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Editorial/Editoriale

Cancer risks among construction workers

Rischio di cancro tra i lavoratori edili

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Summary

Numerous studies with different study designs from different parts of the world consistently show excess cancer risks in construction workers, compatible with exposures to products or agents possessing cancer risks in the different job categories. International Agency for Research on Cancer (IARC) has concluded that exposure as a painter is a group 1 carcinogen. Cement and silica dust exposures are associated with excess risks of respiratory cancers – in particular lung – but also of excess cancer of the lip, pharynx, esophagus and stomach. Asbestos exposure is shown to be associated with excess cancer of the larynx and lung and with mesotheliomas of the pleura and peritoneum among construction workers worldwide. Eur. J. Oncol., 17 (1), 5-9, 2012

Key words: **construction workers, cancer risks, materials in construction industry, asbestos**

Riassunto

Numerosi studi, con approcci diversi da diverse parti del mondo, dimostrano regolarmente un eccesso di rischi cancerogeni nei lavoratori dell'edilizia. Tale eccesso è compatibile con esposizioni a prodotti o agenti potenzialmente cancerogeni nelle diverse categorie di lavoratori. La IARC ha concluso che l'esposizione alle sostanze a cui è sottoposto un imbianchino è un cancerogeno del gruppo 1. Le esposizioni alle polveri di silice e del cemento sono associate ad un eccesso di rischio di sviluppare il cancro delle vie respiratorie, in particolare del polmone ma anche delle labbra, della faringe, dell'esofago e dello stomaco. È stato dimostrato che l'esposizione ad amianto è associata ad un eccesso di rischio di cancro alla laringe ed al polmone e di mesotelioma della pleura e del peritoneo tra i lavoratori dell'edilizia in tutto il mondo. Eur. J. Oncol., 17 (1), 5-9, 2012

Parole chiave: **lavoratori edili, rischi cancerogeni, materiali in edilizia, amianto**

Assessments of cancer risks in a specified working population should preferably start by characterizing the substances to which a specified task exposes the worker. An alternative starting point in those cases where the work site procedures or materials are more variable and less known is to study the disease pattern in such populations followed by a retrospective search for causes. A prospective cohort

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study design would increase the likelihood of identifying causes. Due to the difficult circumstances under which the construction industry works with its transient nature and continuously changing workplaces and conditions at each of them, a combination of the three will be needed to describe cancer risks among construction workers. Unfortunately a job title does not always represent identical tasks in all countries and thus cancer patterns for a specific job might differ between countries due to different exposure. Moreover, when asking a person about his/her job history often the workers themselves know very little or nothing about the products they handle except a brand name as has been shown among Swedish construction workers with mesothelioma.

Exposure

Asbestos, asphalt, cement and silica represent typical hazardous exposures for construction workers (1). Asbestos as used in insulation applications but also for reinforcement purposes in asbestos cement products, silica as released in tunnel work and rock drilling and Polycyclic Aromatic Hydrocarbons (PAHs) from coal tar based products used by roofers are classified as Group 1 carcinogens by IARC. Although the same classification for chromium 6+ mainly refers to stainless steel welding, the chromium is a constituent in cement in amounts enough to cause severe allergic reactions. Radon exposure in underground and tunnel work and diesel exhaust in truck and heavy equipment driving are additional agents occurring in construction settings on the IARC carcinogen list as is exposure to sunlight. Unfortunately, unlike in stationary industrial settings like a factory, appropriately measured and well defined exposure levels are seldom available for construction work situations.

