Solitary pulmonary nodules: approach options

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AIMS

- To discuss the problems related to the management of solitary pulmonary nodule (SPN)
- To evaluate the indication and the possible biopitic techniques for the diagnosis of a SPN
- To assess the role of bronchoscopy in the diagnosis of SPN
- To describe the possible techniques of guidance for the bronchoscopic approach to SPN
- To describe the advantages and disadvantages of transbronchial and percutaneous approach to SPN
- To describe a possible algorithm for the diagnostic approach to SPN

SUMMARY

Diagnostic management of SPN is a common problem for which universally accepted guidelines have not yet been defined [1].

The definition of SPN should be reconsidered, since small nodules less than 0.8-1 cm and non-solid nodules with a ground glass appearance may require to be managed differently [2].

For nodules ≤ 8 mm a strategy of careful observation with serial CT could be the best option. Small nodules are difficult to biopsy and they are not reliably characterized by PET scan. The timing of CT surveillance is related to the size of the nodule and to the risk factors (age, smoking habit, morphology) and is well established by Fleischner Society recommendation, endorsed by ACCP guidelines in 2nd and 3rd edition [2-4].

Concerning nonsolid nodules (ground glass opacity – GGO) the strategy is different. A GGO may be neoplastic (the histotype more frequently responsible is adenocarcinoma) but the growth rate may be slower than solid nodules. Consequently, the criterion of two years stability used for solid nodules to classify the lesion as benign, is not valid. The false negative PET results are more frequent in subsolid nodules. The radiological Fleischner Society proposed recommendations for the management of GGO, defining the timing of CT follow-up, that must be longer than 2 years [5]. The risk of malignancy is higher in GGO with solid component and in this case biopsy or surgery is indicated if the nodule persists at a repeated CT at three months [4].

For nodules greater than 0.8 cm, in the case of high probability for malignancy and in patients good surgical candidates the possibility of an immediate surgery could be considered. However, in most patients surgery is contraindicated because of age, cardiorespiratory impairment, comorbidity and a biopic assessment is necessary. Non surgical biopsy may also be indicated when the probability of malignancy is low to moderate, when a benign diseases requiring medical treatment is suspected or if the patient desires proof of malignancy prior to surgery [4].

For biopic purposes a SPN may be approached both transbronchially and percutaneously [6].

The bronchoscopic approach, even if provides a lower sensitivity in comparison with percutaneous needle biopsy, has the advantage to obtain information for staging (airway exploration, synchronous lung cancer, lymphnodes TBNA) and to be burden of a lower incidence of complications (especially pneumothorax that occurs in 15-25% of cases of transthoracic biopsy).
There is evidence in the literature, that bronchoscopy may be useful in the preoperative assessment of SPN and, even if in a small percentage of patients (3-5%), it may provide information that could modify the planned surgery [7,8].

The bronchoscopic approach to a SPN should always be performed by using a guidance system to verify the sampling site, since the blind sampling or bronchoalveolar lavage provide a very low sensitivity (<10%). Fluoroscopy is the traditional guidance system which is widely employed. Results obtained with fluoroscopic guidance vary greatly in the literature (up to 83%) and this variability may be related to several factors such as the size of the lesion, the sampling instrument used, the number of sampling instruments and the operator’s experience [9].

The size of the lesion is an important factor affecting sensitivity of transbronchial approach to SPN. Sensitivity range from 76% to 83% for nodules greater than 2 cm, while falls to 33-58% for nodules ≤ 2 cm. Among sampling instruments, there is enough evidence in the literature that transbronchial needles have a better yield in comparison to forceps biopsy, brushing or curette [10].

However the major factor that limits the sensitivity of transbronchial approach to SPN is the relationship between the airways and the lesion. If the nodule is outside the airways and a bronchus leading into the lesion is lacking, it is not possible to transbronchially reach the target. This point has been well demonstrated by Naidich et al [11], that described the CT “bronchus sign” (a CT evidence of a bronchus leading to or contained within the nodule) as predictor of success for the transbronchial biopsy of a SPN.

An attempt to overcome this problem has been recently proposed with the introduction of a new techniques (bronchoscopic transparenchimal nodul access) that consists in creating a tunnel with a set of catheter based tools between the airways and the nodule [12,13]. Just few pilot studies of feasibility have been performed and this system is still to be considered experimental.

In the last years, new technologies (endobronchial ultrasound, electromagnetic navigation, virtual bronchoscopy) have been proposed as guidance systems for transbronchial approach to SPN [14-17]. It seems that these new systems may increase the diagnostic yield, expecially for smaller nodules < 2 cm (60%), but no comparative randomized studies to fully support this observation have been performed. These new systems have the advantage to avoid radiation exposure, both for the patients and for the operators, but are more expensive (especially electromagnetic navigation) in comparison to fluoroscopy. It could be proposed to use these new technologies when a fluoroscope is not available or when the lesion is not visible by fluoroscopy (this is more frequent for small lesion and for GGO).

In conclusion, an algorithm that can be proposed for the diagnostic approach to SPN could include a bronchoscopic approach as first step (expecially in patients candidate to surgery or in subjects with impairment of respiratory function with high risk in case of pneumothorax). It must be stressed that in case of SPN bronchoscopy must be performed with a guidance system, otherwise the diagnostic yield is very low. If transbronchial technique has failed, a percutaneous approach must be considered.

However, the indication to bioptic techniques must be evaluated for each individual case in the clinical context, estimating the imaging characteristics of the lesion, discussing with the patient the risks and the advantages of each possible alternative strategies.

REFERENCES