Radiological chest findings associated to extrathoracic signs and symptoms: importance of clinical-radiological correlation to make an appropriate diagnosis.

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Learning objectives

Numerous extrathoracic signs and symptoms can be associated with radiological chest findings. Knowledge of this relationship can be useful towards a more accurate chest radiology report, which will benefit the patient.

Background

Progress in imaging techniques allows the radiologist to be able to detect more findings.

Radiological report should include a description part where all these findings are detailed and a diagnostic conclusion where the findings are integrated in the clinical context of the patient in order to make an appropriate diagnosis.

Radiologists, particularly residents, must learn that, after identifying the "hypodense, round, mass, nodule, interstitial line..." their report should include the integrated interpretation of these findings including the clinical information in order to make an accurate diagnosis of a neoplastic, inflammatory or other type of diseases. If it is not possible to be so conclusive which such diagnosis, the radiologist will be better informed to suggest the next step in the diagnostic procedure.

Many diseases are associated with chest radiological findings. In this poster we have tried to show a brief list of these common and uncommon disorders in order to make a more accurate chest X-ray and CT reports.

Images for this section:
...appears to be a possible, borderline, indeterminate, equivocal, suspected pixel, probably of questionable significance. Clinical correlation needed... maybe...

Fig. 1
Findings and procedure details

CASE 1

- 25 years female with pruritus.
- Chest X-ray and CT shows an anterior mediastinal mass. Fig. 2 on page 6 Fig. 3 on page 8 Fig. 4 on page 9
- What is your diagnosis?

CASE 2

- 52 years male. Episodes of unexplained symptomatic hypoglycemia.
- Chest X-ray shows a round extrapulmonary mass located in the right lower hemithorax. Reviewing previous x-ray of the patient, a slow growth of the mass is confirmed. Fig. 5 on page 9 Fig. 6 on page 10
- What is your diagnosis?

CASE 3

- 42 years female with uveitis.
- Chest- X-ray shows bilateral hilar and paratracheal lymphadenopathy and right upper lobe consolidation. At CT lung consolidation is seen as nodules in subpleural peribronchovascular interstitium. Hilar and mediastinal lymphadenopathy are confirmed. Fig. 7 on page 12 Fig. 8 on page 13 Fig. 9 on page 14
- What is your diagnosis?

CASE 4

- 41 years female, abdominal pain with retroperitoneal and pelvic lymphangioleiomyomas.
- Abdominal CT shows retroperitoneal and pelvic cystic masses consistent with the diagnosis of lymphangioleiomyomas. Lung bases included in the abdominal study show multiple, small, round parenchymal cysts. Fig. 10 on page 14 Fig. 11 on page 15
- What is your diagnosis?

CASE 5

- 65 years male, subacute neurological symptoms.
- Enhanced brain CT shows multiple intraaxial ring-enhancing lesions with vasogenic edema. Fig. 12 on page 16
- What can the next diagnostic test be? Fig. 13 on page 17 Fig. 14 on page 18

CASE 6
• 47 years male, general symptoms caused by **Graves-Basedow disease**.
• CT shows an anterior mediastinal mass. Fig. 15 on page 19
• What diagnostic test would you suggest?

**CASE 7**

• 55 years male, **right ptosis, miosis and anhidrosis, (Horner’s syndrome).**
• Chest X-ray shows an area of increased density in right lung apex. Fig. 16 on page 20 Fig. 17 on page 21
• What is your diagnosis?

**CASE 8**

• 60 years male, **chronic arthralgias.**
• CT shows multiple pleural-based round nodules Fig. 18 on page 22, some of them cavitate in follow-up Fig. 19 on page 23. Ground glass opacities can be seen at lung bases.
• What is your diagnosis?

**CASE 9**

• 45 year female, **light brown spots on the skin ("café-au-lait" spots).**
• Lateral chest X-ray shows an extrapulmonary density overlying posterior elements of lower vertebrae. Fig. 20 on page 24 CT scan shows multiple round masses in dorsal foramina. Fig. 21 on page 26 A suprarrenal heterogeneous mass is also incidentally found. Fig. 22 on page 27
• What is your diagnosis?

**CASE 10**

• 49 years female, **muscle weakness.**
• Chest X-ray shows a retroesternal space mass Fig. 23 on page 27. CT confirmed a lobulated enhanced anterior mediastinal mass Fig. 24 on page 29.
• What is your diagnosis?

