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JMEA 4420

ASBESTOSIS WITH INSULATION WORKERS

by

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Three ill persons were referred to the clinic within the last three months with a chronic, therapy-resisting bronchitis. The treating physicians, as could be seen from the referral letters, etiologically only thought of the pressure of a virus infection and the possibility of a special excessive sensitivity. No attention was paid to and therefore no corresponding examinations were made, however, as this is shown by the following medical histories, concerning the very important question, whether and to what extent the pulmonary changes could be caused by effects, which are possible in the profession of the sick person.

1. The patient, age 55: At the beginning of October, 1958, illness in the form of a flu-like infection with high fever. No real decrease in temperature, but appearance of bronchial pneumonia with high temperature, which decreased with the giving of penicillin, but the (blood test?) remained high (40/80 mm). Neither the cough nor the expectoration decreased.

   Diagnosis: weight 52, 3kg, height 162,5 in, temperature without diagnosis, BSG(?) 60/79 mm, RR 160/100 mm, drumstick (?) fingers and toes. Rigid chest *with deep inhalation and exhalation only 2 cc difference (?) in circumference), the borders of the lungs can only be moved slightly on both sides, lessening (?) of sound above the right lower area (?) of the lung. Moist, resonant Rg (?) of small (foamy) bubbles above both lower areas of the lung. Vital capacity 2000. X-ray thorax (fig.1)(?): stringy-indurative shadows in both lower areas of the lung, which come together as homogenous cloudy areas. Deposit of indistinctly (?) outlined centers (areas) of five spots. In-homogenous concentrations in the right (?) upper area. On the right pleural effusion. Punctioring of the effusion results in sanguive olent exudate, many eosinopbile cells, no proven tumor cells. 10 ccm sputum daily, in which asbestosis particles can be shown.

   Job anamnesis: Employed from 1928-1945 and from 1954 til now as insulation worker with a Kiel shipyard, so that patient worked for about 21 years with material containing asbestos. Further produced himself asbestos mattresses from 1928-1931, during which considerable dust developed. Has worked since 1931 actually only with finished processed asbestos cloth. Dust develops here also due to the cutting, putting on of asbestos mats, armatures, valves, sewing, removal of old asbestos mats, repairs etc.

2. H. H., age: 48: for many years tendency to bronchial catarrhs.

Frequent chest pains. Increasing shortness of breath. Persistent cough. Discharge of mostly clear (glassy), occasionally also yellowish sputum. In 1954 Billroth II - operation due to chronical stomach problems subsequent embolism & pueumonia. Removal of polyp from the larynx 6 months ago due to hoarseness.
Diagnosis: weight 63.4 kg, height 170 cm. temperature without diagnosis, BSG with treating doctor 40/75 mm., Hint of watdiglass nails. The lung borders can be moved (adjusted) sufficiently. Difference in circumference between deep inhalation & exhalation: 7cm., (?) percutoric without diagnosis, during auscultation dry, not resonant sounds on both lungs. Vital capacity 2500 ccm. on both lungs. Vital capacity 2500 ccm. x-ray thorax (fig. 2): slightly increased appearance (outline) in the right lower area of the lung, that is the basis of the center lobe & the auterior lower lobe segment. Only small amount of sputum (expectoration), in which asbestos particles were shown.

Job ananuesis: Has worked as insulation worker constantly with asbestos since 1933 with the exception of 3 war years. On his job H. had to fasten the mostly finished asbestos mats an boiler pipes, armatures on a local shipyard for new ship construction & repairs on ships. Occasionally also with repair work mattresses were stuffed and cut. Dust develops constantly at the place of work & in the shop.

3. G. L. age: 38, shortness of breath for 2 years, cough with viscous clear (glassy) sputum, occasional pains on the right chest side & weakness. In his youth always healthy, except for mumps & tonsillitis. Increase of difficulties (complaints) during the last 6 months. Diagnosis: weight 71 kg, height 171 cm, temperature without diagnosis. BSG 3/8 mm Drumstick fingers & watch glass nails. Thorax configurated normally. Lungborders can (?) be moved less on the left than on the right. Difference with maximum inhalation and exhalation: 10 cm; percutoric: without diagnosis. Over both lower areas of the lung medium (?) bubbly, moist, resonaut rustling noise. Further & humming on the entire lung. Vital capacity: 2300 ccm. X-ray thorax (fig. 3). Roughly striped outline of the lung in the center areas, especially on the left with inhomogeneous clouding. On the right, hump in diaphragm. On both sides diaphragm adhesions with parietal, lamellar pleura schw . Pain with pressure on left sinus. Hoarseness. Only small amounts of sputum. No tubercular bacilli in sputum, plenty of eosinophile cells and asbestos particles can be proven.

