 19

**HYDATID CYST Fig. 14 on page 20**

Hydatidosis is a zoonotic infection caused by *Echinococcus granulosus*. 
A hydatid cyst can be seen in almost any part of the body; however, a primary chest wall cyst is very rare (7.4%), even in countries where echinococcosis is endemic.

The possible mechanism of primary hydatid disease of the chest wall may be as follows: the embryo passes through the duodenal wall into either the portal vein or the periduodenal and perigastric lymphatics. Periduodenal and perigastric lymphatic channels connect with the thoraco-mediastinal lymphatic and the thoracic duct. This mechanism may explain the development of primary chest wall hydatid disease in the absence of pulmonary or hepatic cysts. When an intrathoracic extrapulmonary hydatid cyst lies in a neighborhood of bone structures it may result in bone destruction.

The imaging characteristics of soft tissue involvement resemble those of hydatid cysts found in the liver, showing a multiseptated or multicystic mass surrounded by a rim. Typically, the lesion consists of a mother cyst, containing multiple daughter cysts.

ACTINOMYCOSIS Fig. 15 on page 20

Actinomycosis is an uncommon disease caused by Gram-positive anaerobic bacteria from the group of Actinomyces, which is a common saprophyte of the oral cavity, gastrointestinal tract and bronchial secretions.

Cases of thoracic involvement are rare (10-20%) and only 12% of such cases affect the chest wall.

Actinomycosis is well known for its tendency to involve the chest wall from the lung and pleura, often creating fistulas without regard for tissue planes by producing proteolytic enzymes.

Imaging findings are nonspecific: abnormal thickening of the soft tissue, draining sinus, wavy periostitis and rib destruction in relation to the capacity of this infection to be locally aggressive and making differential diagnosis with malignant conditions challenging.

ASPERGILLOSIS Fig. 16 on page 21

Aspergillosis is a disease of worldwide extension caused by species of the dimorphic fungus Aspergillus. These organisms are opportunistic invaders that chiefly affect immunocompromised hosts, most commonly as a result of cancer and related therapy but also following organ transplantation or cardiac surgery. Invasion of the chest wall and pleura can create fistulas.

Chest wall involvement in aspergillosis usually begins with a focus of lung infection, which then spreads directly to an adjacent rib or thoracic vertebra. Uncommonly, there may be hematogenous spread to the bone.
Radiological findings of chest wall include presence of chest wall or extra pleural mass, pleural thickening, pleural effusions, and bony involvement including rib or vertebral erosions or sclerosis.

**NEOPLASTIC**

**Benign tumours**

**LIPOMA** Fig. 17 on page 21

Lipoma represents the most common soft-tissue tumour in the chest wall. They typically occur in patients who are 50-70 years of age being more frequent in obese patients.

All lipomas are composed of adipose tissue, but various types of non-adipose tissue, such as connective tissue septa and calcification, are present in one-third of these tumours.

CT shows a well-circumscribed encapsulated mass with uniform fat attenuation values (-100 to -160 HU) and non-enhancing after intravenous contrast material administration. However, septa less than 2 mm. in thickness are often visible and may enhance mildly. Furthermore, many lipomas of the chest wall are deep seated and involve muscular layers.

A significant number of lipomas have prominent non-adipose areas, difficulting its differentiation with low grade liposarcomas. Features favouring the diagnosis of well-differentiated liposarcoma include lesion size greater than 10 cm, presence of thick (>2 mm.) septa (diffuse or focal), presence of nodular and/or globular non-adipose areas or masses, and lesion composition of less than 75 % of fat. Lipomas can not always be successfully distinguished from well-differentiated liposarcoma on the basis of CT imaging alone.

**ELASTOFIBROMA DORSI** Fig. 18 on page 22

Elastofibroma dorsi is a benign soft-tissue pseudotumour characterized by accumulation of collagenized tissue with elastic fibers. Its prevalence is 2%, occurring in elderly patients, with a female predilection.

Although the cause of these lesions is not clear, some authors thought of elastofibroma as a pseudotumour, reactive in nature, and attributable to mechanical friction of the scapula against the ribs during heavy manual labor.

Elastofibroma dorsi often presents as bilateral subscapular masses and it typically appears as a poorly defined, inhomogeneous soft-tissue mass with attenuation similar
to that of skeletal muscle containing linear streaks of fat attenuation with a layered appearance on CT. Only mild enhancement is seen after administration of contrast in these typically benign tumours.

Deformation of adjacent bony structures has also been reported.

**NEUROFIBROMA Fig. 19 on page 22**

Neurofibromas are slow-growing neoplasms that originate from a nerve, may or may not be encapsulated, and may include components of cystic degeneration and calcification.