**CASE 11**

• 50 years male, **painful swelling of limbs, stiffness of joints.**
• X-ray of bones (hands, ankle) shows periosteal proliferation of new bone Fig. 25 on page 29 Fig. 26 on page 30
• What radiological test would you do next? Fig. 27 on page 32

**CASE 12**

• 75 years male, **dysphonia, left vocal cord paralysis on exploration.**
• What radiological test would you do next? Fig. 28 on page 33
CASE 13

- 48 years female, **Raynaud phenomenon, arthralgias, thickened skin.**
- Chest X-ray shows a bilateral interstitial lung disease. Chest CT shows ground-glass opacities at lung bases. You have to find another sign that is very typical of this disease. You will get an award if you find it. Fig. 29 on page 33  Fig. 30 on page 34  Fig. 31 on page 35
- What is your diagnosis?

Images for this section:
Pruritus can be associated with renal or hepatic diseases. It can also be a paraneoplastic sign, especially in hematological diseases in which it can be the initial symptom. If there is no dermatological illness that could justify the pruritus, some test as chest X-ray should be done to rule out other diseases. The mnemonic "4 T’s" (thymoma, teratoma, thyroid tumor and terrible lymphoma) are classically used for the differential diagnosis of an anterior mediastinal mass. In this patient, because of his age (25 ys) and the knowledge of the relationship of pruritus and lymphoproliferative disease, diagnosis of lymphoma should be the most likely. DIAGNOSIS: HODGKIN LYMPHOMA
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**Fig. 5:** Doege-Potter syndrome is characterized by hypoglycemia associated with solitary fibrous tumors. Hypoglycemia occurs in approximately 4% of solitary fibrous tumors and it is thought that one possible factor is the secretion of insulin-like-growth factor II by the tumor. Solitary pleural fibrous tumors are rare benign neoplasm (account for less than 5% of primary pleural tumors). Surgical resection is the treatment of choice. **DIAGNOSIS:** SOLITARY PLEURAL FIBROUS TUMOR. (DOEGE-POTTER SYNDROME)
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Fig. 7: Sarcoidosis is a multiorgan granulomatous disease. Ocular involvement may occur in 11 to 83% of patients and can be the first symptom. Lung, skin, liver, heart and nervous system are other parts of the body that can be affected. Thoracic radiologic abnormalities by sarcoidosis are described in 90% of patients although they can be asymptomatic. Pulmonary sarcoidosis may manifest itself in various radiological
patterns. Bilateral hilar lymphadenopathy and interstitial disease with micronodules in a perilymphatic distribution are the most typical findings. DIAGNOSIS: SARCOIDOSIS
Fig. 8: Sarcoidosis is a multiorgan granulomatous disease. Ocular involvement may occur in 11 to 83% of patients and can be the first symptom. Lung, skin, liver, heart and nervous system are other parts of the body that can be affected. Thoracic radiologic abnormalities by sarcoidosis are described in 90% of patients although they can be asymptomatic. Pulmonary sarcoidosis may manifest itself in various radiological patterns. Bilateral hilar lymphadenopathy and interstitial disease with micronodules in a perilymphatic distribution are the most typical findings. DIAGNOSIS: SARCOIDOSIS

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Fig. 10: Lymphangioleiomyomatosis (LLM) is a rare disorder characterized by pulmonary cyst in lung parenchyma. Certain abdominal findings can be seen in more than 50% of patients with LLM and may reinforce the diagnosis. Retroperitoneal and pelvic lymphangioleiomyomas are produced by proliferation of smooth muscle cells in the lymph vessels. Other abdominal findings that can be associated to LLM are renal angiomyolipomas, chylous ascites and lymph node enlargement. DIAGNOSIS: LYMPHANGIOLEIOMYOMATOSIS
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Brain metastases were suspected with CT brain findings. Lung neoplasm accounts for nearly 47% of cases of brain metastases. Therefore, the next diagnostic imaging test could be a chest x-ray. In the case presented chest x-ray shows a complete upper right lobe atelectasis with the Golden S sign which proves the existence of a hilar mass.

**DIAGNOSIS: LUNG NEOPLASM AND BRAIN METASTASES**
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**Fig. 15:** Benign thymic hyperplasia can be associated with hyperthyroidism in Graves-Basedow disease. A decrease in size after treatment of the hyperthyroidism, as happened in this case, supports the diagnosis and can avoid more diagnostic procedures. **DIAGNOSIS:** THYMIC HYPERPLASIA ASSOCIATED TO GRAVES-BASEDOW DISEASE
Fig. 16: The area of increased density in right lung apex is confirmed as a mass in CT scan. The etiology of the Horner syndrome was a Pancoast lung tumor that infiltrates the sympathetic chain and ganglion. DIAGNOSIS: PANCOAST LUNG TUMOR
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Fig. 18: Rheumatoid arthritis was diagnosed with analytical tests. Rheumatoid arthritis lung diseases include many disorders. This image shows necrobiotic nodules. They are usually multiple, pleural based and can cavitate. They are typically asymptomatic and can resolve spontaneously. They represent a diagnostic dilemma, because the need to rule out malignancy. At lung bases, ground glass opacities are present, characteristic findings of nonspecific interstitial pneumonia, and are also associated with the arthritis. DIAGNOSIS: RHEUMATOID PULMONARY NODULES
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Fig. 20: Skin lesions (café-au-lait spots) and the multiple neurofibromas are considered major criteria for the diagnosis of Neurofibromatosis type I. Adrenal mass was surgically resected with the pathological result of pheochromocytoma, one of the possible complications that can develop in neurofibromatosis. DIAGNOSIS: NEUROFIBROMATOSIS I, NEUROFIBROMAS AND PHEOCHROMOCYTOMA

