Hand and Arm Vibration Syndrome

By Dr. Delia Roberts

Power tools are a mainstay for many who work in Forestry. They make the work easier, but unfortunately vibrations produced by these tools are transferred into the body where they can damage a number of tissues. Chronic vibration exposure is associated with the development of painful symptoms, known as Hand and Arm Vibration Syndrome (HAVS). In this debilitating disease, damage to the nerves and blood vessels of the hand and arm lead to circulatory and neurological impairments, as well as increasing the risk of developing musculoskeletal injuries. Over time, the damage can become permanent and interfere with the ability to work and perform even the most basic tasks of daily life. Hence, it's very important to be aware of the symptoms so as to be able to identify them as early as possible, self-monitoring is critical to avoid HAVS.

It's estimated that about 10% of the Canadian workforce use hand-held power tools. The very strong association of chronic vibration exposure with HAVS suggests that there are between 72,000 and 144,000 cases of HAVS in Canada. Based on meta-analysis of the literature, the risk of developing HAVS has been reported as 4-5-fold more likely in workers exposed to hand and arm vibration. However, the actual number is unknown because identification of HAVS is complicated by a number of issues. Symptoms are generally under-reported because the main treatment for HAVS is to stop the vibration exposure, which can result in a loss of livelihood. Even if symptoms are reported, not all medical practitioners are up to date with how to diagnose HAVS. For example, more recent research has shown that neurosensory symptoms appear with a 3-fold shorter exposure period than the more commonly assessed vascular symptoms. Newly developed tests for biomarkers show promise but are not generally used. It is thought that as many as 50% of workers exposed to vibrations on a regular basis will develop the disease within 2 years, however, there are no available accounts of how many cases of HAVS actually occur in forestry in BC or elsewhere. British Columbia is one of the few provinces that has specific limits for vibration exposure and WorkSafeBC has accepted HAVS cases for compensation, but there is no separate reporting category for this disease.

The factors that contribute to the development of HAVS include the magnitude and character of the exposure. Frequencey, amplitude, direction and duration (both total duration and bursts of exposure without changing grip, body position or a momentary break) are important and charts like this one below are available to help evaluate the risk.

Exposure Points Ready-Reckoner (from Control of Vibration at Work Regulations)

2005, Health and Safety Executive, UK. Published by TSO Online.

However, even the assessment of vibration is complicated. Manufacturers of tools are required to report the level of vibration produced by the tool, but this is only an indication of what will be experienced during use. There is no gold standard method for vibration measurement and there are problems with the accuracy of all the available methods. In addition, the vibrations associated with any given tool change based on the conditions of use, like the density of the material being worked with and the age and maintenance status of the tool to name a few. Transfer of the vibrations generated by the tool into the body can be affected by the material interface. Wraps and gloves, damping surfaces and similar strategies have been employed to try and lower exposure. Unfortunately, many of these approaches have not been successful and in some cases can even increase vibration exposure. Anything that changes the gripping surface of the tool can alter how hard the tool must be held. The tighter the grip is, the more vibration is transferred into the body. A tight grip also restricts blood flow and compresses tissues, so the damage resultant from the vibration is increased. This is particularly problematic for outdoor workers, where cold and wet conditions further reduce blood flow to the hands. Body posture also contributes to the risk of developing HAVS. When muscles, ligaments and tendons are already under load,

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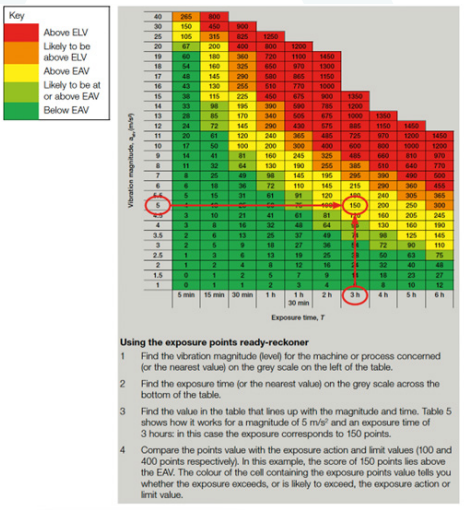

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exposure to vibration seems to cause more damage. Individual variance is also a factor; some people seem to be more sensitive to vibration exposure.

