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Outbreak of silicosis in Israel

Dr. Luba Pushnoy
Safety and Health Administration
Israel
Bilbao, January 28, 2015



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Artificial marble stone





193 reported cases of silicosis between 2009-2014.

Most from small size enterprises processing artificial stone.

Approximately 3000 workers in this sector.

Is this a new type of silicosis?

Diagnostic criteria of silicosis

1. Occupational history of exposure to silica dust:
 - a) Minimum intensity of exposure: above 0.05 mg/m³.
 - b) Minimum duration of exposure: 5 years (2 years in accelerated disease).
2. Abnormal chest x-ray (or chest CT scan) consistent with silicosis: bilateral, multiple rounded opacities in the upper zones that may conglomerate in advanced disease.
3. Medical evaluation to exclude other possible causes of abnormal chest x-ray.
4. Pulmonary function tests: restrictive pattern in advanced disease.
5. Lung biopsy indicated only when other diagnoses are being considered.
6. Tissue silica content.

Characteristics of cases

Main types of silicosis:

1. Chronic silicosis (classical simple silicosis) typically appears 20 to 40 years after initial exposure.
2. Accelerated silicosis, characterized by earlier onset and more rapid progression of severe disease.
3. Cases of progressive massive fibrosis.
4. Extrapulmonary silicosis.
5. Shorter latent period.

Years of exposure to silica dust in marble workshops of 113 workers with silicosis (reported in 2012-2014)

<i>Years of exposure to silica dust in marble workshop</i>	<i>Number of workers (%)</i>
Less than 10 years <i>Less than 6 years</i>	41 (36 %) 24 (21%)
10-19 years	30 (27%)
≥ 20 years	42 (37%)

Case of extrapulmonary silicosis

Case report

45 old male
16 years occupational exposure to
silica dust as artificial marble stone
worker: cutting and polishing
Rheumatoid arthritis
Smoking history - 15 years.
Persistent cough , fever,
weight loss.

Lung function test

Parameter	Pred.	Act.	% pred
<u>Flow-volume</u>			
FVC	4.51	1.86	41
FEV1	3.69	1.53	41
<u>Body plethysmography</u>			
TGV	3.39	1.81	54
TLC	6.82	3.02	44
CO- Diffusion	30.91	12.12	39
ml/min/mmHg			

Case of extrapulmonary silicosis (continue)

Clinical picture: thoracic silicosis with extrathoracic lymph nodes enlargement (cervical, mesenteric, retroperitoneal lymph nodes)

Open lung biopsy suspected **B cell lymphoma**

- ❖ 6 courses of R-CHOP
- ❖ Worsening dyspnea , Hypoxemia
- ❖ Biopsy revision: Hyalinizing necrotizing granuloma
- ❖ **Diagnosis: Silicosis , PMF**
- ❖ Referred for lung transplantation



Prevalence of lung transplantation for Silicosis in Israel

The frequency of lung transplantation for silicosis in Israel is extremely high and increasing in the last 5 years:

Israel: 16 out of 475 lung transplantations between 1997-2012 (4%)

ISHLT: 50 out of 24,090 – (0.02%)

Chest. 2012 Aug;142(2):419-24.

Artificial stone silicosis :disease resurgence among artificial stone workers.

Kramer MR¹, Blanc PD, Fireman E, Amital A, Guber A, Rhahman NA, Shitrit D.

This is report about unusually high incidence of advanced, life threatening silicosis linked to a specific engineered product with high silica content.

RESULTS:

During the 14-year study period (1997-2010), 25 patients with silicosis were referred for evaluation, including 10 patients who went on to undergo LTX. All patients were exposed by dry cutting a relatively new, artificial, decorative stone product with high crystalline silica content used primarily for kitchen countertops and bathroom fixtures. The patients had moderate-to-severe restrictive lung disease. Two patients developed progressive massive fibrosis; none manifested acute silicosis (silicoproteinosis). Three patients died during follow-up, without LTX.

CONCLUSIONS:

The incidence of silicosis-related lung transplantation in Israel is higher than expected: 0.68 silicosis cases would have been expected instead of the 10 observed (incidence ratio, 14.6; 95% CI, 7.02-26.8).

This outbreak of end-stage silicosis leading to lung transplantation caused by dust generated through dry cutting of engineered decorative stone with very high silica content



Comorbidity of artificial stone silicosis and autoimmune rheumatologic diseases

The new silicosis outbreak carries within an outbreak of autoimmune diseases.

It is associated with multiple distinct rheumatologic entities.

Silica associated autoimmune disease does not differ in clinical presentation from non-silica associated disease.



Autoimmune rheumatologic diseases in patients with silicosis referred to lung transplantation center

9 cases of autoimmune rheumatologic disease were observed among a cohort of 42 patients with silicosis referred to lung transplantation center over a 10-year period.

1. Four cases with Systemic Sclerosis
2. Two cases with mixed connective tissue disease
3. One case with Rheumatoid Arthritis
4. One case with Sjogren's syndrome
5. One case of anti JO-1 dermatomyositis



Recommendations

Persons with artificial stone silicosis:

to search for autoimmune manifestations.

Patients with autoimmune rheumatological disease:

a full occupational history addressing potential silica exposure is needed.

Recent research: a novel monitoring to detect workers at risk for developing of silicosis

Prof. Elizabeth Fireman and a team of researchers from Laboratory of Pulmonary and Allergic Diseases, Tel Aviv Medical Center, Sackler School of Medicine, Tel Aviv University.

Quantitative assessment of pulmonary silica dust content in workers exposed to artificial stone dust as a tool for biological monitoring.

Study purpose: to develop a methodology for surveillance and monitoring of workers exposed to artificial stone dust using biological monitoring.

Study population: 100 exposed artificial stone workers compared to 50 individuals free of occupational exposure.

Methods: occupational questionnaires were fulfilled by all exposed participants

- Pulmonary function tests (PFT)

- Induced Sputum (IS)

- Exhale breath condensate (EBC)

- Quantitative silica content analysis was performed using XRF (X Ray Fluorescence) analyzer

Biological monitoring of study population was carried out by quantitative silica content analysis in IS and in EBC, analyzing particles size and neutrophils count in IS and by pulmonary function testing.

Preliminary results of the study

1. PFT performed in all marble workers were significantly lower compared to control group.
2. Sputum neutrophils were elevated in study group compared to control group showing significant neutrophilic inflammation.
3. Analysis of particles size in induced sputum showed high percent of $<5 \mu$ particles.
4. EBC samples contained measurable levels of silica compared to control group that had no detectable silica.

The correlation was found:

1. Between accumulation of $<5 \mu$ particles and elevated neutrophils in induced sputum (positive correlation).
2. Between accumulation $<5 \mu$ particles and impairment in PFT (negative correlation).

This study is a step for use of induced sputum analysis as biomonitoring method in the surveillance of exposed to silica dust workers.

Repeated IS sampling may be useful to detect the disease progression(from subclinical form of silicosis to clinical form).



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Thank you for your attention