Job anamnesis: G. L. has worked since 1936 as insulation worker. Before the war he worked in Brannsdiweig only with glass wool & gypsum. 1939 - 1946 military service. After the war he worked at first in Kiel in the same manner as earlier. Since 1949 he has to put finished asbestos mats on armatures & valves and sew asbestos cloth onto pipes on the local shipyard. With this, quite considerable dust develops.

With all three ill persons the subjective symptoms of lung fibrosis existed, i.e. coughing with mucus discharge (expectoration), sharp and dull chest pains, shortness of breath. With the second ill person also anorexy existed, however in 1954 due to a recidivous ulcer a stomach resection was performed, so that it could not be clarified whether there might be a lack of appetite due to the chronical stomach trouble. It has been pointed out by many observers that the anorexy & the cadiexia, which are noticeable at first, draw the attention to an abdominal problem, since the x-rays frequently only show little lung fibrosis. The essential finding for a diagnosis of asbestosis is the proof of asbestosis particles in the sputum. The asbestosis particles mostly are brownish formations, which have a considerable variety of size & shape. Most often one observes a longitudinal shape with ends which are thicker in the shape of spheres or clubs. Sometimes one sees segmentations. The asbestosis particles occur in the organism due to asbestos needles penentrating into the lung tissue and then being surrounded by organic material contiaining iron. They are proven by adding to the sputum the same amount of antiformin, centrifuguing it and one then looks at the sediment under the microscope (fig. 4) The fact that the asbestosis particles due to their iron contents, result in the Berlin blue reaction with ferricyankali & hydrochloric acid, makes their detection easier. Fahr found them already in 1914 in the lung of a dead asbestos worker. The significance of this finding however was recognized only, when 15 years later the asbestosis particles were also found in the sputum. According to Bohue "the asbestosis particles mean the same for the asbestosis as the assumption however, other authors point out that the proof of asbestosis particles at first is only a sign that an inhalation of dust took place, but does not justify in itself a diagnosis of lungfibrosis. When real asbestosis is present, they can almost always be proven with sufficient amounts sputum (expectorotion) sputum & correspondingly exact examination, but one cannot draw any conclusions from their presence concerning the severity of the illness.

According to the offical memorandum concerning the lung diseases due to asbestos dust "the asbestosis is only detected with difficulty with x-rays - especially in its first stage. The di in the lung, which can be seen with x-rays, are much less apparent compared to silicosis." In many works (papers) the striking discrepancy is pointed out repeatedly between clinical symptoms & x-ray results & it is emphasised that the x-ray picture alone cannot be considered the criteria for the presence or absence of asbestosis. With the beginning asbestosis one finds on the x-rays a stronger outline of the lung, uncharacteristic veiling, which look like a net, which extends from the hilus to the base of the lung. With the actual asbestosis the typical x-rays show mainly in the lower areas of the lung cloudy "steamlike vapors," strip-like

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shadowing or diffuse clouding, which look like "frosted glass."

