association has been described with similar results and could be due to a combination of the effects of obesity and diffuse airway obstruction.[2] Obesity is known to be a major risk factor for OSA linked with increased neck circumference and amounts of peripharyngeal fat, which could narrow and compress the upper airway[3]; obesity may also play a role by reducing lung volumes. Obesity affects ERV by decreasing FRC, and ERV may also be reduced with an increase in residual volume (RV) that occurs, not exclusively, but particularly in the obese, due to premature closure of the small peripheral airways.[4] We found that the absolute effect of the correlation of ERV with obstructive events was similar to the effect of BMI, but ERV remained influential independently of all confounders such as BMI. The reduction in end-expiratory lung volumes, which are accentuated in sleep, may lead to a reduction in tracheal traction on the pharynx and so increasing its collapsibility. Conversely, increases in lung volumes have been shown to increase tracheal traction with stabilization of the upper airway during inspiration,[5] and in OSA patients, they have been shown to decrease positive airway pressure requirements and OSA severity, suggesting improvements in pharyngeal collapsibility.[6] Although this relationship seems unequivocal, as shown in our study, more research is needed in order to define more precisely which end-expiratory volume – ERV, FRC or even RV – plays the major role and how it influences the occurrence of obstructive events during sleep.

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CT-guided transthoracic lung biopsy: Predictive factors of pneumothorax

Biópsia pulmonar transtorácica guiada por TC: factores preditivos de pneumotórax

Dear Editor,

Computed tomography (CT) guided transthoracic lung biopsy (TTLB) is a well established method in the diagnosis of intrathoracic lesions with good diagnostic yield.[1] Pneumothorax is the most frequent complication with an incidence varying between 8% and 64%.[2]

The objective of this study was to evaluate potential risk factors associated with the occurrence of pneumothorax in CT-guided TTLB. We performed a retrospective study of patients undergoing CT-guided TTLB between 2007 and 2012 in Braga Hospital. Clinical data and radiologic images of patients were reviewed.

A total of 269 TTLB were performed (201 fine needle aspiration biopsies and 68 core biopsies), in 209 patients with a mean age of 64.2 years, 75.8% male, 60% with smoking habits. Pneumothorax rate was 20.8%. Treatment of pneumothorax with chest drainage was necessary in 10/269 biopsies (3.7%). An initial univariate analysis identified the following risk factors: larger needle size ($p = 0.033$), smaller size of the lesion ($p = 0.001$) and absence of pleural contact ($p < 0.001$) – Table 1. A multiple logistic regression analysis has identified absence of pleural contact ($p < 0.001$; R^2 adjusted 0.107) and size of the lesion ($p = 0.030$; R^2 adjusted 0.120) as significant independent risk factors for the occurrence of pneumothorax. Pneumothorax occurred in 41/111 (36.9%) biopsies in lesions without pleural contact vs 15/158 (9.5%) with pleural contact. Pneumothorax rate for lesions ≤ 2 cm was 31% compared with 15.4% for lesions > 4 cm. Age, gender, smoking habits, presence of emphysema, needle size, presence of cavitation, contours, location and depth of lesion were not significantly associated with increased risk of pneumothorax.

In our study, the absence of pleural contact was the most significant risk factor associated with the occurrence of post-TTLB pneumothorax. These data were corroborated by another retrospective study of Khan et al.[3] in which lesions in the lung parenchyma had a higher pneumothorax rate than lesions located in the pleura or thoracic wall. Another significant risk factor identified was lesion size. There seems to be a gradual increase in the risk of pneumothorax to progressively smaller lesions. In a retrospective analysis of 660 biopsies, Yeow et al.[4] showed that the risk of pneumothorax was about 11 times higher in lesions ≤ 2 cm than in lesions >4 cm.

Table 1 Univariate analysis of demographic characteristics of patients and multiple variables of TTLB.

Variables	All biopsies	Pneumothorax		*p* value
		No	Yes	
Biopsies, no.	269	213 (79.2)	56 (20.8)	–
Age, years	64.2 ± 13.6	64.6 ± 13	62.8 ± 15.8	0.752[a]
Gender male/female	204/65	167/46	37/19	0.055[b]
Smoking habits				
Smoker	80 (29.8)	62 (29.1)	18 (32.1)	
Ex-smoker	81 (30.1)	63 (29.6)	18 (32.1)	0.748[b]
Non smoker	108 (40.1)	88 (41.3)	20 (35.8)	
Needle size				
FNAB (25 Ga)	201 (74.7)	153 (71.8)	48 (85.7)	0.033[b]
CB (18 Ga)	68 (25.3)	60 (28.2)	8 (14.3)	
		No	Yes	
Lesion size, mm	48.5 ± 28	51.3 ± 28.9	37.4 ± 21	0.001[a]
Lesion depth, mm	60.4 ± 21.8	59.4 ± 22.3	64.2 ± 19.5	0.075[a]
Presence of emphysema	78 (29)	58 (27.2)	20 (35.7)	0.213[b]
Lesion location				
Right upper lobe	81 (30.1)	61 (28.6)	20 (35.7)	
Middle lobe	13 (4.8)	9 (4.2)	4 (7.1)	
Right lower lobe	58 (21.6)	46 (21.6)	12 (21.5)	0.762[b]
Left upper lobe	68 (25.3)	55 (25.8)	13 (23.2)	
Left lower lobe	42 (15.6)	35 (16.5)	7 (12.5)	
Mediastinum	7 (2.6)	7 (3.3)	0 (0)	
Lesion contours				
Regular	31 (12.3)	24 (11.2)	9 (16.1)	
Irregular/spiculated	216 (80.3)	175 (82.2)	41 (73.2)	0.511[b]
Lobulated	20 (7.4)	14 (6.6)	6 (10.7)	
Presence of cavitation	24 (8.9)	17 (30.4)	7 (12.5)	0.291[b]
Pleural contact				
Yes	158 (58.7)	143 (67.1)	15 (26.8)	<0.001[b]
No	111 (41.3)	70 (32.9)	41 (73.2)	

Data presented as mean ± SD or no. (%).
[a] Mann–Whitney *U* test.
[b] Pearson χ^2 test.

In conclusion, this study supports the performance of CT-guided TTLB in the study of undetermined lung lesions as a safe method. Although the overall incidence of pneumothorax was 20.8%, the clinically significant pneumothorax rate requiring treatment with chest tube drainage was low (3.7%).

Authorship

João Filipe Cruz conceived this study, collected the data and carried out the statistical analysis. Rui Rolo collected the data, collaborated in the inception of the study and supervised all aspects of its implementation. Lourdes Iglésias and João Cunha contributed to the critical revision of the manuscript. All the authors contributed to the interpretation of the results and the proof reading of the manuscript.

Conflicts of interest

The authors have no conflicts of interest to declare.

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