Devices to prevent repetitive strain injuries should take into account bony characteristics determining the behaviour of the interosseous membrane (IOM) in supination, neutral position, and pronation of forearm and hand

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Devices to prevent repetitive strain injuries should take into account bony characteristics determining the behaviour of the interosseous membrane (IOM) in supination, neutral position, and pronation of forearm and hand

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In using the PC-mouse, prolonged pronation of forearm and hand easily leads to undue tension in muscles and joints, thus evoking certain forms of neuropathies and / or repetitive strain injuries (RSI) (Sorgatz, 2002).

It has been suggested that small and repetitive motions of our hand in handling the computer mouse by moving the wrist sideward, leads to hypertrophy of wrist flexor muscles within their compartments, which in some cases may cause compression neuropathy of the ulnar nerve at the elbow region (Joshi & Joshi, 2002).

With regard to the design of PC-mice, various adjustments have been proposed to prevent such ailments, varying from lightly slanted (Chen & Leung, 2007) to purely vertical mice (Slutski *et al.,* 2000). Thanks to this "handshake" or neutral position of hand and forearm, such vertical mice are assumed to leave thumb and fingers relatively free (Cail, 2008) so as to prevent strain in forearm muscles and joints. Such assumptions however ought to be verified *in vivo* where possible, but first of all *in vitro*, i.e. in anatomical specimens.

To analyse the interosseous membrane (IOM) behaviour *in vitro,* anatomical specimens of the forearm supple enough to simulate *in vivo* movements, were therefore observed in supination, neutral position, and pronation of hand and forearm.

The bony interosseous borders of radius and ulna lie in frontal plane in supination. Their distal third quarters follow each others curvature, leaving the IOM in-between undulated and rather lax. The neutral position of the forearm, ulna unchanged, whereas the arched curvature of the radius lies in a more or less sagittal plane, creates the largest distance between these bones, causing the IOM to be maximally taut. In full pronation (radius and ulna crossed) the interosseous borders re-approach each other, causing the IOM to become undulated and lax again. These bony characteristics, directed differently during the three positions, causing the IOM to be whether lax or taut, possibly evoke different proprioceptive neural signals.

The use of vertical PC-mice in "handshake" positions, although stated equivalent to other devices (Card *et al.*, 1978), should therefore be re-evaluated in view of the observed interosseous membrane tautness that our study demonstrated. As most thumb and index finger long muscles - agonists and antagonists alike - do originate from this forearm interosseous membrane (Frick *et al.*, 1991), undue strains simultaneously caused by opposing muscles in using vertical PC-mice may anew elicit problems *in vivo*. Excessive neural signals evoked by periosteal strain in consequence of forearm interosseous membrane stress, as well as by the muscles' and tendons' organs of proprioception (Frick *et al.*, 1991) might thus contribute to developing RSI and neuropathies again

Keywords : forearm interosseous membrane; peripheral neuropathies; computer mouse design