Cancer disease

Selikoff's pioneering studies on members of the US insulators union in the 1960s showed an excess of lung cancer and mesotheliomas of the peritoneum and pleura caused by asbestos exposure (2). Later, in a number of Proportionate Mortality Ration (PMR) studies from the US in the mid 1980s, 15-20% excess rates were reported for lung cancer among laborers, carpenters, electricians, plumbers and bricklayers. In insulators the reported lung cancer rate was twofold the expected and the pleural tumor (mesothelioma) rate extremely high. Even in plumbers and electricians a threefold mesothelioma rate excess was observed. Excess laryngeal cancer has been reported for painters and bricklayers. PMR and Proportionate Cancer Mortality Ratio (PCMR) studies with members of specific US construction unions based on large numbers of deaths during a 3-5 year observation period during the late 1980-/early 1990s showed excess rates for cancers of the esophagus, stomach, lung and pleura in carpenters (3), for stomach and lung in laborers (4) and for esophagus, stomach and lung in bricklayers (5). A Canadian study on bricklayers similarly showed an OR of 2.35 for stomach and 1.58 for lung (6). A 15 year update of a cohort of 57,000 painters and other union members in the US showed a significant excess of cancer of the lung Standardized Mortality Ratio (SMR) (SMR 1.23) and of the bladder (SMR 1.23) which remained in a direct comparison with the non-painter union members only (7). A report on cancer mortality in Swiss men by occupation showed high mortality from cancers of the upper digestive tract and lungs for construction workers (8).

A number of specific respiratory cancer studies have singled out excess rates in different construction trades. In a study on lung cancer in New Zealand and Odds Ratio (OR) of 5.65 for bricklayers was observed (9). A French mesothelioma study showed an OR of 2.25 for construction workers combined and ORs around 5 for plumbers and for construction sheet metal workers and around 2 for bricklayers (10). In a Spanish mesothelioma study the OR for bricklayers was similar to the French while the plumbers had an OR even higher than the French study (7.49) (11).

In the five Nordic countries a major undertaking is The Nordic Occupational Cancer Study (NOCCA) which is based on matching population census data for 15 million people with cancer registry data resulting in 2,8 million cases (12). Swedish population census and cancer registry mortality Cancer Environment Registry (CMR) represent part of the NOCCA. For several construction related jobs the

excess rates for specific cancers are compatible with the above mentioned findings. Some of the job categories include workers even outside the construction industry. This reservation does not apply to the almost 218.500 "other construction workers" which show statistically excess Standardized Incidence Ration (SIR) for cancer of the lip (SIR 1.54), oral cavity (1.22), pharynx (1.12),esophagus (1.31) and stomach (1.20). Excess SIRs for all sites of the respiratory tract – cancer of the nose (SIR 1.24), larynx (1.23), lung (1.32) and mesotheliomas (1.42) are also shown. In the tables for all occupations both peritoneal and pleural are combined but in men only a small fraction is peritoneal. Even the more than 51,000 bricklayers have predominantly been employed in the construction sector. They show excess cancer of the oral cavity (SIR 1.34), pharynx (1.39) and to a lesser degree stomach (1.10) and rectum (1.13). Respiratory tract excess SIRs include cancer of the lung (1.25) and mesotheliomas (1.57). A large share of the almost 369,000 woodworkers are probably from the construction industry and they show two sites with excess cancer rates – mesotheliomas (SIR 1.57) and nose (1.84); specifically for adenocarcinomas of the nasal sinuses at SIR 5.50. Adenocarcinomas represent 1/3 of all sinus cancers in carpenters while only less than 1/10 in the above mentioned as other construction workers. A large proportion of the 66,000 plumbers are also probably from the construction industry. They show excess SIRs for several gastro-intestinal sites – esophagus (SIR 1.19), stomach (1.12), colon (1.09), rectum (1.12) and liver (1.37) – and for cancer of the lung (SIR 1.42) and mesothelioma (4.74). Although the almost 100,000 painters and wall paper hangers include some with industrial paint application and thus different exposure compared to construction painting, the majority have probably been working in the construction sector. Cancer of the tongue (SIR 1.27), oral cavity (1.49), pharynx (1.24), esophagus (1.14) and rectum (1.11) represent those gastro-intestinal tract sites with excess SIRs. Excess SIRs for cancer of the larynx (SIR 1.22), lung (1.23) and mesothelioma (1.77) and for cancer of the bladder (1.08) are also shown. An assessment of the role of smoking habit differences between occupations and its role in lung cancer excesses has been made based on the Norwegian data in the report. In most of the occupational groups probably exposed to lung carcinogens – among whom most of the construction industry groups were included – adjustment for smoking led to further elevation of the risk estimate. The results are summarized as "largely supportive of the interpretation that the varying smoking habits do not explain all the occupational variation in risk".

