

HYPOTHENAR HAMMER SYNDROME: AN UNDERDIAGNOSED CAUSE IN WORKERS EXPOSED TO HAND-ARM VIBRATION

Alice Turcot¹, Marie Fortier¹, and Miruna Dana Dumitrescu²

¹Institut national de santé publique du Québec, Québec, Canada, G1V 5B3

²INSPQ 945 rue Wolfe, Québec, Canada

1. INTRODUCTION

Hand-arm vibration syndrome (HAVS) may contribute to various disorders of the vascular, neurological and musculoskeletal systems. Vibration-induced white finger (VWF) is characterised by episodic constriction of digital arteries. VWF without permanent trophic changes is most often a purely vasospastic disorder without organic arterial obliterations (Olsen, 2002). In severe cases, structural lesions have been reported in biopsies (Takeuchi et al., 1986). In advanced cases, peripheral circulation becomes sluggish, giving a cyanotic appearance to the fingers, whereas in very rare cases (1%), trophic skin changes (gangrene) will occur at the fingertips (Taylor & Brammer, 1982). In vibration exposed workers, underlying secondary causes of Raynaud's phenomenon or ischemia can be present such as hypothenar hammer syndrome (HHS), thoracic outlet syndrome, Buerger's disease or connective tissue disorders. Given that working with vibrating tools involves repetitive trauma to the hands, the aim of this presentation is to review the literature reporting structural lesions such as HHS among HAVS patients and present further cases of thrombosis of the radial and cubital arteries that could account for the poor prognosis of HAVS patients.

2. METHODS

We searched Medline for articles published between 1970 and 2010, in French and English, using the keywords "hypothenar hammer syndrome" and "ulnar artery thrombosis". Abstracts were excluded. A total of 86 articles for HHS were retrieved and analysed. In addition, from a study of 355 compensation files submitted to the Quebec Workers Compensation Board (CSST) for HAVS claims between 1993 and 2002 (Turcot et al., 2007), 33 files of workers with digital thrombosis and/or ulcers were identified. One case was rejected for further analysis because of a diagnosis of severe primary ischemic Raynaud's disease. Descriptive analysis of the remaining 32 cases was carried out with respect to personal, medical and occupational characteristics, prescribed treatments and recommendations about return to work. Among the 32 files, one case and 2 other cases of confirmed HHS referred to us in 2009-2010 will also be presented.

3. PRELIMINARY RESULTS

The preliminary literature review on HHS found few studies on HHS, mainly case reports and a few small cohort studies. Thompson et al. (2006), Noël (1998) and Kaji et al.

(1993) reported cases of HHS and Youakim (2006) reported one case of thenar hammer syndrome. These arterial lesions were described alone or in combination with HAVS. HHS is a rare disease, first described by Conn et al. (1970). True incidence and natural history are unknown. Among 1300 individuals presenting with hand ischemia, the prevalence of HHS was 1.6% and has been reported as high as 7% in 333 vibration-exposed workers (Ferris et al., 2000; Kaji et al., 1993). Depending on frequency or severity of the traumatizing event, repetitive trauma can cause arterial vasospasm but, over time, damage to the intima occurs with subsequent thrombus formation and, less frequently, aneurysmal dilatation (Friedrich et al., 2010). The condition may be complicated by embolization of thrombi to intermetacarpal or digital arteries, or both. HHS has been described in a number of industries in which the workers use their hands to pound or push, including carpenters, automobile mechanics, metal workers, coal miners, rock drillers, forestry workers, construction workers, water well drillers, and factory workers (Marie et al., 2007; Thompson & House, 2006; Kaji et al., 1993). Mean duration of occupational exposure to repetitive palmar trauma at HHS diagnosis was 21 years in one study and 19 years in another (Marie et al., 2007; Kaji et al., 1993). Signs and symptoms due to vascular insufficiency include discoloration of the fingertips, cold sensitivity, pain, cyanosis, and subungual hemorrhage or ischemic ulcers. Other features suggestive of HHS include asymmetrical distribution of Raynaud's phenomenon (RP), usually in the dominant hand, and absence of the hyperemic phase of RP. A hypothenar mass or callus may be palpable (Spencer-Green et al., 1987). Any finger may be involved, except the thumb, due to anatomic variability of the superficial palmar arch. Paresthesia, pain and numbness are due to ulnar nerve irritation or compression (Taj et al., 2010). Diagnosis can be made by clinical investigation: Allen's test, or doppler ultrasound, while arteriography is the gold standard for establishing the treatment plan. Noninvasive investigations include multi-detector computed tomography (CT) angiography, magnetic resonance angiography (Taj et al., 2010). The optimal strategy for therapy remains unclear and controversial (Friedrich et al., 2010).