The symptoms of HAVS can appear within weeks to years of vibration exposure. They usually begin slowly; those working with power tools should be alert for any tingling or prickling or 'pins and needles' sensations in their hands. These are symptoms of nerve damage. Another early sign is a whitening of one or two fingertips, which is what leads to HAVS having been known historically as White-finger Disease. Eventually, this blanching can progress to include all the fingers and reach all the way down to their bases which indicates damage to the small blood vessels. When blood flow returns to the whitened areas the tissues can flush and become very painful. In fact, HAVS is associated with a 7-fold greater increase in the risk of developing Raynaud's Phenomenon, a painful disease where blood flow to the fingers is intermittently reduced. Over time there may be numbness with a loss of sensation to touch and a weakening of grip strength. There is also an increased risk of developing carpal tunnel syndrome, approximately 1/3 of HAVS cases experience this painful wrist condition. Vibration exposure can also cause damage to tissues beyond the upper extremity. Reports have been made of increased risk of circulatory and neurosensory problems in the feet of those chronically exposed to vibrations. In addition, the combination of noise and vibrations appears to increase the damage caused by either of these two occupational hazards alone.

There are ways that you can reduce your risk of developing HAVS. First and foremost, be aware of the signs and symptoms and speak to your health care provider immediately if they develop. Remember that if HAVS proceeds the damage to the nerves and blood vessels of your hand and arm will result in permanent disability. However, if adjustments are made immediately upon the appearance of symptoms, you may be able to continue working without problems.

- Adjusting your grip and posture frequently can help, even short breaks to allow blood to circulate and to unload the nerves and tissues to relax are a good idea.
- Wriggle your fingers and shake out your hands and arms to help increase blood flow whenever possible.
- Keep your power tool in good working order, cleaning, sharpening, lubricating and inspecting for damage frequently. The more efficiently it functions the less force will be required to complete the job, and the less pressure will be required by your hands and arms.
- For similar reasons, use good postures and the best possible ergonomics. HAVS increases the risk of developing musculoskeletal injuries so there are several reasons to take the time to position your body as best as possible. Again, good body positioning will decrease the strength that you have to exert with your hands and arms, helping to maintain blood flow and reduce the stress on your joints and connective tissues.
- When purchasing a new tool, look for those with lower vibration characteristics and good ergonomic design.
- For older devices, there are a number of different ISO 10819 standard anti-vibration gloves and wraps on the market and they may be worth trying. Make sure that the fit is very good and that they do not end up increasing the amount of force required to grip and handle your device. It's also important that the glove or wrap has been tested with your specific device because research has shown that the materials used for damping vibrations can resonate at some vibration frequencies and directions of vibration and actually result in increased exposure to lower frequency vibrations. It is these lower frequency vibrations which are the ones that are the most damaging. WorkSafe BC has done some testing in this area and may be able to provide assistance in determining whether any of these products are helpful to you.
- Maintain good body temperature and consider battery powered warming gloves during colder seasons, but again, they must allow a good enough level of dexterity that you can manage your tool without increasing how hard you have to grip.
- One very promising development is the use of vibration-damping carbon-fibre composites in aftermarket handles. A project is currently underway in BC to test this approach for several commonly used chainsaws.
- Another thing that you can do to reduce your risk of developing HAVS is to stop smoking, vaping or chewing tobacco. All of these habits increase the risk of damage to the small blood vessels throughout the body.

If you work with power tools it is essential that you self-monitor for any whitening of your fingers or tingling and numbness in your hands. Ignoring these early indicators of HAVS can lead to permanent damage and significant loss of function. Get into the habit of taking micro-breaks to shift position, relax your grip and let your tissues recover. It might take a few minutes longer to complete your task but it can keep you working in the long term.

For more information and to access free HAVS Awareness Posters:

- Centre for Research Expertise in Occupational Disease
- Government of BC Ministry of Energy, Mines and Low Carbon Innovation
- Canadian Centre for Occupational Health and Safety