

Occupational lung cancer: autopsy findings regarding 139 cases from Brescia (Italy) Institute of Forensic Medicine

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Introduction

A retrospective study was carried out on post-mortem examination data of lung-cancer deaths recorded by the Brescia (Italy) Institute of Forensic Medicine during the period 2004-2013. The aim of the study was to investigate the relationship between occupational carcinogens and cell type of lung carcinoma, and the diagnostic reliability of post-mortem histological findings from tumor specimens collected during autopsy.

Materials and Methods

The case study was carried out on 139 autopsies of people died of lung cancer, required by the District Attorney's Office to evaluate the possible occupational aetiology of the lung tumor. The following variables were considered: gender, age, lifetime occupational history (type and duration of job-exposure), non-occupational risk factors (tobacco smoking habits), time of clinical diagnosis and autopsy findings.

For each case lung samples were collected during autopsy both from apparently healthy and from neoplastic tissue. Considering that different cell type of lung cancer can express different kind of molecules, after traditional Hematoxylin and Eosin (HE) staining, for a more accurate diagnosis all the specimens obtained from the lungs were analysed using immunohistochemical staining (p63, TTF-1, CK7, CK5/6 and CD56 antibodies) [1,2] (see Figures).

Results

In 49 cases, the anamnestic evaluation of the potential occupational exposure allowed to exclude exposure (31 cases) or to qualify it as not relevant (18 cases) in the pathogenesis of lung cancer. In 90 cases a causal or concausal relationship between occupational exposure and lung cancer was demonstrated, mostly concerning silica (26 cases), asbestos (16 cases) or both (4 cases) exposure (Table 1). Ante mortem histological

diagnosis was available for 81 cases: 33 squamous cell carcinoma (SqCC), 30 adenocarcinoma (ADC), 11 small cell lung carcinoma (SCLC), 7 non small cell lung carcinoma (NSCLC). Post-mortem histological evaluation using HE and immunohistochemical staining allowed to identify 13 SqCC, 19 ADC, 11 SCLC, 32 NSCLC. For 15 cases the histological characterization wasn't possible due to the advanced post-mortem putrefaction decay of the lung tissue. As shown in Table 2, post-mortem cell-type diagnosis confirmed ante-mortem diagnosis in a small number of cases.

Conclusions

In partial contrast with other studies [3] we found a slight prevalence of squamous cell carcinoma (SqCC) both in silica and in asbestos exposure; no significant relationship was found between polycyclic aromatic hydrocarbons (PAH) exposure and a specific cell type lung cancer. For other carcinogens, the small number of cases and their dispersion don't allow any definitive conclusion.

As shown in Table 2, post mortem diagnosis was different with regard to ante-mortem diagnosis in 41 out of 81 cases (50.6%). These differences could be due to: 1) intrinsic tumor progression, taking into account that in some cases long time (till some years) passed from the tumor diagnosis to the death; 2) the effects of chemotherapy/radiotherapy; 3) the effects of post-mortem decay, considering that in Italy, according to the law, autopsy can be performed not before 24 hours after the death (and in some cases autopsy is performed some days later, although preserving the body in the fridge).

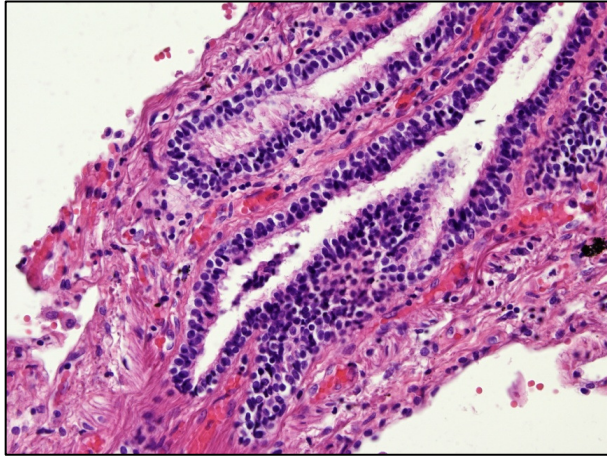
The good correlation between ante-mortem and post-mortem diagnosis found in SCLC cases (10 out of 11 cases; 91%) through immunohistochemistry (confirming HE staining) could be due to the intrinsic characteristics of this kind of tumor, probably more resistant than others to post-mortem decay.

In other cell type lung cancers, immunohistochemical staining (compared to HE alone), allowed anyway in a certain number of cases to find a correlation between ante-mortem and post-mortem diagnosis.