Developed most commonly in patients between the ages of 20 and 30 years of age the presence of neurofibromas is associated to the diagnosis of type-I neurofibromatosis (NF-1) in 60-90% of patients.

They are smoothly marginated, round or oval-shaped masses. Displacement of adjacent structures rather than invasion is seen. Neurofibromas have a low attenuation similar to that of the muscle on non-enhanced CT and show heterogeneous enhancement after contrast injection. They may include cystic degeneration or calcifications.

Subcutaneous neurofibromas are common in NF1 and classically appear as soft, mobile, discrete nodules that may cause varying degrees of disfigurement. At CT, neurofibromas appear as focal subcutaneous nodules with soft-tissue attenuation and are often numerous. Occasionally, subcutaneous neurofibromas may have very low attenuation (5-15 HU) and mimic lesions such as sebaceous cysts or epidermal inclusion cysts as seen in Gardner syndrome.

**DESMOID TUMOUR Fig. 20 on page 22**

A desmoid tumour is an aggressive form of fibromatosis of musculoaponeurotic origin.

The tumour is found most often in the anterior abdominal wall, but it may originate in virtually any musculotendinous structure. Desmoid tumours of the chest wall are rare and have been described mainly in single case reports or as isolated cases in large series of extra-abdominal desmoid tumours.

Several factors have been implicated in the pathogenesis of desmoid tumours including pregnancy, estrogenic treatment or previous local accidental or surgical trauma. Desmoid tumour occurs most frequently in young adults between the ages of 20 and 40 years of age and are more frequent in women than in men. Generally unique but in 10-15% of cases there are synchronous multicentric lesions.
A genetic or generalized "fibromatogenic principle" is suggested by the occasional familial occurrence of desmoid tumours or by their relatively frequent association with Gardner's syndrome.

On CT desmoids may be well or poorly defined and because of the variability in tumour composition the lesions have very variable attenuation and pattern of enhancement.

It has been reported that extra-abdominal desmoids are iso- or hypodense relative to muscle and enhance to 100-110 HU after injection of iodinated contrast material.

**Malignant tumours**

**MALIGNANCY ASSOCIATED WITH CHRONIC EMPYEMA** [Fig. 21 on page 23]

Chronic tuberculous empyema is defined as persistent, grossly purulent fluid containing tuberculous bacilli. CT scans show a focal fluid collection with pleural thickening and calcification and with or without extrapleural fat proliferation.

Malignancy associated with chronic tuberculous empyema is rare. The mean duration of chronic empyema before diagnosis of malignancy is reported to be about 25 years.

The histopathologic diagnoses in reported cases have been malignant lymphoma, squamous cell carcinoma, mesothelioma, malignant fibrous histiocytoma liposarcoma, rhabdomyosarcoma, angiosarcoma, and hemangioendothelioma in order of frequency.

The pathogenesis of malignancy developing in chronic empyema may be a long-standing severe inflammatory process of a non-autoimmune nature in malignant lymphoma or chronic stimulation of mesothelial cells or the action of oncogenic substances contained in the pleura in other malignancies, including mesothelioma.

Detection of malignancy near the empyema cavity is difficult in most cases. Careful radiologic assessment, as well as active and accurate biopsy procedures, is necessary.

CT may demonstrate an abnormal mass with soft-tissue attenuation in the vicinity of the empyema and usually shows enhancement after contrast administration. Biopsy is necessary in most cases because differentiation between malignancy and infection is rather difficult.

**METASTASES** [Fig. 22 on page 23] [Fig. 23 on page 24]

Metastatic disease to the chest wall is uncommon. It is often seen at the terminal stages of malignant diseases, or earlier in presentation with particularly aggressive tumours. Metastatic lesions from breast, lung, or unknown primary tumours can be found in the chest wall.
Skeletal muscle metastases may be incidental findings on CT of the chest, for most of the lesions were neither painful nor palpable.

The most common appearance of the lesions on contrast-enhanced helical CT is that of a rim-enhancing mass with central hypoattenuation.

Metastases from Renal Cell Carcinoma on radiological imaging usually appear as hypervascular lesions.

**MESOTHELIOMA** *Fig. 24 on page 24*

Malignant pleural mesothelioma is an uncommon neoplasm that arises from the pleura or, rarely, the pericardium or peritoneum. It is associated with prior asbestos exposure.

The tumour can invade both visceral and parietal pleura. It is locally aggressive, with frequent invasion of the chest wall, mediastinum, and diaphragm. Occasionally, it can extend into the chest wall via needle biopsy tracks, surgical scars, and chest tube tracts.

Chest wall involvement may manifest as obliteration of extrapleural fat planes, invasion of intercostal muscles, displacement of ribs, or bone destruction.

