

# Pleural Mesothelioma Following Unusual Exposure to Asbestos: A Cluster in the Production and Maintenance of Electric Motors for Hand Tools

A recent re-evaluation of 364 cases of malignant mesothelioma (MM) without any apparent exposure has identified or suggested a possible source of exposure in a significant proportion [1]. In 2005, we suggested producing and maintaining motor components for electric hand tools as a potential source of occupational asbestos exposure in two workers who died from pleural MM [2]. The first one was ascribed to an unknown exposure to asbestos by the classification proposed by the National Mesothelioma Register [3]. Still, the appearance of a second case suggested the need for in-depth studies on this process, which made it possible to highlight a previously ignored exposure to asbestos, confirming the occupational origin of both MM cases in the turning and grinding spare parts for power tools in a factory employing about 25 workers and operating since 1972. This led to their INAIL insurance compensation.

The two workers' jobs required the manipulation of components of electric motors – rotors – coated with an insulating phenolic resin also reinforced with chrysotile asbestos (until 1991), found in samples of the insulating material analyzed after the appearance of the second case. In the following years, the systematic epidemiological surveillance led to identifying two more cases of pleural MM: one was a worker who performed the same tasks as the previous two. Table 1 summarizes the clinical and anamnestic characteristics of the 4 cases detected up to 2020.

The judicial autopsies performed on the latter two workers (cases 3 and 4) made it possible to analyze the residual lung content of asbestos

bodies (in light microscopy, MOCF) and asbestos fibers (in scanning electron microscopy, SEM) at the ARPA Electronic Microscopy Centre in Milan with the methodology described elsewhere [4, 5]. In the third case, a total of 16,000,000 asbestos fibers/g dry tissue were found, 87% amphiboles and 11% chrysotile. In the 4th case, amphibole fibers equal 330,000 and 700 asbestos bodies/g dry tissue. For all workers, possible occupational exposure to asbestos before or after the one that occurred in this factory and non-occupational exposures were excluded; in addition, none had received chest radiotherapy.

We would like to comment on some aspects of this pleural mesothelioma cluster: (i) the death of 3 workers occurred much earlier than predictable according to the average life expectancy; (ii) the duration of asbestos exposure was short (min. four, max. seven years) in three out of four cases; (iii) four cases of pleural mesothelioma in a small cohort of workers suggest a high risk, even though part of the pieces was wetting and grinding; (iv) the lung fiber load detected in the third case is high and mainly composed of amphiboles. This result suggests a relevant cumulative exposure and is not limited to chrysotile alone, confirming that the intensity of exposure in this factory could be high, at least for the task of assembly and maintenance. Unlike turning and grinding, operations did not take place with the wetting of the machined components.

In conclusion, even the cluster of cases of pleural mesothelioma described here corroborates the fact that occupational asbestos exposure, initially thought

**Table 1.** Characteristics of malignant mesothelioma (MM) cases in four out of 25 workers from a small factory producing and maintaining motor components for electric hand tools.

ID#	Birth	Diagnosis	Death	Age	Histology	Task	From	To	Latency
1	1955	2002	2003	48	bifasic	turning and grinding	1973	1980	29 y
2	1960	2003	2005	45	epithelioid	turning and grinding	1974	1979	29 y
3	1957	2007	2010	53	bifasic	assembly and maintenance	1973	1977	34 y
4	1951	2019	2019	68	bifasic	turning and grinding	1974	2018	45 y

to be absent or improbable, can instead be defined as sure after (i) in-depth checks on the working methods and materials used and (ii) biological indicators of cumulative dose, qualitative-quantitative expression of previous exposure.

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