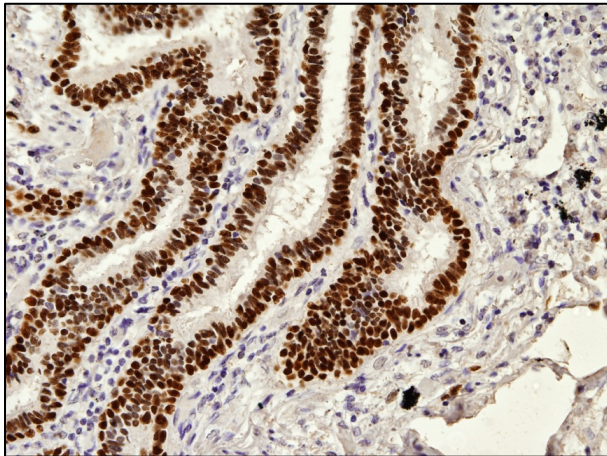
In conclusion, post-mortem lung cancer cell type diagnosis is quite hard and it should be considered with caution, above all in cases other than SCLC.

Table 1. Relationship between occupational agents and cell type of lung cancer						
	SqCC (33 cases)	ADC (30 cases)	SCLC (11 cases)	NSCLC (7 cases)	Ante mortem data not available (9 cases)	Tot.
Silica (26 cases)	[38%] (30.3%)	[27%] (23.3%)	[8%] (18.2%)	[8%] (28.6%)	[19%] (55.6%)	[100%]
Asbestos (16 cases)	[44%] (21.2%)	[38%] (20%)	[6%] (9.1%)	[6%] (14.3%)	[6%] (11.1%)	[100%]
PAH (8 cases)	[37.5%] (9.1%)	[37.5%] (10%)	[12.5%] (9.1%)	[12.5%] (14.3%)		[100%]
Silica, PAH, asbestos (7 cases)	[57.1%] (12.1%)	[28.6%] (6.7%)		[14.3%] (14.3%)		[100%]
Silica and asbestos (4 cases)	[25%] (3%)	[50%] (6.7%)			[25%] (11.1%)	[100%]
Chrome (4 cases)	[25%] (3%)	[50%] (6.7%)	[25%] (9.1%)			[100%]
Welding fumes (2 cases)	[100%] (6.1%)					[100%]
Silica and PAH (3 cases)	[33.3%] (3%)	[66.7%] (6.7%)				[100%]
Paints (4 cases)	[50%] (6.1%)	[25%] (3.3%)	[25%] (9.1%)			[100%]
Asbestos and welding fumes (3 cases)	[33.3%] (3%)			[66.7%] (28.6%)		[100%]
PAH and chrome (2 cases)		[50%] (3.3%)	[50%] (9.1%)			[100%]
Diesel exhausts (3 cases)		[100%] (10%)				[100%]
Other (8 cases)	[12.5%] (3%)	[12.5%] (3.3%)	[50%] (36.4%)		[25%] (22.2%)	[100%]
Tot.	(100%)	(100%)	(100%)	(100%)	(100%)	
SqCC (Squamous Cell Carcinoma); ADC (Adenocarcinoma); SCLC (Small Cell Lung Carcinoma); NSCLC (Non Small Cell Lung Carcinoma). PAH (Polycyclic Aromatic Hydrocarbons).						

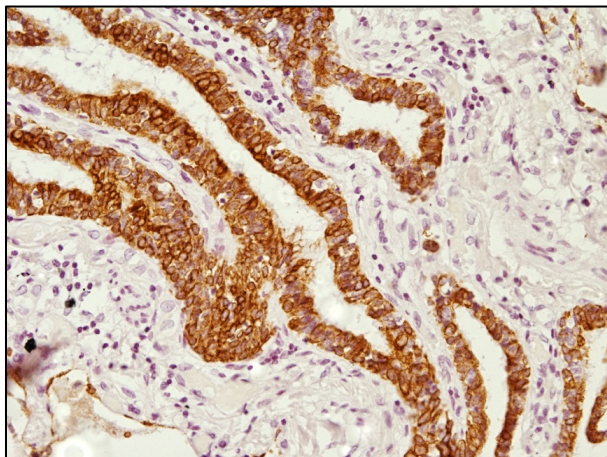
Table 2. Ante mortem and post mortem histological diagnosis			
Cell type carcinoma	Ante mortem diagnosis	Post mortem diagnosis	Ante mortem diagnosis confirmed by post mortem
SqCC	33	12 SqCC	12 out of 33 (36.4%)
		2 ADC	
		0 SCLC	
		15 NSCLC	
		4 inconclusive	
ADC	30	1 SqCC	14 out of 30 (46.7%)
		14 ADC	
		0 SCLC	
		10 NSCLC	
		5 inconclusive	
SCLC	11	0 SqCC	10 out of 11 (91%)
		0 ADC	
		10 SCLC	
		0 NSCLC	
		1 inconclusive	
NSCLC	7	0 SqCC	4 out of 7 (57.1%)
		1 ADC	
		1 SCLC	
		4 NSCLC	
		1 inconclusive	
Ante mortem data not available	9	0 SqCC	/
		2 ADC	
		0 SCLC	
		3 NSCLC	
		4 inconclusive	
	90		
SqCC (Squamous Cell Carcinoma); ADC (Adenocarcinoma); SCLC (Small Cell Lung Carcinoma); NSCLC (Non Small Cell Lung Carcinoma).			