**PRIMITIVE NEUROECTODERMAL TUMOR (PNET)** *Fig. 25 on page 25*

PNET constitutes an aggressive type of Ewing sarcoma. It is the most common malignant tumour of the chest wall in children and young adults, and probably develops from embryonal neural crest cells.

It usually occurs in the bone, but occasionally has an extraskeletal site of origin.

CT scan will show a large, inhomogeneous mass with poorly defined margins, displacing surrounding tissues and mixed internal attenuation, similar to muscle tissue, with necrosis and/or calcification.

**LYMPHOMA** *Fig. 26 on page 25*

Primary malignant lymphomas in the chest wall account for less than 2% of soft-tissue tumours. Lymphoma usually extends directly into the anterior chest wall from the mediastinum in patients with aggressive disease.

Extranodal diffuse large B-cell lymphoma, the primary lymphoma type most frequently found in the chest wall, manifests in a multinodular or diffuse infiltrative pattern.

CT scans show well-defined masses with soft-tissue attenuation, occasionally with central areas of necrosis, and diffuse slight enhancement. Infiltration along the neurovascular bundle and extension through the subcutaneous tissue are also common.
Alveolar soft part sarcoma (ASPS), also called alveolar soft-tissue sarcoma (ASTS), is a rare malignant soft-tissue neoplasm. Its prevalence is less than 1% of all primary soft-tissue sarcomas.

It is more common in adolescents and young adults, especially in those who are 15-35 years old; it occurs more commonly in women; and is rarely seen in children.

These tumours are usually indolent in behaviour, but have a high propensity to recur locally after excision, and to metastasize early on. The lungs, brain and bone are common sites of metastatic disease. Tumour size and site have no significant bearing on the prognosis, and tumour resectability is the crucial prognostic marker.

The tumour generally shows slow growth and late occurrence of metastases.

Areas of necrosis and hemorrhage are common in larger lesions.

On non-enhanced scans the tumour is slightly hypodense or even isodense compared with surrounding muscle. Contrast-enhanced scans show an intense enhancement and may also demonstrate numerous dilated vessels within the tumour.

**Images for this section:**

![Images showing CT scans of alveolar soft part sarcoma](image_url)
**Fig. 1:** Poland syndrome in a 75-year-old woman: a) Axial CT shows absence of the greater and small pectoral muscles (blue arrow). b) Coronal reformatted image (blue arrow).

**Fig. 2:** Sternalis muscle in a 89-year-old man: a) Axial CT shows flat right sternalis muscle in parasternal position anterior to greater pectoral muscle (blue arrow). b) Sagital reformatted image (blue arrow).
**Fig. 3:** Chest wall hematoma in a 74-year-old man: a) Axial CT shows large hematoma (blue arrow) in the left chest wall. In the arterial phase no abnormal enhancement is seen. b) A delayed phase shows a hyperdense line suggestive of active bleeding (blue arrow).

![Fig. 3](image)

**Fig. 4:** Palpable nodule in the mid-axillary line in a 30-year-old woman: a) Axial CT shows left pleural catheter with the distal end in the subcutaneous tissue (blue arrow). b) Sagital reformatted image (blue arrows).

![Fig. 4](image)

**Fig. 5:** 60-year-old man with firearm injury in the chest in childhood: a) and b) Axial CT shows artefactual images from metallic shot pellets in anterior chest wall (blue arrows).

![Fig. 5](image)
**Fig. 6:** Transdiaphragmatic intercostal hernia in a 48-year-old woman: a) and b) Coronal reformatted image shows the important intestinal contents (blue arrows) and small lung herniation through the left chest wall (red arrow).

**Fig. 7:** Chest wall calcifications post-RT treatment in a 58-year-old woman: a) Axial CT shows heterotopic calcifications in the subcutaneous tissue of the left mastectomy bed (blue arrow). b) Sagital reformatted image (blue arrow).
**Fig. 8:** 74-year-old man with prostate cancer and bone metastases with hormonotherapy treatment for 1 year. (a) Axial CT scan shows substantial retroareolar glandular tissue consistent with gynecomastia. (b) Coronal reformatted image.

**Fig. 9:** Empyema necessitans in a 70-year-old man after left pneumonectomy for Non-small-cell lung carcinoma. a) Axial CT scan shows empyema and draining chest wall abscess (blue arrows). b) Coronal reformatted image (blue arrows).
**Fig. 10:** 74-year-old man after right pneumonectomy who developed bronchopleural fistula and empyema. The patient underwent open drainage surgery (Eloesser flap). a) Axial CT image showing chest wall defect (blue arrow). b) Coronal reformatted image shows the chest wall defect (blue arrow) and a gauze inserted into the pneumonectomy space.

