Imaging of soft tissue tumours and mass-like lesions of the chest wall

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Learning objectives

The purpose of our study is to describe the imaging findings of chest wall soft tissue tumours and tumour-like lesions. We searched the radiological and pathological archive at our institution retrospectively and reviewed the literature on soft tissue tumours of the chest wall.

Background

Tumours of the chest wall are uncommon. They can be divided into those of bony and those of soft tissue origin. Common soft tissue neoplasms and non-neoplastic chest wall masses include benign or malignant tumours which may be of muscular, vascular, fibrous and fibrohistiocytic, peripheral nerve, adipose, haematologic and cutaneous tissue origin. Tumour-like lesions include abscesses and "empyema necessitans". Many of those tumours have distinctive radiological findings on CT scan or MRI or occur in specific locations, allowing a specific radiological diagnosis to be suggested. Thoracic ultrasonography can also lead to diagnosis in case of abscess or necessitans empyema.

Imaging findings OR Procedure details

Peripheral nerve tumours

Schwannomas on non-contrast CT appear as smooth, round lesions, either isodense or hypodense to chest wall muscle. Post contrast administration various patterns are seen, including a diffuse inhomogeneous pattern (Fig. 1), multiple hypodense or cystic areas, radial enhancement, peripheral enhancement with low attenuation centre, diffuse low attenuation or central enhancement with peripheral hypodensity. At MR schwannomas have signal intensity equal to or greater than muscle on T1 weighted images. T2 weighted imaging reveals a higher signal than T1 often heterogeneous, intermediate to high signal intensity when compared with adipose tissue (Fig 2a,b,c). Malignant schwannomas have similar CT findings, but often have associated abnormalities including pleural effusions, pleural nodules and metastatic pulmonary nodules.
Neurofibromas (Fig 3) are typically smoothly marginated, with a low muscle-like attenuation on non-contrast CT and show heterogeneous enhancement post contrast. The MR features include uniform low signal similar to muscle on T1, and a high signal rim-like pattern with a low signal centre on T2 weighted images. Uniform enhancement is seen following intravenous administration of gadolinium.

**Lipomas and liposarcomas**

Fatty chest wall tumours are relatively common. Most are lipomas. Lipomas are sharply circumscribed tumours with uniform fat attenuation on CT (Fig 4) and homogeneous fat signal characteristics on MRI. They may contain a few thin internal septations. There is uniform signal loss on fat-suppressed MRI.

Poorly differentiated liposarcomas may exhibit patchy, little or no fat suppression. Imaging features that favour a diagnosis of liposarcoma include size greater than 10 cm, thick internal septations, nodular non-adipose areas on CT scan (Fig 5 and 6) or MRI and lesions with less than 75% fat signal characteristics.

**Haemangioma**

Haemangiomas are rare benign lesions, composed of multiple dilated, thin walled tortuous vessels. They are seen most commonly in children and young adults. On CT, haemangiomas usually appear as soft tissue masses with poorly defined margins. Phleboliths may be identified at ultrasonography (Fig 7) or at non-contrast CT imaging in "sclerosing haemangiomas". They usually have heterogeneous low attenuation on CT pre-contrast, and show marked enhancement post contrast (Fig 8).

**Elastofibroma dorsi**

Elastofibroma dorsi are muscular tumours of the posterior chest wall. They characteristically occur at the inferior angle of the scapula and have a reported prevalence of 2% in the elderly population. Elastofibroma typically appears as a tumours soft tissue mass with a layered appearance on CT. On MR, a mass of low signal similar to muscle is seen, interspersed with linear high signal on T1 and T2 weighted images (Fig 9, 10). Only mild enhancement is seen post administration of contrast in these typically benign tumours.

**Fibromatosis or desmoids tumors**

Fibromatous tumours which are often seen in the chest wall can be beginin (Fig 11, 12) or locally aggressive (Fig 13, 14, 15, 16).

