The Chest CT scan - Don't stop at the first glance, it's the little things that matter

Poster No.: C-3136
Congress: ECR 2019
Type: Educational Exhibit
Authors: C. Desiderio¹, M. Palermo¹, F. Tiralongo¹, G. Distefano², S. Seminatore¹, L. A. Mauro¹, P. V. Foti¹, A. Basile¹, S. Palmucci¹; ¹Catania/IT, ²Ragusa/IT
Keywords: Thorax, Lung, Respiratory system, CT, CT-High Resolution, CT-Angiography, Localisation, Perception image, Medico-legal issues, Education and training, Image verification, Quality assurance
DOI: 10.26044/ecr2019/C-3136

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method ist strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Learning objectives

To identify and describe the most common findings in different thoracic structures that are usually missed during the evaluation of chest CTs; to suggest a method to examine everything in the CT scan throughout the use of acronyms, to be sure you don't miss any lesion.
Background

During chest CT examinations, radiologists usually focus on the parenchyma, and mostly look for signs in reference to the clinical request. Therefore, it is possible that they don't pay enough attention to the rest of the structures, like soft tissues or vessels. These structures can often be the site of important lesions that risk to be missing in the report and might have a clinical relevance.
Findings and procedure details

Using our database, we have selected all the chest CTs performed during the last year (From January to December 2018) and we reviewed over 2600 CTs; we have therefore selected all the reports in which accessory findings were reported and we have studied the images of these exams. We studied them twice: once focusing on the clinical suspect and once again using a methodic approach to analyze the whole image. In a large amount of chest CT scans, at the first look, we missed several lesions in vascular structures, soft tissues and upper airways that were then noticed in our second approach. The most common lesions we found on our second look are described, showing their radiological features and emphasizing their clinical relevance.

Considering that during the report of a chest CT we focus mainly on parenchyma, bronchi and lymph nodes, we found that other thoracic regions may be underestimated during our study.

The main lesions that were missed on our first look, regarded the following structures: mediastinum (thymus and thyroid), vessels, bones, diaphragm, breast and soft tissues, muscles, windpipe, esophagus. For each omitted anatomical structure, we comment on images extracted from our series.

**Mediastinum**

One of the most frequent accessory findings in our series is represented by the thymic residue. This condition is frequently found especially in pediatric cases (up to 64%), while it is rarer in adulthood [1] and can be a cause of diagnostic error and unnecessary anxiety, and does not normally require therapeutic initiatives, in isolated cases has been described as possible cause of Horner’s syndrome [2] (FIG 1) Another condition that in some cases may go undetected, and therefore under-diagnosed, is the thyroid goiter, a relatively frequent condition, although there are no accurate statistics in The possibility of finding this type of lesion is strictly correlated with the size of the gland, which can be considerable, and of any associated focal lesions. In our case series, we have found several cases of immersed goiters, a very small number of cases has not been identified in the first evaluation, but this accessory finding is still important to report and because it may be home to benign and malignant diseases and also enters differential diagnosis with all the masses of the upper mediastinum (FIG 2, FIG 3)

**Vessels**

Vascular malformations represent an unusual finding. The condition called lusor artery is an uncommon condition, which may be completely asymptomatic or associated with cough, gastro-esophageal reflux and dyspnea, found up to 2.5% in autoptic cases
and accounts for 17% of all aortic arch malformations [3]. The term "lusoria" refers to dysphagia "may be called lusoria, from lusus naturae" (Latin for "freak of nature") that gives rise to it" (FIG 4). Another vascular malformation not uncommon in TC is represented by the bovine arch; in this type of abnormal vascular we observe the anomalous origin of the anonymous trunk and of the left common carotid directly from the aortic arch: this condition is usually asymptomatic and therefore constitutes an accessory finding that could escape an inadequate analysis (FIG 5).

Windpipe

The trachea is rarely associated with the finding of malformities pathology and in most cases the anomalies are well evident; more limited structural anomalies can go instead quite unnoticed if asymptomatic: it is the case of tracheal diverticulum, an aerial cyst that develops in paratracheal site with a congenital or acquired character, often completely asymptomatic or responsible for dysphagia, odynophagia, neck pain, hoarseness, hemoptysis, choking, and recurrent episodes of hiccups [4] (FIG 6). Tracheomalacia is not uncommon in our experience, although it is reported at 10% in some cases [5]; characterized by collapse for more than 70% of the expiratory trachea, it can be acquired or, very rare, congenital, and is often asymptomatic or accompanied by non-specific symptoms such as persistent cough, breathing difficulties and recurrent infections. The clinical importance in the detection of this lesion is correlated with the possibility of explaining some clinical features of the patient in light of the tracheomalacia relief (FIG 7).