**Fig. 11:** Tuberculosis in a 31-year-old woman: a) Axial CT shows round soft tissue mass in anterior chest wall (blue arrow). b) CT scan demonstrates a patchy and poorly defined consolidation in left upper lobe (blue arrow).
**Fig. 12:** Patient in the previous case c) Axial CT scan shows wall thickening in the right colon (blue arrow).
**Fig. 13:** Post-tuberculous empyema necessitans in a 82-year-old man a) Axial CT scan shows increased soft tissue density (blue arrow) in right chest wall with calcified pleural thickening (red arrow). b) Coronal reformatted image (blue and red arrows).

**Fig. 14:** Hydatid cyst in a 61-year-old man: a) Axial CT scan shows a mass with mixed solid and cystic components located in the chest wall causing destruction of adjacent ribs (blue arrows). b) Axial CT image also shows a heterogeneous mass located in the paravertebral soft tissue causing destruction of the adjacent bone (blue arrow).
**Fig. 15:** Actinomycosis in a 81-year-old man: a) and b) Axial CT and coronal reformatted image show right inferior chest wall lesion (blue arrows) associated with rib destruction (red arrow).

**Fig. 16:** Aspergillosis in a 62-year-old man: a) and b) Axial CT shows subcutaneous tissue infiltration involving the 4th and 5th rib, causing cortical disruption of the adjacent ribs (blue arrow) and subpleural involvement (red arrow).
**Fig. 17:** Right intercostal lipoma in a 83-year-old man: a) CT scan shows mass with fat attenuation (blue arrow) and calcifications (red arrow) in right lateral chest wall. b) Coronal reformatted image (blue and red arrows).

![CT scan of right intercostal lipoma](image1.png)

**Fig. 18:** Bilateral elastofibroma dorsi in a 63-year-old woman: a) CT scan shows bilateral crescent-shaped soft-tissue lesions in the deep dorsal region between the thoracic wall and the lower third of the scapula (blue arrows). b) Coronal reformatted image (blue arrows).

![CT scan of bilateral elastofibroma dorsi](image2.png)

**Fig. 19:** Multiple neurofibromas in a 55-year-old man with neurofibromatosis type I: a) CT shows low-attenuation subcutaneous nodules within the anterior chest wall (blue arrows). b) Sagital reformatted image (blue arrows).

![CT scan of multiple neurofibromas](image3.png)
**Fig. 20:** Desmoid tumor in a 35-year-old woman with Gardner syndrome: a) CT scan shows soft-tissue tumor related to paravertebral musculature of lower posterior chest wall (blue arrows). b) Sagital reformatted image (blue arrows).

**Fig. 21:** Malignant lymphoma associated with chronic tuberculous empyema in a 70-year-old man: a) Axial CT scan shows post-tuberculous chronic pleural empyema with soft tissue mass in the adjacent right chest wall (blue arrows). b) Coronal reformatted image (blue arrows).
Fig. 22: 34-year-old man with metastatic mandibular sarcoma: a) Axial CT scan shows non-enhancing anterior chest wall metastasis (blue arrow). b) Sagital reformatted image (blue arrow).

Fig. 23: 73-year-old woman with metastatic hypernephroma: a) Axial CT shows enhancing posterior chest wall metastasis (blue arrow). b) Sagital reformatted image (blue arrow).
**Fig. 24:** Right pleural mesothelioma in a 67-year-old man: a) Thickening and pleural effusion (blue arrow) with soft tissue mass in the right posterior chest wall secondary to direct tumour extension (red arrow). b) Coronal reformatted image (blue and red arrows).

**Fig. 25:** Primitive neuroectodermal tumor in a 30-year-old man: a) Axial CT scan shows a large mass in the right chest wall (blue arrow) in contact with a subcutaneous nodule (red arrow). b) Coronal reformatted image (Blue and red arrows).
Fig. 26: Malignant lymphoma in a 83-year-old woman: a) Axial PET-CT shows hypermetabolic nodule in the subcutaneous tissue in the left anterior chest wall (blue arrow). b) Coronal reformatted image (blue arrow).

Fig. 27: Primary alveolar soft part sarcoma of the left chest wall in a 39-year-old man: a) Axial CT scan shows heterogeneous mass in the left paravertebral chest wall (blue arrow). b) Sagital reformatted image (blue arrow).
Conclusion

Chest wall lesions can present atypical radiological findings and be caused by uncommon conditions. Familiarity with the radiological features of these diseases facilitates accurate diagnosis and optimal management. Multidetector CT with multiplanar or 3D reformation tools is an excellent diagnostic test in these cases.

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