Silicosis and emerging risks to patients working with engineered stone

Silicosis is caused by inhalation of respirable crystalline silica (RCS) particles less than 5 µm in diameter, which are small enough to reach the alveoli to trigger lung injury and persistent inflammation. This can lead to lung fibrosis and nodular changes.[1] Silicosis has long been associated with occupational exposure in the mining and quarrying industries. However, new sources of RCS exposure are emerging, leading to earlier onset of silicosis. Individuals who work with silica-based materials in construction or manufacturing—particularly installing or manufacturing engineered stone materials, such as countertops—may be at risk of developing accelerated silicosis.[1]

Silicosis phenotypes

The intensity and duration of exposure to RCS can impact the type of silicosis patients develop. The most common presentation is chronic silicosis, which develops slowly over decades, involves lower-level exposure, and presents later in life (typically when the patient is in their 60s or 70s). Accelerated silicosis has a shorter latency period (5 to 10 years) and involves higher exposures over shorter periods of time. Acute silicosis is a rare phenotype involving very high exposures over weeks or months, which leads to a rapid onset of symptoms and lung injury.[2] Once established, silicosis is irreversible and progresses even after exposure stops. This results in predisposition to other lung diseases (e.g., chronic obstructive pulmonary disease, lung cancer, tuberculosis).[2]

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Emerging and ongoing exposures

An estimated 57 000 workers in BC are exposed to silica each year, with 64% of these workers at risk of high exposures.[3] Workers can be exposed to RCS through activities such as tunneling; sandblasting; ceramic work; and sanding, cutting, drilling, grinding, crushing, demolition, and cleanup of silica-based materials such as concrete, cement, asphalt, bricks, and stone materials, including countertops.

Engineered stone, an alternative to granite or marble, is increasingly being used for kitchen and bathroom countertops, stone veneer cladding or siding stone, flooring, and decorative elements (e.g., columns, fireplace surrounds). Compared with natural stone, engineered stone contains a higher proportion of crystalline silica (> 90% silica in engineered stone vs approximately 45% in granite and 5% in marble).[4]

Chronic silicosis is the more common presentation for individuals who work in mines or quarries, whereas accelerated silicosis may be a more common presentation for workers exposed to high levels of RCS, with presentation more common among younger individuals (median age 33 to 55 years).[4]

Clinical features and assessment of silicosis

Silicosis rates can be challenging to determine, as silica-related diseases and mortality are estimated to be underreported by a factor of 2.5 to 5.[5] Early silicosis may be asymptomatic or with subtle findings. Typical features include dyspnea on exertion, persistent nonproductive or mildly productive cough, fatigue, reduced exercise tolerance, chest tightness, occasional chest pain, and weight loss in more advanced cases.[2] If a patient presents with unexplained progressive dyspnea and cough and has a relevant occupational history, include silicosis on your differential. An occupational history is critical and includes asking about the following:

- All jobs ever held (particularly in construction, mining or quarrying, countertop stone fabrication, masonry, tunneling, foundries, sandblasting, or demolition).
- Exposure to RCS (e.g., exposure to dust from engineered stone, sandstone, granite, or other mineral-based materials, as well as concrete, mortar, and brick).
- Job activity specifics (e.g., use of powerful air-blowing or air-lance tools for cleanup).
- Duration on the job (years) and intensity (hours per day).
- Use of wet methods (i.e., use of water to reduce exposure to dust), ventilation, and personal protective equipment (specifically, type of respirator used), and other known safety measures for silica control used at the workplace.
- If and when exposure has ended.

A history should also include information on smoking, as well as previous TB or other lung diseases.

Testing and early management

If silicosis is suspected, investigations include a chest X-ray and pulmonary function tests, along with potential screening for TB infection or disease.[2] Indicate "occupational exposure to silica; suspect silicosis" on requisitions.

Chest X-ray has limited sensitivity to detect silicosis. If chest X-ray is equivocal

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or an atypical presentation is suspected, consider a high-resolution CT or referral to a respirologist for further investigation.[6,7] Pulmonary function tests typically demonstrate a restrictive defect; however, in late-stage disease, there can be mixed defects with obstruction, restriction, and impairment in gas transfer.[2]

In addition to symptom management and RCS avoidance, early management involves minimizing other pulmonary risks. This includes smoking cessation, influenza and pneumococcal immunization, and monitoring and management of comorbid conditions (e.g., chronic obstructive pulmonary disease, pulmonary hypertension, kidney disease).[2]

If you have a patient with a WorkSafeBC claim or suspect silicosis, please indicate on your Form 11 that you would like your patient to be referred to a respirologist or to the WorkSafeBC Visiting Specialist Clinic (respirology). You can also reach a WorkSafeBC medical advisor on the RACE app+ to discuss your patient's case. If you have concerns about the RCS exposure described by your patient, reach out to WorkSafeBC's prevention team at 604 276-3100 (Lower Mainland) or 1 888 621-7233. For more information, visit www.worksafebc.com/silica. ■

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