Stannosis Occurred by Tin Plating: Case Report

Kalaycıda Gelişen Bir Stannozis Olgusu

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ABSTRACT Stannosis is a type of pneumoconiosis that results from the inhalation of tin in the form of tin oxide (SnO_2) fumes or dust. A 63 years old man making tin-plating for 56 years had symptoms of dyspnea and cough. His SaO2 was 88 percent. There were moderately profused small nodules on chest x-ray and most of them were metallic in density. Since stannosis is rarely seen in tin-platers with demonstrative HRCT findings; this case is presented. Tin plating is a very rare occupation nowadays and it is important to recognize the condition and to avoid unnecessary invasive diagnostic procedures.

Key Words: Stannosis, tin, tin-plater

ÖZET Stannozis, kalay oksit (SnO_2) işlenmesinde ortaya çıkan gazların veya tozların akciğerde birikmesiyle ortaya çıkan bir pnömokonyoz tipidir. Nefes darlığı ve öksürük yakınmasyla başvuran 63 yaşındaki olgu 56 yıldan beri kalaycılık yapmaktaydı. Oksijen satürasyonu %88 bulunan olgunun akciğer grafisinde her iki taraflı yaygın metalik dansitede küçük çaplı nodüler görüntüler saptandı. Tipik akciğer YRBT bulguları olan stannozis bu işle uğraşanlarda nadirdir. Kalaycılık günümüzde artık fazla yapılmayan bir mesleksel uğraşdır. Ancak kalaycılık yapanlarda stannozis gelişebileceğinin bilinmesi bu hastalara gereksiz invaziv tanı girişimlerinin yapılmasını önleyecektir.

Anahtar Kelimeler: Stannozis, kalay, kalaycılık

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Tin is a soft and malleable metal. It is used to make brasses, bronzes and babbitts and in soft solders.[1] Exposure to tin occurs during mining, smelting, refining and in production and use of tin alloys and solders.[1] An important use of tin is providing a protective coating for metals, particularly in the food and beverage canning industry, roofing tiles, silverwares, coated wire, household utensils, electronic components and pistons.[2] Tin is used for solder, fillers in automobile bodies, castings for hydraulic brake parts, aircraftblanding gear and engine parts. Organic and inorganic compounds are used in the production of drill-glass ceramic, porcelain, enamel, glass and inks. They are also used as a mordant in production of fungusides, antihelmintics and insecticides. Stannosis chloride is used in the chemical industry as a reducing agent. Tin oxide is used as an

opacifier in ceramic enamels, as a ceramic color, as an abrasive and as a coating for conductive glass.[3]

Tin-plating is a rare cause of stannosis. Best of our knowledge there are only two reported cases of stannosis in tin-platers in the English literature. Tin-platers are mostly romans and this kind of job is becoming rarer nowadays. The case is a tin-plater doing this job for 56 years and have some typical radiological findings of stannosis.

CASE REPORT

A 63 year old man presented with a year history of nonproductive cough and increasing dyspnea. He has been a tin plater for 56 years. He started the work with his father first. He has been using tin on ornament things, pots and pans making and saucepan stannosing without using mask. He was a nonsmoker. On physical examination he had a blood pressure of 110/60 mmHg, a pulse of 76 beats /min. The body temperature was normal. On auscultation of lungs there were bilaterally inspiratory ralles in both middle and lower zones. On laboratory examination complete blood count, biochemistry, urinary tests, ANA, anti dsDNA and RF were normal. PPD testing was 5 mm in diameter. Also blood and urinary calcium levels, blood ACE level, x-ray of hand-ankle, bilateral eye examinations were normal. Only CRP was high. An arterial blood gase analysis revealed a PaO_2 of 59 mmHg, a $PaCO_2$ of 42.1 mmHg, Sa O_2 of 88 % and a pH of 7.38. On pulmonary function tests FVC: 34%, FEV1: 43%, FEV1/FVC: 102, FEF_{25-75}: 76% was recorded. Chest radiography showed bilateral diffuse reticulonodulary infiltrations (Figure 1). On high resolution computerized tomography (HRCT) imaging of chest there were reticulonodulary infiltration areas, peribronchial thickenings and ill defined areas of ground glass opacities (Figure 2). We diagnosed patient as stannosis especially with own history and radiographic imaging. After the diagnosis we have treated the patient symptomatically and warned about getting away from his occupation.

DISCUSSION

Stannosis is a rare pneumoconiosis which develops after heavy or prolonged exposure to tin oxide.[4]

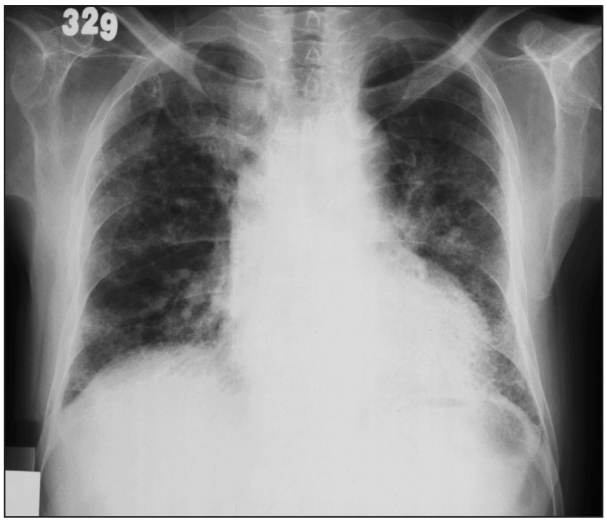

FIGURE 1: Chest x-ray imaging of the patient; bilateral diffuse reticulonodulary infiltrations.