If aggressive, they produce large exuberant tumor growth patterns but rarely metastasize. The shoulder is the most frequently affected area. It is most frequently seen in elderly patients, tending to be centred on muscle or surrounding fascial planes. These tumors
tend to be invasive and spread into adjacent muscle groups. The CT findings of these lesions are variable and depend on the tumor composition. Lesions with a higher solid tissue component have greater attenuation and enhancement. These lesions have similar signal to muscle on T1, with very high signal on T2 weighted images. Central areas of low signal are also seen on T2 weighted images, thought to be due to high collagen content (Fig 15).

**Malignant fibrous histiocytoma (MFH)** is a neoplasm that occurs commonly in the chest wall. It is most frequently seen in elderly patients, tending to be centred on muscle or surrounding fascial planes. These tumours tend to be invasive and spread into adjacent muscle groups. The MR characteristics include signal intensity similar to or lower than muscle on T1 weighted images, often inhomogeneous, and T2 weighted signal equal to or greater than adipose tissue.

**Lymphoma**

Chest wall lymphoma is rare. Usually the tumour extends directly into the anterior chest wall from the mediastinum in patients with aggressive disease (Fig 17). Tumor tissue from lymphoma is usually of soft tissue attenuation at CT, occasionally with central areas of necrosis. The margins are usually well defined. Lymphoma tends to spread around bone and cartilage and to spare these structures. A variable degree of enhancement is seen post contrast. MRI usually shows masses of isointense to mildly increased signal on T1 imaging, with hyperintensity on T2 imaging.

**Metastatic lesions**

Metastatic lesions to the chest wall (Fig 18) are uncommon and usually only seen in patients with extensive metastases elsewhere. Breast carcinoma has reported rates of recurrence in the chest wall from 5% to 20%. Breast carcinoma may recur in the chest wall, in scars, close to margin edges or in adjacent axillaries lymph nodes. The occurrence of chest wall metastases is a poor prognostic indicator, associated with decreased survival rates.

**Tumour-like lesions:**

**Abcess**: Although primary infection of the chest wall is rare, it can occur spontaneously or in association with diabetes mellitus, immunosuppression, or trauma (including surgical trauma). Heroin addicts are unusually prone to develop septic arthritis of the sternoclavicular and sternochondral joints. The typical imaging features consist of a focal mass-like lesion with enhancing walls and central necrosis resulting in fluid attenuation on CT (Fig 19, 20), and high signal intensity on T2 weighted MR images. Bone destruction can be seen. The imaging findings are suggestive of infection, but microbacterial identification is required to direct appropriate anti-microbial therapy.
**Empyema necessitans**: The formation of a chest wall abscess via direct communication with a pneumonia or empyema (usually of tuberculosis) is termed "empyema necessitans". Bone destruction may or may not occur (Fig 21, 22).

**Hydatid cyst**: The primary soft tissue chest wall hydatid cyst is extremely rare. CT appearance may show well-defined, single or multiple cystic lesions without any contrast enhancement (Fig 23, 24, 25), calcification, or germinal membrane detachment. The cystic lesion may show a honeycomb appearance, pathologic fracture, bone expansion. In MRI, the cyst wall appears as a low signal intensity rim on T2-weighted images, and on T1-weighted images, a relatively high signal intensity wall with ‘folded parasitic membranes’.

Images for this section:
**Fig. 1:** Intercostal schwannoma in a 44 year-old woman. Axial enhanced CT scan: extrapleural mass that originated from intercostal soft tissue along the course of an intercostal nerve.

**Fig. 2:** Intercostal schwannoma in a 44 year-old woman. Coronal T1 weighted MR image(a), coronal T2 (b) and coronal T1 post gadolinium images (c): Tumour mass with T2 high signal intensity, T1 low signal intensity and heterogeneous enhancement.
**Fig. 3:** Fig 3: Plexiform neurofibrome in 13 year-old girl with Von Reckling Hausen Neurofibromatosis. Enhanced axial CT scan: Anterior chest wall lobulated mass with heterogeneous enhancement, thickening of the subcutaneous tissue and displacement of anterior arc rib.