Esophagus

In our series we have noted that achalasia, in a CT examination, could be misunderstood; the most relevant datum is represented by dilatation of the esophagus which presents itself with thin walls; however, CT is not the most suitable method to study this pathology (FIG 8).

Soft tissues

In addition to the evaluation of the mediastinum, the analytical method for the correct interpretation of a CT scan of the thorax cannot disregard the careful evaluation of the bony structures and soft tissues. In these structures it is possible to appreciate both the presence of benign conditions, such as bone fractures ever in consolidation, or malignant ones, such as breast neoplasia. From our series we report cases of vertebral fractures, elastofibroma dorsi, intramuscular lipomas and among the lesion of the soft tissues, particular clinical relevance is attributed to the benign and malignant diseases of the breast. Although in general they are easy to identify, in some cases they can be misunderstood because of the clinical request that focuses radiologists’ attention elsewhere: they are non-diagnoses that can have serious consequences on outcomes in appropriate clinical settings (FIG 9).
**Bones**

Costal fractures are certainly among the most interesting bone pathologies in common clinical practice; these pathologies can be associated with pain and functional impotence, but it is not uncommon for the symptoms to be very blurred and therefore may not be the primary objective of a CT assessment. In our experience it is common to find these lesions in the absence of a positive history of recent traumas; although often asymptomatic, they may be associated with vascular lesions, nerve injuries, pneumothorax, parenchymal herniation and bleeding; the number of displaced fractures is inter alia correlated with an increase in severe pulmonary complications [6] (FIG 10). Even vertebral collapses can go unrecognized: the recognition of this type of lesions requires the evaluation of reformatting on the sagittal plane (FIG 11).

**Muscle**

Elastofibroma dorsi is a benign soft tissue tumor located in the intrascapular region, bilaterally or not; in most cases it remains asymptomatic, but can sometimes be associated with pain. In CT it appears as a hypo-isodense mass compared to muscles [7]. The importance of this lesion lies in the possibility of making a diagnostic error with respect to other pathologies, benign or malign, of the soft tissues and muscles (FIG 12). Lipomas are the most common benign tumors in the adult population may be misunderstood as a result of a superficial evaluation of a CT scan performed for other reasons. In our series we have noticed several cases of intramuscular lipomas. Lipomas present themselves as well-defined lesions of variable size in the soft tissue context, with attenuation values equal to those of fat. The clinical importance is due to the possible association in syndromic diseases (FIG. 13) [8]. From our series we extracted a case of latissimus dorsi lipoma, a condition often characterized by pain and functional impotence of the upper limb probably correlated with localized microtrauma of the axillary region (Fig 14) [9].
Fig. 1: thymic residue. In the axial scans of this test, performed for the evaluation of a patient affected by cystic fibrosis and hemoptysis, the presence of thymic residue was found.
**Fig. 2:** immersed goiter. Scanning on axial plane (A) and reformatting on sagittal (B) and coronal (C) planes. This examination was performed in the suspect of pulmonary embolism; despite the conspicuous dimensions of the thyroid, to a first observation the report was ignored. This diagnostic error did not affect the therapy or follow-up, however it is an emblematic case that warns about the possibility of error in the evaluation of mediastinal lesions.

© DEPARTEMENT OF MEDICAL SURGICAL SCIENCES AND ADVANCED TECHNOLOGIES - RADIOLOGY I UNIT, UNIVERSITY OF CATANIA - Catania/IT

**Fig. 3:** immersed goiter. Scanning on the axial plane (A) and reformatting on the sagittal plane (B). Evaluation was required for dyspnea and mediastinal enlargement; in this case the immersed goiter (which had not been identified during the evaluation of parenchyma using a "bone" window) is smaller in size.