Typical lung changes on the x-rays - stringy shadows & cloudy darkening in the lower areas of the lungs - existed only with the 55 year old patient with the hemorrhagic pleura effusion, right side which patient had worked for 23 years with asbestos material. We were successful in obtaining earlier x-rays of this patient for comparison of the findings. As can be seen from the file card of the x-ray examination office, there was nothing alarming, in 1951 with P. After sending our present x-ray findings, the x-ray examination office informed us "In 1951, it is striking however, to see the increased outline, (?) on both sides, perihiler (?), especially in the right central lower part." On an x-ray taken about a year later, the increased (stronger) lung outline was clearly noticeable in the area of both lung halves, (?) especially para?hiler & in the right lower area. Further, already at this time, there existed a pleural shadow. During 8 years, therefore, the characteristic x-ray findings pointing to asbestosis became more & more distinct. With the 48 year old insulation worker, with which the treating doctor thought of a neoplasma due to anorexia & the weight loss, only at the basis of the central lobe and in the auterior lower lobe segment a slightly increased outline existed, even though this patient was occupied in his profession for 21 years, with the 38 year old insulation worker, who worked for 10 years with asbestos material, aside from the roughly striped outlines in the central areas an inhomogenous clouding on the left & pleural (?) (thick sleius) schwarteu were noticed. A lung fibrosis, which could be identified by x-rays with increasing changes, therefore existed only with the 55 year-old insulation worker. Based on the clinical findings made by us with the 3 insulation workers, we too must point out again that the x-ray examination alone (see x-ray finding 1951) is not sufficient to find a beginning asbestosis on time. This is due to the fact that with the usual x-ray examination methods, which again & again is not considered enough, mostly the change of the substratum, but not primarily the functional distrurbance of the organ is recognised. The disturbance of the function, however, is certainly the first sign, i.e. the early symptom, of the asbestosis caused by the inhalation of asbestos dust. Also with obstructive lung emphysema, the degree of seriousness of the illness can never be deducted from the x-ray alone. Also with it, due to the disturbance of the ventilation, i.e. secundarily, changes of the lung structure occur, which then make up with the x-rays the "x-ray signs" (symptoms) pf the presence of emphysema.

The three insulation workers, observed by us, complained as already mentioned, of coughing, mucus expectoration,

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sharp & dull chest pains & shortness of breath. Then finding asbestosis particles in the sputum, one could find with all three that they are exposed to the inhalation of asbestos dust & from the lung function examination, whose result was collected in the chart, it resulted that their vital capacity was reduced.

The difference of the nominal value of the vital capacity was figured based on the formulas of Baldwin & Co-workers. The boundary value for breathing was determined with the open method, the exception from the norm was determined according to the "sliding standard". The flow index (HERT2) was calculated form the boundary value for breathing and the calculated maximum volume of breathing per minute. The arterial oxygen saturation (So2a) & the CO2 contents (co2a) of the arterial blood was defined manometrically according to Van Slyke, the arterial CO 2 - tension (Pco2a) of CO 2 contents & electrometrically ineasured p H was calculated according to the equation of Henderson - Hasselbalch.

CHART: Data for the functioning of the lung of the three patients with asbestosis

NAME	AGE	VITAL CAPACITY ML	PERCENTAGE OF NORMAL VALUE	BOUNDARY VALUE OF BREATHING	PERCENTAGE OF NORMAL VALUE	FLOW INDEX	S02a	Cco2a	Pco2

See German Text

The proven decrease of the vital capacity with the three patients is the expression of restrictive ventilation disturbance. The expansion capacity of the lung is reduced due to the increased rigidity of its tissue, so that the elastic resistance of the lung has increased. The pleural changes in the 55 + 38 year old patients are not so extensive that the restriction of the vital capacity could be caused by them alone. With the first two patients the boundary value of the breathing is decreased according to the vital capacity. The boundary value for breathing is lower, however, with the 38 year old insulation worker than could be expected with a purely restrictive ventilation disturbance. Since with the third & youngest patient also the flow index is clearly under 1, aside from the restrictive also an obstructive ventilation disturtance exists due to the increased flow resistance in the air passages, which are "inflamed" due to the chronical brouchitis. The arterial CO 2 - tension is increased correspondingly as expression of the alveolar hypoventilation, caused by the increased endobrouchial resistance.

The disturbance of the lung functioning is greater with the three sick insulation workers than could be expected from the x-ray symptoms. Various references were made already to the striking decrease of the vital capacity & the boundary value for breathing with asbestosis.

The result of the analysis of the state of the illness present with the three insulation workers observed by us shows very impressively, that the degree of seriousness of the disturbance of the function connected with the asbestosis cannot be judged solely, on the basis of the x-ray "symptoms." The lawmaker also tries to consider this fact. Therefore, in the 5th. order (decision) of July 26, 1952, concerning the extension of accident insurance to occupational diseases, contrary to the 4th. order (decision) of 1943, the demand "difficult", by which the recognition of asbestosis as a disease liable to ideinuity was limited, is not contained in it anymore. Therefore, it says in the official reason for the 5th. order, that "the functional impairement of breathing & circulation is in the foreground of the picture of the disease anyhow earlier and already with a relatively small formation of the dianges, which can be proven with the x-ray method."