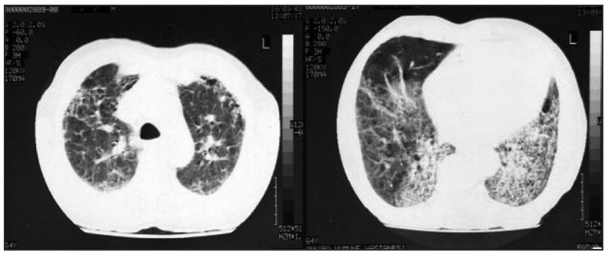

FIGURE 2: HRCT imaging of the patient; reticulonodulary infiltration areas, diffuse nodulations, peribronchial thickenings and ill defined areas of ground glass opacities.

It was first described by Beintker in 1944 as a benign pneumoconiosis.[5] Stannosis seems to be an uncommon cause of pneumoconiosis with only approximately 200 recorded cases.[6] The relative importance of exposure to tin fumes in the etiology of this disorder was emphasized by Dundon and Hughes.[7] The significance of the quantity of dust and the duration of exposure were stressed by Robertson and Whitaker.[6] Bartak et al reported a stannosis case in a workman who had suffered from asthma for many years and who attended a furnace in which metallic tin was burnt to produce tin oxide. Necropsy of this man, who died from gastric carcinoma, revealed deposits of tin oxide in the lungs, lymph glands, liver and spleen. Six other workmen with a similar radiographic appearance of the lungs did not have any symptoms of asthma or signs of pulmonary disfunction. Similar radiological findings were reported by Cutter et al in two

cases with nodules 1-2 mm in diameter unaccompanied by evidence of pulmonary disfunction. Both had been working in a tin recovery department for 20 years.[6] Occupations in which exposure to tin may occur include; babbit makers (tin-copper), Britannia metal workers (tin-copper-antimony), tinners (tinsmith), dye workers, pewter makers, herth tinners, brass founders (copper and zinc), bronze founders (tin-copper), fungucid workers, pigment workers, solder makers, type metal makers (lead-antimony tin), tin miners and scrap metal recovery plant operators. The amount of tin in crude ore is so small that mining procedures involving drilling and loading of ore do not cause stannosis. The silica in the dust, however, may cause silicosis.[3] Tin dust and fumes are generated when emptying bags of crude ore.[1] In fact the fume of tin oxide is concidered to be a more important source of stannosis than the dust, also we have to consider the quality of the dust and the duration of exposure. Dundon and Huges suggested that tin fumes were a more important source of exposure than tin oxide dust.[1,7]

The case we presented was a tinner and he has done this work since 7 years old, for about 56 years. He started the work with his father first. He was melting tin crubs and mixing it with amonium chlorure over fine place and then put this compound over the copper plates or other copper household utensils. During this procedure fume including tin oxide was produced. He was not wearing any mask or not protecting himself in any way. Although some textbooks mention tin plating as a source of fume with tin oxide and as a kind of occupation causing stannosis, according to best of our knowledge there was no regarded case of stannosis happened in a tin-plater in English literature. The National Institute for Occupational Safety and Health (NIOSH) has established a recommended exposure limit for tin oxide (as Sn) of 2 milligrams per cubic meter (mg/m^3) of air as a time-weighted average (TWA) for up to a 10-hour workday and a 40-hour workweek.[8]

On pathological microscopic examination of stannosis lung tissue macrophages containing dust particles are deposited within alveolar walls, around vessels and bronchioles and beneath the pleural surface. The dust particles also accumulate in hilar lymph nodes.[3] Generally massive fibrosis doesn't occur. Tin oxide crystals are strongly birefringent. There is a good correlation between the quantity of tin in the lung and x-ray changes. Tin concentrations in lung tissue in stannosis cases have been reported to range between 0.5 and 3.3 gr per lung, in cases where duration of exposure has been 11 and 50 years.[1]

Generally there may be no symptoms or abnormal findings on physical examination. But if exposure duration is long especially over 20 years, patients can have pulmonary symptoms.[6] Yılmaz et al presented two cases in 2009 as stannosis. Both cases had a long time oocupation of tin plating (Respectively 40 years, 33 years). The thorax CT findings of these cases are similar to our case's findings. These cases had respiratory failure.[9] The present case had respiratory failure too. If there is, shortness of the breath is the first symptom and a nonproductive cough comes next. In our case, the patient had dyspnea symptom and on physical examination there were bilaterally inspiratory ralles on both middle and lower zones. On pulmonary function test restrictive pattern was present and in arterial blood gase examination there was hypoxemia.

On chest x-ray numerous very dense opacities with a more irregular shape and kerley-B lines which represent deposition of dust in the interlobular septa may be seen. Progression or clearing does not occur after cessation of exposure.[7,10]

The best treatment of stannosis is simply to get away from the dust and the best remedy is prevention by the use of face masks, piping clean air into a closed hood over the workers head and wetting down the materials before they are worked on. To recognize this condition in a tin-plater is important to avoid from unnecessary invasive diagnostic procedures. We presented this case since it is unusual to see stannosis in a tin-plater.

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