**Fig. 4:** Fig 4: Intramuscular lipoma in a 54 year old man. Enhanced axial CT scan: intramuscular (serratus anterior muscle) well defined mass with fat homogeneous density.
**Fig. 5:** 44 year-old woman with hemangioma of the posterior chest wall: Ultrasonography shows solid mass with phlebolith.
**Fig. 6:** 44 year-old woman with hemangioma of the posterior right chest wall. CT scan shows round soft tissue mass with heterogeneous enhancement.
**Fig. 7:** A 65-year-old women with left infrascapular elastofibroma. T2 weighted MR image show low signal mass similar to muscle with internal "layered" appearance due to adipose tissue.
**Fig. 8:** 65-year-old women with left infrascapular elastofibroma. T1 weighted MR image show low signal mass similar to muscle with internal "layered" appearance due to adipose tissue.
Fig. 9: Fig 5: Liposarcoma in a 81 year-old man. Unenhanced axial CT scan: Anterior chest wall voluminous mass which extend to anterior mediastinum with mixed fat and tissular density.
**Fig. 10:** Fig 6: Liposarcoma in a 81 year-old man: Anterior chest wall voluminous mass which extend to anterior mediastinum with mixed fat and tissular density. Enhanced CT scan shows enhancement of the tissular component.
**Fig. 11**: 32 year-old man with tuberculosis empyema necessitans. CT scan shows empyema and draining left anterior chest wall abscess.
Fig. 12: Fig 23: 68 year-old man with chest wall hydatid cyst. Enhanced axial CT scan: Left posterior chest wall well defined multilocular cystic lesion.
Fig. 13: Chest wall abscess (proteus mirabilis) in a 55 year-old woman with diabetes. Sagittal reconstruction shows fluid collection extend to anterior mediastinum.
Fig. 14: Chest wall abscess (proteus mirabilis) in a 55 year-old woman with diabetes. Enhanced axial CT scan shows fluid collection containing air bubbles extend to anterior mediastinum with thickening of the surrounding subcutaneous fat.
Fig. 15: Fig 18 : Chest wall metastasis of lung cancer in a 68 year-old man. Non enhanced Axial CT scan : solid mass developed in contact with infrasupinatus muscle with surrounded fat opacity.
Fig. 16: 68 year-old man with chest wall hydatid cyst. Enhanced axial CT scan: Extension of the left posterior chest wall cystic lesion to the pleural cavity.
Fig. 17: 32 year-old man with tuberculosis empyema necessitans: CT scan shows empyema and draining left anterior chest wall abscess with bone destruction of the rib in contact.
Fig. 18: Fig 12: Benign Fibromatosis tumor of the left posterior chest wall developed on a thoracotomy scar in a 39 year-old man. Axial enhanced CT scan: left para spinal solid mass well defined deep to left trapezius muscle with poor enhancement.
Fig. 19: 31 year-old woman with aggressive fibromatous tumor of right chest wall. Enhanced CT scan shows an enhanced upper and right chest wall mass deep to minor pectoralis muscle extending posteriorly.
Fig. 20: 31 year-old woman with aggressive fibromatous tumor of right chest wall. Axial T1 weighted MR shows a large tumour of similar attenuation to muscle arising from the right chest wall.
Fig. 21: Fig 16 : 31 year-old woman with aggressive fibromatous tumor of right chest wall. Axial T1 fat-saturated MR post Gadolinium shows intensive tumour enhancement with poorly defined limits.
Fig. 22: Benign Fibromatosis tumor of the left posterior chest wall developed on a thoracotomy scar in a 39 year-old man. Axial nonenhanced CT scan: left paraspinal solid mass well defined deep to left trapezius muscle.
Fig. 23: Fig 15: 31 year-old woman with aggressive fibromatous tumor of right chest wall. Axial T2 weighted MR shows high heterogeneous signal intensity of the tumour.
Fig. 24: Fig 17: Non Hodgkin lymphoma in a 34 year old woman. Enhanced Axial CT scan shows extensive anterior chest wall spread of lymphoma with right pleural effusion.
Fig. 25: 68 year-old man with chest wall hydatid cyst. Coronal CT scan reconstruction: Left posterior chest wall well defined multilocular cyst.
Conclusion

Soft tissue tumours and pseudo-tumours of the chest wall are uncommon but they often have a characteristic appearance or occur in a typical position. The imaging findings on CT scan or MRI coupled with a clinical history can often lead to an accurate radiological diagnosis. Definitive diagnosis requires in most of the cases histological verification.

Personal Information

References


