SENSORY TESTING USING NEUROTHESIOMETRY

Editor,

As colleagues at the West Midlands School of Podiatry, we are curious about the use of vibration perception measurements as a clinical tool for the determination of neurological dysfunction in conditions such as diabetic neuropathy and leprosy. Our curiosity is *not* with the use of vibration perception thresholds (VPT) *per se*, since this technique is well documented, *but* the site at which testing is performed.

It is our understanding that in a neurological setting, vibration perception is assessed by holding a vibrating device (tuning fork or neurothesiometer etc.) firmly against the malleollus or some other bony prominence.[1] However, it is known that whilst skin has a variety of somatic sensory receptors, bone has none.

Therefore, the action of placing a vibrating device against a bony prominence has a number of pitfalls. Firstly, the skin is likely to be 'thinner' at this site, with little underlying subcutaneous tissue. This suggests that the number of sensory units per unit area is lower than at other sites where there is a greater 'body' of tissue present. Secondly and more importantly is the role that the underlying bone will play in the vibration transmission. It has been pointed out that a bony site will act as a sounding board[2] and hence it would be difficult to know which receptors were being activated. In fact, it was reported as a common experience that vibration in the fingers was felt when a tuning fork was held against a 'bone protuberance at the elbow'.

The variation in the 'damping and spread' of the vibration is determined by the 'stiffness' of the tissue.[3] These workers reported in their study that 'care was taken to apply the stimulator where the subcutaneous tissue was so thin that the stimulus would be transferred maximally to the underlying bone'. These two comments from the same report appear at odds with each other. Surely if it is known that vibration is damped by a 'stiffer' tissue (such as bone), it would more prudent *not* to apply it to a 'stiffer' tissue such as a bony prominence. Goldberg and Lindblom[3] have reported a series of vibration amplitudes, where it can be seen that the malleolus and tibia all damp the vibration significantly; the finger pad damps the signal to a much lesser degree.

In the well-known report by Bloom *et al.*,[4] the centile charts for vibration thresholds for the thumbs and medial malleoli may possibly be explained by this damping effect. The vibration threshold is lower in the thumb, which unlike the medial malleolus, has no bony prominence.

The ramifications of this damping effect are obvious. Firstly, it will be impossible to get a true determination of VPT when using a bony prominence. Secondly, a situation might arise in a neuropathic patient where the stimulus is felt as a *consequence* of transmission of the vibration along the bone in the lower limb away from a neuropathic area, to an area where the vibration is perceived not as a consequence of the initial cutaneous stimulus, but as a secondary effect of transmission to the sensory receptors 'outwards' from the bone; from 'underneath' as it were.

We would welcome discussion on this topic, since the technique is widely used in podiatry clinics and is one of the major pieces of armament in the battle against neuropathy and its consequences.[5,6]

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