The cancer risk for painters has been evaluated twice by IARC 1989 (Vol 47) and 2010 (Vol 98) (13, 14). In both instances it has been concluded that "there is sufficient evidence for the carcinogenicity of occupational exposure as a painter" and "Occupational exposure as a painter is carcinogenic (Group 1)". In the second volume is specified that "occupational exposure as painters causes cancer of the lung and urinary bladder". Already in the first volume it is stated that available information among painters indicates that smoking alone can not explain an excess risk for lung cancer of this magnitude (about 40%). In the second volume adjustment for smoking has shown a consistent 35-40% excess risk for lung cancer and about 25% excess risk for cancer of the urinary bladder. Cancer of the buccal cavity, pharynx, esophagus, stomach, liver and larynx have also been mentioned as sites with excess risk in many of the reviewed studies and also excess risk of mesothelioma.

In Sweden another source exists for prospective cohort studies of the cancer experience among construction workers. It is specifically based on the medical record system for BYGGHALSAN, which was the all construction industry comprehensive occupational health service during the ¼ of a century between 1968 and 1993 (15). During that period more than 370,000 men underwent medical surveillance examinations where data relevant to job category, certain specific exposures and smoking were registered. Subsequently, the cohort comprising the different job categories has been linked to the Swedish cancer registry with an extremely low loss to follow-up and a number of reports have been published over the years on the cancer experience in general in the different construction jobs as well as on asbestos related cancer outcomes in particular (16-18). Those reported findings compare well with those in the above NOCCA analyses. When comparing those reports over the years it is obvious how misleading information from early studies with

short follow-up might be in not revealing excess risks that become visible with prolonged follow-up in the later reports. That is relevant for all cancer sites but even more so for mesotheliomas of the pleura in the asbestos exposed parts of the cohort. In a report on the follow up period 1971-1998 (19) it was observed in all 215 tumors of the pleura and in a recent update until 2009 the number had almost doubled to 424 - an additional 209 in those 11 years only. This is the picture although new use of asbestos products in the Swedish construction industry ceased in 1976.

In a study on head and neck cancers using this cohort (20) the almost two-fold excesses of both laryngeal and pharyngeal cancers were found to be associated with asbestos and cement dust respectively. In a study on esophageal adenocarcinoma and gastric cardia cancers using this cohort (21) positive associations were found between high exposure to asbestos Incidence Rate Ratios (IRR 4.5) and cement dust (IRR 3.8) and risk of esophageal adenocarcinoma. Associations were observed between high exposure to asphalt fumes (IRR 2.3) and wood dust (IRR 4.8) and risk of cardia adenocarcinoma. A study on occupational sunlight exposure and cancer incidence based on this cohort (22) found a 1.5-1.7 Rate Ratio (RR) for cancer of the lip and in particular lower lip in those with medium and high exposure compared to low exposure. A RR of 3.4 for melanomas of the eye and also an increased RRs for stomach cancer and for myeloid leukemia in the medium and high exposure groups were observed. Whether that is related to sunlight exposure per se or is related to these outdoor jobs having exposure to other carcinogens relevant to i.e. stomach cancer is unknown.

Conclusions

All types of studies from different parts of the world show excess cancer in construction workers compatible with known exposures possessing cancer risks.

Cement and silica dust exposures are associated with excess risks of respiratory cancers - in particular lung - but also of excess cancer of lip, pharynx, esophagus and stomach. Dust suppression represents the basic and most effective prevention measure.

IARC has established that exposure as a painter is a Group 1 carcinogen. In this case substitution of the hazardous components whenever possible is a key preventive step.

Asbestos exposure is associated with excess cancer of the larynx and lung and with mesotheliomas of the pleura and peritoneum among construction workers worldwide.

That asbestos exposure causes the highest and longest prevailing risks should be a message to all those economies that continue to use and apply asbestos containing material in the construction sector. The infrastructural shortcomings of this industry does not make any “safe use of” philosophy applicable. They should not be misled by not observing immediate detrimental health effects or not even any in the near future – they are surely going to be seen in the end!

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