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1) 2) 3)

Abstract

A Case of Lung Cancer Caused by Long-Term Asbestos Exposure

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Objectives: To report a case of lung cancer caused by long-term asbestos exposure in a shipyard.

Methods: We evaluated chest X-ray, pulmonary function test, and chest CT and analyzed asbestos concentration in the lung tissue and bulk sample from the workplace. We also performed a workplace survey.

Results: The patient had worked at the shipyard for 31 years. The biopsy samples were processed to determine the asbestos content in the lung tissue and bulk sample using a transmission electron microscope (TEM) equipped with an energy dispersive X-ray analyzer (EDX). The TEM-EDX analysis revealed many asbestos fibers, the majority of which were amosite. In addition, the concentration asbestos fibers in the workplace exceeded the occupational exposure limits of asbestos.

Conclusions: Our findings strongly suggest that this patient's lung cancer was related to the long-term asbestos exposure.

Key Words: Lung cancer, Asbestos, Shipyard

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* 2003 () .

: (, 55)

:

: 1973 4 1

가

2003 2 6

() 3a (NSCIC, Adenocarcinoma stage a)' 2003 3 14

, 2003 4 28 5 28

. 2003 4 06

1970

“ ”

가

1990

가

: 1/3 15

3

가

, 1 2 , 30

, 30 15 가 가 (LaDou, 2003).

. 3

가

: 1973 4 1

2003 3 12

31 8

가

71

1970 1980

가

1995), 1994 (1993 (, 1994) (gasket)

가

30

가

가

가
 : (Pulmonary Function
 Test)
 (Simple chest x-ray)

(Fig. 1) (Chest
 CT)
 (Fig. 2a) (Fig. 2b).
 (Adenocarcinoma, moderately
 differentiated) (Fig. 3)
 가 (Fig. 4)
 :
 2003
 8 4 8 8 5
 08:30 ~ 16:30 7



Fig. 1. Chest PA shows a small nodular lesion in right lower lung.

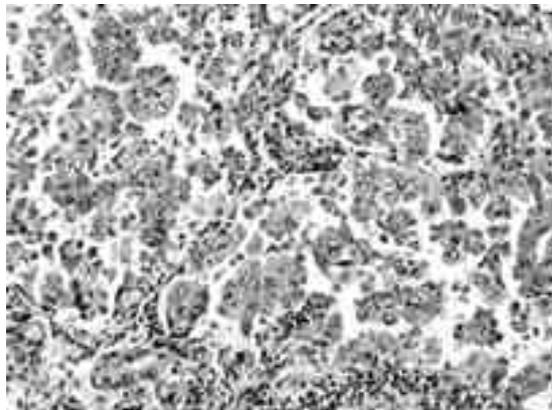


Fig. 3. The lung shows a moderately differentiated adenocarcinoma (x 200, H&E stain).



Fig. 2. Contrast-enhanced chest CT scans show a nodular lesion with lobulated margin(A) and pleural thickening(B) in right lower lobe.

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(Rion, Quest, Larson Davis)
 (Rion NL-05, B&K)
 { : 90 dB(A)} 85.4 dB(A)
 (Gilian Gil-Air RCMF, MSA
 Escort Pump, MSA Gemini Twin Port
 Sampler) (:
 5 mg/m³ 33.792 mg/m³
 (: 0.1 /cc)
 1.423 /cc
 (: 1 mg/m³) 0.3038 mg/m³, (:
 : 5 mg/m³) 3.2072 mg/m³
 (Table 1).

(Lung sample)
 Polycarbonate
 filter filter
 (grid) chloro
 form vapor filter
 (Bulk sample)
 Poly carbonate filter
 (grid) chloroform vapor filter
 X- {STEM(Scanning Transmission
 Electron Microscope)-EDS (Energy Dispersive
 X-ray Spectrometer)}