Fig. 21: Skin lesions (café-au-lait spots) and the multiple neurofibromas are considered major criteria for the diagnosis of Neurofibromatosis type I. Adrenal mass was surgically resected with the pathological result of pheochromocytoma, one of
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Fig. 23: Thymoma is the most common primary neoplasm of anterior superior mediastinum. Nearly 50% of patients with thymoma have myasthenia gravis. (25% of patients with myastenia gravis have a thymoma; in 65% it is due to thymic hyperplasia)
Removal of thymic tumor often results in symptomatic improvement. DIAGNOSIS: THYMOMA

Fig. 24: Thymoma is the most common primary neoplasm of anterior superior mediastinum. Nearly 50% of patients with thymoma have myasthenia gravis. (25% of patients with myastenia gravis have a thymoma; in 65% it is due to thymic hyperplasia) Removal of thymic tumor often results in symptomatic improvement. DIAGNOSIS: THYMOMA
Fig. 25: The radiological findings suggest hypertrophic osteoarthropathy which has thoracic and extrathoracic causes. One simple approach could be to make a chest X-ray to rule out especially malignancy, since bronchogenic carcinoma is one of the principal causes of the osteoarthropathy. Other causes can be chronic infection and benign tumors. Look at left upper lobe and you will see a round mass overlying the clavicle. Remember that this is an area to check carefully where really big lesions can hide. DIAGNOSIS: HYPERTROPHIC PULMONARY OSTEOARTHRPATHY SECUNDARY TO LUNG NEOPLASM.
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Fig. 28: Vocal cord paralysis can be caused by an injury to the mediastinal recurrent laryngeal nerve. The cause of this is mostly malignancy. Therefore, chest X-ray could be the next diagnostic step. But, as in the case showed, sometimes the lesion is only visible on CT (you can appreciate the necrotic mass in the aortopulmonary window). So, to rule out a mediastinal lesion, chest CT would be the most appropriate test. DIAGNOSIS: LUNG NEOPLASM WITH MEDIASTINAL MASS INJURING RECURRENT LARYNGEAL NERVE.
**Fig. 29:** The patient suffers from musculoskeletal scleroderma, a multisystem connective tissue disorder. It can also affect lungs. Interstitial lung disease is a common complication (usually nonspecific interstitial pneumonia, as in this case). Also notice the esophageal dilatation in mediastinum. It is produced for an atony or hypokinesia in distal esophagus, which is secondary to gastrointestinal scleroderma. Remember to look for the esophagus if you suspect scleroderma. This was the sign that you had to find! **DIAGNOSIS:** NONSPECIFIC INTERSTITIAL PNEUMONIA AND ESOPHAGEAL DILATATION IN SCLERODERMA.
Fig. 30: The patient suffers from musculoskeletal scleroderma, a multisystem connective tissue disorder. It can also affect lungs. Interstitial lung disease is a common complication (usually nonspecific interstitial pneumonia, as in this case). Also notice the esophageal dilatation in mediastinum. It is produced for an atony or hypokinesia in distal esophagus, which is secondary to gastrointestinal scleroderma. Remember to look for the esophagus if you suspect scleroderma. This was the sign that you had to find! DIAGNOSIS: NONSPECIFIC INTERSTITIAL PNEUMONIA AND ESOPHAGEAL DILATATION IN SCLERODERMA.
Fig. 31: The patient suffers from musculoskeletal scleroderma, a multisystem connective tissue disorder. It can also affect lungs. Interstitial lung disease is a common complication (usually nonspecific interstitial pneumonia, as in this case). Also notice the esophageal dilatation in mediastinum. It is produced for an atony or hypokinesia in distal esophagus, which is secondary to gastrointestinal scleroderma. Remember to look for the esophagus if you suspect scleroderma. This was the sign that you had to find! DIAGNOSIS: NONSPECIFIC INTERSTITIAL PNEUMONIA AND ESOPHAGEAL DILATATION IN SCLERODERMA.
Conclusion

Clinical radiologists are expected to move beyond mere description of radiological signs towards integration of the clinical signs and symptoms with the radiological findings in order to make a more convincing diagnosis.

Personal information

References