With the 38 year old insulation worker no indication was given in the medical history for the assumption that the found pleural changes are residues of an earlier pneumonia or pleurisy. Since it was also emphasised by pathological anatomists repeatedly in the last two decades that with asbestosis the pleurae often have thickened fibrous (?) areas & that the thickened layer often is as hard as cartilage, we assume that with this ill person the pleural changes, which could be seen by x-rays, also were created by asbestosis. With the 55 - year old insulation worker, with whom a sauguinolent exsudate was proven thru a pleural puncture, we feared even though there was no proof of tumor cells, the presence of an asbestosis carciuonie, since at this age the presence of sanguinolent pleural effusious always causes the suspicion of the presence of a carcinome. During the last 20 years the combination of asbestosis with the brouchial carcinome was strikingly frequent, and it was observed up to 20%. Asbestos particles were also proven in pleural tumors. Based on the publications of Nordmaun & the animal experiments of Nordmaun & sorge the lung cancer was already incorporated in the 4th. order concerning occupational diseases with asbestosis as a disease liable to indemuity. In the official reason for the 5th order, the lawmaker tries to take into consideration the diagnostic difficulties with recongnizing asbestosis by stating: "Based on the present experiences the insurance coverage (with additional lung cancer) is not to be made dependent on the assumption of an existing (apparent) state of disease of the asbestosis." The sentence: "Occupational cancer occurs with all states of the asbestos dust lung, also with cases, which during the life of the patient were not diagnosed clearly as asbestosis based on available x-rays," shows that inspite of the definition of the lawmaker many doctors still in their thinking make the presence of asbestosis dependent on the presence of x-ray "symptoms".

Since with asbestosis as well as with the other dust lung diseases, the treatment must be limited to purely symptomatic steps, the prophylactic steps & steps for occupational hygiene and their regular control are especially important. Devices for the suctioning off of the created dust and masks with colloid filters to prevent dust inhalation are above all necessary with the work, with which much dust is created, as e.g. with the stuffing of asbestos mattresses. This fact is taken into consideration in the guidelines, valid since Sept. 1950, given for fighting the danger of dust in asbestos processing companies by the Principal Association of the Trade Union . Futher it is forbidden, but not paid enough attention to, to have meals & to remain in the work areas endangered by dust during the work breaks. Neither must the streethclothing, which was taken off, be stored in the work areas. Further, the adhering dust must be cleaned at regular intervals from the work clothing, in accordance with the given rules.

If an impairment of functioning already exists, the removal of the sick person from the dusty area is definitely required, so that the effect of the asbestosis, whose prognosis is unfavorable, does not become worse due to a further exposure.

Summary

1. With three patients referred to the clinic because of a therapy - resisting, chronical bronchitis at the age of 55, 48, & 38, the presence of asbestosis was overlooked, since, in the first place, no corresponding job anamuesis was made, secondly no extensive sputum tests were made and thirdly it was not tried to clarify the disparity between the subjective symptoms & the objective finding (diagnosis by means of an exact lung function test measuring of the vital capacity etc.).

2. The three patients with the chronical bronchitis had to work for 23, 21 and 10 years in a shipyard professionally as insulation workers with asbestos containing material, whereby exposure to the inhalation of asbestos dust was given.

3. The prooving of asbestosis particles in the sputum is facilitated in that the substance, which encloses the asbestos needles, contains iron and consequently results in the Berlin blue reaction with Ferricyancali and hydrochloric acid.

4. The subjective symptoms of the lung fibrosis, which often starts very slowly, are cough, little mucus expectoration, sharp or dull chestpains, lack of appetite and shortness of breath. Contrary to these "chronic" complaints often so -called "x-ray symptoms" are lacking, from which the presence of an asbestosis could be concluded by a radiologist. The proof of asbestosis particles in the sputum is actually the sign of a dust inhalation having taken place. The assumption

of a lungfibrosis is already then given, which also was taken into consideration by the lawmaker if, as this was the case with the three mentioned patients, a considerable limitation in the function is present.

5. Brief reference is made to the relationship between asbestosis & lung cancer based on the diagnosis made with the 55 year - old insulation worker.

Note:

The last paragraph is the bibliography for this article.