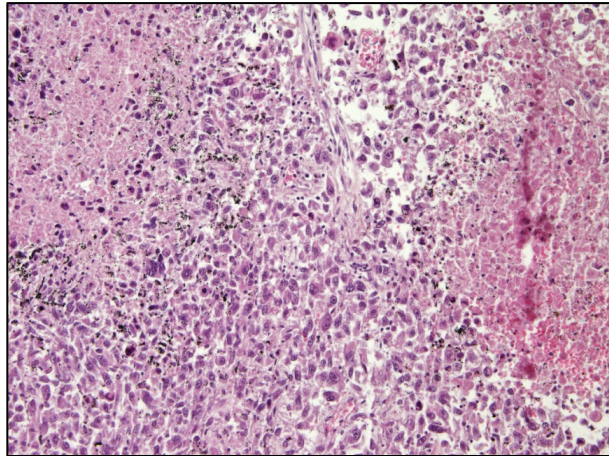
Adenocarcinoma (H-E 20x)



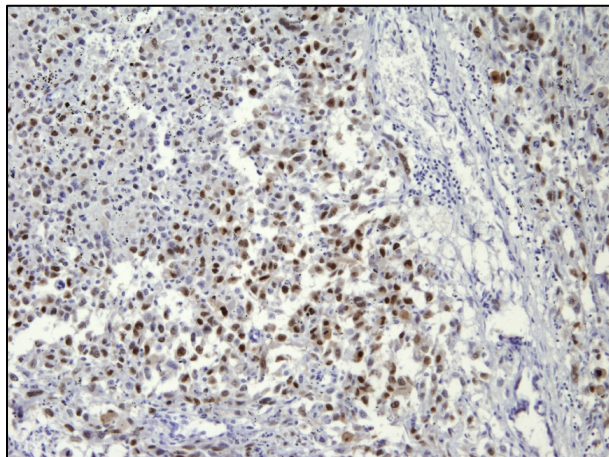
Adenocarcinoma (TTF-1 20x)



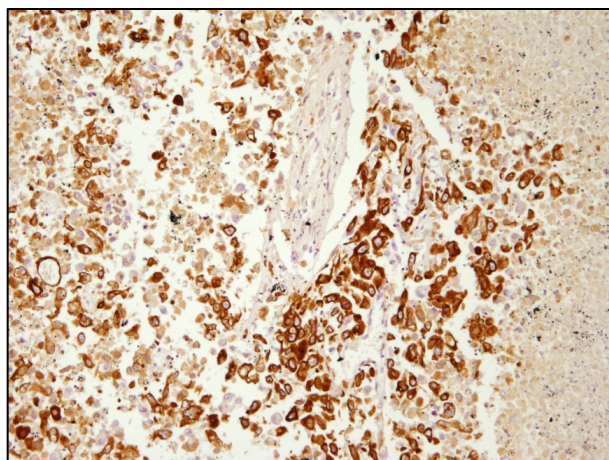
Adenocarcinoma (CK7 20x)



Squamous Cell Carcinoma (H-E 10x)



Squamous Cell Carcinoma (p63 10x)



Squamous Cell Carcinoma (CK5/6 10x)

References

- [1] Mani H, Zander DS. Immunohistochemistry. Applications to the evaluation of lung and pleural neoplasms: part 1. *Chest*, 142(5):1316-23, 2012.
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- [3] Bianchi C, Brollo A, Ramani L, Zuch C. Asbestos exposure in lung carcinoma: a necroscopy-based study of 414 cases. *Am J Ind Med*, 36:360-64, 1999.