The preliminary results of the analysis of the 32 files reveal that the diagnoses were made in different ways. Ten were based solely on an abnormal Allen test by one clinician while arteriography was performed and positive in 9 cases. Results from 25 Allen's tests were retrieved from the 32 files and results varied from one clinician to another. Two

Doppler ultrasound tests for 2 workers carried out in these 32 patients were positive. The diagnosis of HHS was rejected for compensation by the CSST in 4 cases. One case of thrombosis of the radial artery was confirmed by angiography. Twelve workers presented digital ulcers, and one case of gangrene was described. These workers were mainly from mining (n=12), automobile mechanics (n=9), construction (n=2), forestry (n=3), heavy equipment operators (n=1), pressure hose operators (n=1), seamstress (n=1), factory workers (n=1), skidder operators (n=1), sandblaster operators and loggers (n=1). Vibrating tools included high pressure hose, grinder, zip gun, sledgehammer, ratchets, impact wrench, jack leg drill, stopper, plugger, road drill, sewing machine, chain saw, compressed-air cutting machine, skidder, and brush cutter.

Analysis of the files shows confusion in the diagnosis established by different clinicians for the same file, the use of non-standardized clinical tests for Raynaud's phenomenon, incomplete clinical investigation of HHS, incomplete examination of occupational "hammering" tasks, and differences in impairment and in functional limitation rating. Medical and surgical follow-up differs among the workers. Three clinical cases were presented to us: one mechanic and two road workers. The HHS diagnosis was delayed and recognition of the disease questioned. One of the workers underwent amputation of digits 4 and 5.

4. DISCUSSION

Workers who operate vibrating tools are at risk of HHS due to the nature of their tasks, which require that they push and grasp the tools tightly in the palms of their hands. The impacts generated by certain tools, such as air hammers, weaken the hypothenar eminence. It is difficult to differentiate the contribution to repeated hand trauma from impact activities versus the trauma related to the transmission of vibration by the tools (Thompson & House, 2006). It is surprising to note the low prevalence of HHS, considering the frequency of palm impacts and trauma in manual workers using vibrating tools. Very few studies exist on the exact prevalence of disease in workers exposed to vibration. According to Little & Ferguson (1972), the syndrome might go undetected in its early stages, which suggests the need for increased surveillance. Preliminary analysis of the files shows that clinicians do not understand the syndrome very well. In fact, faced with documented cases of acute ischemia, other etiologies are often reported by clinicians, such as Buerger's disease or connective tissue disease, thus ruling out a diagnosis of HHS. Patients are often misdiagnosed or diagnosed too late (Liskutin et al., 2000). Confusion exists in the diagnoses reported in the analysis of cases, in the lack of consensus regarding medical investigation and inadequate occupational histories, and in the investigation of the tasks and use of tools that could cause HHS. HAVS and HHS can produce similar

symptoms; however, the presence of hand cyanosis and pain, ulcers and necrosis with or without Raynaud's phenomenon, and the presence of neurological symptoms secondary to ulnar nerve compression, as reported in the cases, should have led to suspected HHS. Could the 1% of cases with necrosis reported in the HAVS literature be due to HHS and incorrectly attributed to microangiopathy of HAVS or other causes of secondary Raynaud's syndrome? It is important to recognize the possibility of HHS in vibration-exposed workers, to conduct a systematic occupational history on work methods and vibrating tools used, to perform an appropriate physical examination and follow a rigorous medical investigation protocol to diagnose HHS. Clear recommendations regarding follow-up of these patients is essential. A consensus on the treatment of cases is essential to avoid complications, including amputation.

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