H&E

(Asbestos body)가

X-

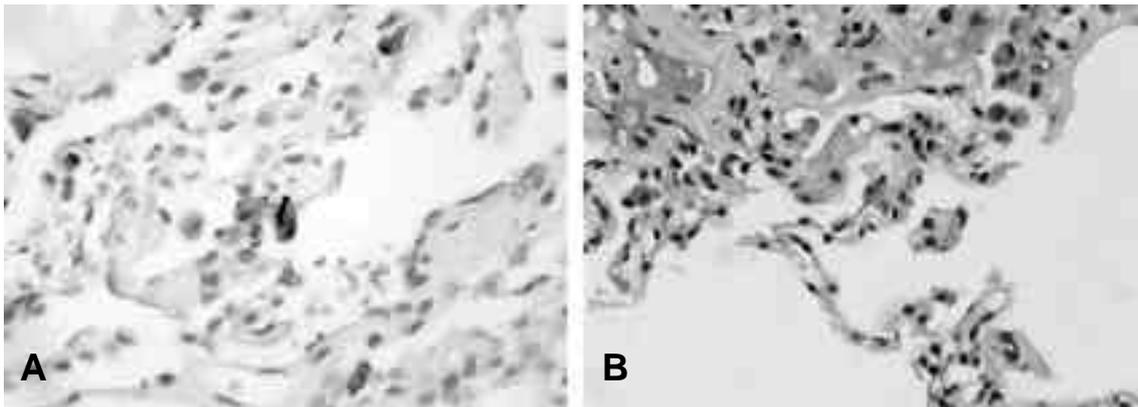


Fig. 4. (A) An iron-coated, beaded asbestos body is seen in the alveoli (× 400, Iron stain). (B) Section shows an asbestos body in the interstitium. The asbestos body is characterized by a clear central core surrounded by a golden yellow coating with beaded pattern and terminal bulb (× 400, H&E stain).

Table 1. 가

	()			
85.4 dB (A)	33.792 mg/m ³	0.3038 mg/m ³	3.2072 mg/m ³	1.423 /cc

(International Agency for Research on Cancer, IARC) Group 1()

100%
3가 가
0.31×10⁶ /g()
1 0.08x
10⁶ , 0.20×10⁶ , 0.03×10⁶
(Table 2).

가

(Asbestosis), (Lung cancer), (Mesothelioma),
(Wagner , 1960; McDonald, 1990; McDonald , 1993; Hunting , 1998; Kamp , 2001; Lee, 2001a)가

(, 2002).

가

1.52(Quinn , 1987)

가 (American Conference of Governmental Industrial Hygienists, ACGIH) (A1:

, 20~30

)

가

가

Table 2.

1			
2		-	-
3		-	-
4			576.2 × 10 ⁶ /g
5			
6			90%
7			
8			90%
9			
10		-	-
11			90%
12		-	-
13	()		84,000 /g() 198,000 /g() 28,000 /g()

가
 1994
 2000 가
 4 (,
 2001) 2001 13
 가
 가
 (, 2001)가
 (Ahn , 1997; Lee
 , 2001a)
 (Bellmann , 2000;
 Bernstein , 2003; Bernstein , 2004).
 가
 (Miller , 1996; Chang , 2002). 가
 (Henderson , 가
 1997) 가
 Ross(2003) (Churg, 1982).
 50% 1.423 /cc
 1993
 1994 7
 (, 1995)
 가 0.01~0.02 /cc
 (Yu , 1998) 0.31×10^6
 10^6 /g()
 가 가
 1 1.26x10⁶, 가 0.1 /cc
 7.7x10⁶
 가 71x10⁶ 2003 7 1
 1 8 2 /
 (Churg, 1982; Donaldson , 1993; Cullen , cc, 0.5 /cc, 0.2 /cc,
 1997). 2 /cc
 0.1 /cc
 가 0.23×10^6 /g()
 1
 가
 가

가 (Kipen , 1987;
(McFadden , 1986; Wagner , 1988).
Kamp , 2001),

50 ~ 100 (Last
, 1992)
, 3

15 가
가

가
, 가
10 ~ 15
가

(Henderson , 1997)
20 5
139

20 23%,
가
1. 31 15 4 ~ 6%

2. 2% (가
가 , 1995).

