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EDITORIAL

The pulmonary nodule: change of paradigm

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Abstract

The threshold for detection of pulmonary nodules has decreased due to advances in CT technology. Particularly in sub-centimetre nodules, non-invasive diagnostic procedures are required for classification into benign and malignant to avoid unnecessary invasive procedures as more than 95% of these lesions are benign.

Keywords: *Solitary pulmonary nodule; lung cancer; granuloma; contrast-enhanced CT; PET; CT volumetry.*

The concept of management of the non-calcified pulmonary nodule is currently undergoing a dramatic change.

Until recently, a 'pulmonary nodule' typically was diagnosed at plain radiography. Due to the limitations of chest radiography in reproducibly identifying lesions in the size range 6–10 mm, a pulmonary nodule was generally considered to represent a relatively large lesion usually with a diameter >10 mm. Histology often revealed malignancy (lung cancer, metastases, carcinoid etc.), whereas benign nodules in this size category were not very common. This prompted the view that every pulmonary nodule has to be considered malignant until proven otherwise (usually by biopsy or surgery). This view persists, particularly amongst clinicians.

Computed tomography, particularly using spiral and more recently multidetector spiral technology, is markedly superior to chest radiography for the demonstration of pulmonary nodules, with increasing sensitivity particularly for sub-centimetre nodules. The widespread use of chest CT has shown that sub-centimetre nodules are common. In some CT studies of heavy smokers small non-calcified nodules were demonstrated in more than 50% of the population. Therefore, using (multidetector) helical CT in adults, particularly in smokers, it has been claimed that 'if you

don't see a small non-calcified nodule you haven't really looked for it!'

More than 95% of lesions <10 mm do not represent malignancy. At follow-up many of them disappear, suggesting that they represent asymptomatic inflammatory nodules—an entity previously unrecognised. Furthermore, it has been recognised that even normal structures such as intrapulmonary lymph nodes may present as small pulmonary nodules.

As a consequence, the approach to these nodules has to be different from that for larger nodules: non-invasive classification is required to avoid unnecessary invasive procedures for benign lesions.

Positron emission tomography (PET) has been shown to represent the single best method to differentiate between benign and malignant pulmonary nodules but is less useful in nodules <10 mm. Contrast-enhanced dynamic CT is particularly useful due to its very high negative predictive value (i.e. if a nodule does not enhance it is almost always benign) and promises to be accurate for small nodules using modern technology (perfusion studies, 3D analysis, enhancement maps etc.). Precise measurement of nodules at thin-section (multidetector) helical CT, preferably using volumetric rather than diametric results, has the potential to detect or exclude growth within a few (4–12) weeks.

Computer-assisted diagnosis (CAD) based on thin-section CT datasets is about to be introduced into clinical routine not only for nodule volumetry but also for assessment of enhancement and detection of nodules.

In conclusion, the old concept that every non-calcified pulmonary nodule has to be considered malignant until proven otherwise may hold true for larger lesions visible on chest radiography. However, in the numerous small (<10 mm) nodules detected at chest CT this concept would lead to a high number of unnecessary invasive procedures. Therefore, in these small nodules non-invasive classification based on imaging techniques is required.