© DEPARTEMENT OF MEDICAL SURGICAL SCIENCES AND ADVANCED TECHNOLOGIES - RADIOLOGY I UNIT, UNIVERSITY OF CATANIA - Catania/IT
**Fig. 4:** arteria lusoria. This CT scan was performed to evaluate a bilateral pleural effusion in a patient affected by multiple myeloma; in the scans performed after administration of contrast agent it was possible to evaluate the presence of the aberrant artery.
Fig. 5: bovine arch. In this CT scan, performed for the study of abdominal pathology, it was possible to identify the presence of an anomalous origin of the anonymous trunk and of the left common carotid artery.
**Fig. 6:** tracheal diverticulum. Axial scan with soft tissue window. Patient evaluated for lymphoproliferative pathology, a small collection of air compatible in the first hypothesis with tracheal diverticulum is demonstrated in correspondence of the dorsal-lateral wall of the trachea: this quite accidental finding, due to its small size of only a few slices, can be missed in a superficial evaluation of the mediastinum.
Fig. 7: tracheomalacia. Axial CT image with window for parenchyma. The patient was studied for a follow-up of a pulmonary nodule; the random finding of tracheomalacia wasn't correlated to any clinical symptoms in this case.

© DEPARTEMENT OF MEDICAL SURGICAL SCIENCES AND ADVANCED TECHNOLOGIES - RADIOLOGY I UNIT, UNIVERSITY OF CATANIA - Catania/IT
Fig. 8: achalasia. examination performed for in-depth examination in a neoplastic patient with pleural effusion. In this examination achalasia had not been correctly reported, but it is visible in this CT scan with a mediastinal window.
**Fig. 9:** hypertrophy of the mammary gland. Axial CT scan with soft tissue window. In correspondence of the left hemithorax a consistent hypertrophy of the mammary gland was found. The CT had been requested for the suspect of metastatic disease in an elderly patient being treated for prostate carcinoma.

© DEPARTEMENT OF MEDICAL SURGICAL SCIENCES AND ADVANCED TECHNOLOGIES - RADIOLOGY I UNIT, UNIVERSITY OF CATANIA - Catania/IT
Fig. 10: costal fracture. Axial CT image with bone window. This patient was evaluated for neoplastic pathology; with a systematic evaluation of the soft tissues it has been possible to highlight the presence of a fracture of the dorsal portion of a left rib, which had not been noted for a first evaluation focused on the pulmonary parenchyma and on the mediastinum.
**Fig. 11:** vertebral fracture only evaluable in a sagittal plane. This lesion would have been lost if the examination had been limited to the assessments only in axial scans.

© DEPARTEMENT OF MEDICAL SURGICAL SCIENCES AND ADVANCED TECHNOLOGIES - RADIOLOGY I UNIT, UNIVERSITY OF CATANIA - Catania/IT
Fig. 12: elastofibroma dorsi. CT examination performed for diagnostic investigation in patients with dyspnea, axial scans with mediastinal window; at a superficial analysis in this examination a dorsal elastofibroma was not detected.

© DEPARTEMENT OF MEDICAL SURGICAL SCIENCES AND ADVANCED TECHNOLOGIES - RADIOLOGY I UNIT, UNIVERSITY OF CATANIA - Catania/IT
Fig. 13: Lipoma. A typical case of lipoma of the infraspinatus muscle found, at the second evaluation, in a patient observed for suspected interstitiopathy.

© DEPARTEMENT OF MEDICAL SURGICAL SCIENCES AND ADVANCED TECHNOLOGIES - RADIOLOGY I UNIT, UNIVERSITY OF CATANIA - Catania/IT
Fig. 14: latissimus dorsi lipoma in a patient evaluated for suspected pulmonary embolism.

© DEPARTEMENT OF MEDICAL SURGICAL SCIENCES AND ADVANCED TECHNOLOGIES - RADIOLOGY I UNIT, UNIVERSITY OF CATANIA - Catania/IT
Conclusion

Considering the most common extra-parenchymal lesions that are left unnoticed in the chest CTs and what they represent, radiologists should be aware of a possible searching model based on acronyms in order to decrease the risk of missing any important finding in the report of a chest CT. In this case, we created a simple mnemonic phrase: "Many view big diseases, but smaller might woefully escape". This phrase contains the acronym that includes every structure we need to strictly analyze in a chest CT other than the parenchyma (Fig 15). This method can be very useful to avoid missing any lesion in our report.
**Fig. 15:** The mnemonic phrase reminds us the acronym that stands for every structure we need to strictly analyze in a chest CT, other than the parenchyma.

© DEPARTEMENT OF MEDICAL SURGICAL SCIENCES AND ADVANCED TECHNOLOGIES - RADIOLOGY I UNIT, UNIVERSITY OF CATANIA - Catania/IT
References