가

3. 가

4. 가
가 : 30
1

, 5. :
가 ,

31

(opacities) 가
- X-

- 1990
2001;13(4):351-9.
2002-2 .
- 가 1 .
1995;48(4):526-30.
- 1995;7(1):46-57.
- 1 1 .
2001;8:148-56.
- 1 .
1994;41(6):651-7.
- Ahn CS, Kim SJ, Oh SJ, Park KJ, Kim HJ. Pulmonary asbestosis: radiologic-pathologic brief report. *Yonsei Med J* 1997;38(5):323-6.
- Bellmann B, Creutzenberg O, Dasenbrock C, Ernst H, Pohlmann G. Inhalation tolerance study for p-aramid respirable fiber-shaped particulates (RFP) in rats. *Toxicol Sci* 2000;54(1):237-50.
- Bernstein DM, Chevalier J, Smith P. Comparison of Calidria chrysotile asbestos to pure tremolite: inhalation biopersistence and histopathology following short-term exposure. *Inhal Toxicol* 2003;15(14):1387-419.
- Bernstein DM, Rogers R, Smith P. The biopersistence of Canadian chrysotile asbestos following inhalation. *Inhal Toxicol* 2003;15(13):1247-74. Erratum in: *Inhal Toxicol* 2004;16(1):67.
- Chang HK, Lee YH, Sakai K, Hisanaga N, Chung YH. Case report of asbestos exposure-related lung carcinoma. *J Toxicol Pub Health* 2002;18(1):43-6.
- Churg A. Fiber counting and analysis in the diagnosis of asbestos-related disease. *Hum Pathol* 1982;13(4):381-92.
- Cullen RT, Miller BG, Davis JM, Brown DM, Donaldson K. Short-term inhalation and in vitro tests as predictors of fiber pathogenicity. *Environ Health Perspect* 1997;105(Suppl 5):1235-40.
- Donaldson K, Miller BG, Sara E, Slight J, Brown RC. Asbestos fiber length-dependent detachment injury to alveolar epithelial cells in vitro : role of a fibronectin-binding receptor. *Int J Exp Pathol* 1993;74(3):243-50.
- Henderson D, Rantanen J, Barnhart S, Dement J, et al. Asbestos, asbestosis and cancer: the Helsinki criteria for diagnosis and attribution. *Scand J Work Environ Health* 1997;23:311-6.
- Hunting K, Anderson J. Association of Occupational and Environmental Clinics, Summary of AOEC database case reports: 1994-1996. Washington, DC:1998.
- Kamp DW, Srinivasan M, Weitzman SA. Cigarette smoke and asbestos activate poly-ADP-ribose polymerase in alveolar epithelial cells. *J Investig Med* 2001;49(1):68-76.
- Kipen HM, Lillis R, Suzuki Y, Valciukas JA, Selikoff IJ. Pulmonary fibrosis in asbestos insulation workers with lung cancer: a radiological and histopathological evaluation. *Br J Ind Med* 1987;44(2):96-100.
- LaDou J. Occupational lung disease. In: *Current Occupational and Environmental Medicine*. third Edition. McGraw Hill, New York, 2003. pp 343.
- Last JM, Wallace RB. Asbestos and other fibers. In: *Maxcy-Rosenau-Last Public Health & Preventive Medicine*. 13th ed. Appleton & Lange, East Norwalk, 1992. pp 343-64.
- Lee PN. Relation between exposure to asbestos and smoking jointly and the risk of lung cancer. *Occup Environ Med* 2001a;58(3):145-53.
- Lee YH, Chang HK, Sakai K, Hisanaga N, Chung YH. Case report of asbestosis. *J Toxicol Pub Health* 2001b;17(3):163-5.
- McDonald JC. Cancer risks due to asbestos and man-made fibers. *Recent Results Cancer Res* 1990;120:122-33.
- McDonald JC, Liddell FD, Dufresne A, McDonald AD. The 1891-1920 birth cohort of Quebec

- chrysotile miners and millers: mortality 1976-88. *Br J Ind Med* 1993c;50(12):1073-81.
- McFadden D, Wright J, Wiggs B, Churg A. Cigarette smoke increases the penetration of asbestos fibers into airway walls. *Am J Pathol* 1986;123(1):95-9.
- Miller BH, Rosado-de-Christenson ML, Mason AC, Fleming MV, White CC. From the archives of the AFIP. Malignant pleural mesothelioma: radiologic-pathologic correlation. *Radiographics* 1996;16(3):613-44.
- Quinn MM, Kriebel D, Buiatti E, Paci E, Sini S. An Asbestos hazard in the reprocessed textile industry, *Am J Ind Med* 1987;11(3):255-66.
- Ross RM. The clinical diagnosis of asbestosis in this century requires more than a chest radiograph. *Chest* 2003;124(3):1120-8.
- Yu IJ, Moon YH, Sakai K, Hisanaga N, Park JD. Asbestos and non-asbestos fiber content in lungs of Korean subjects with no known occupational asbestos exposure history. *Environ Int* 1998;24:293-300.
- Wagner JC, Newhouse ML, Corrin B, Rossiter CE, Griffiths DM. Correlation between fibre content of the lung and disease in east London asbestos factory workers. *Br J Ind Med* 1988;45(5):305-8.
- Wagner JC, Sleggs CA, Marchand P. Diffuse pleural mesothelioma and asbestos exposure in the North Western Cape Province. *Brit J Ind Med* 1960;17:260-71.