Somatic tinnitus – clinical characteristics

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Over the past several years, we have been improving our understanding of the contribution of non-auditory factors to tinnitus. We have been particularly focused upon the fact that head and neck forceful contractions can modulate the tinnitus perception and even elicit tinnitus where it was not previously present. We have collected strong clinical evidence supporting the concept that tinnitus can be caused by head and neck factors only, without any disturbance to the ear. While we have made major advances in understanding this factor, no substantial progress has been made in using this understanding to diminish the loudness of the tinnitus on a long-term basis. At the level of our present understanding, we feel that several approaches may yet bear fruit. Our feeling is that the key is to understand more clearly how the head and upper neck musculature modulate tinnitus.

From our experience with testing people for somatic modulation of their tinnitus, it is quite clear that there is not a simple relationship between muscle contraction and changes in patients' tinnitus. With the same testing maneuver in one patient, the tinnitus can be made louder, whereas in a different patient, the same maneuver can quiet the tinnitus. Moreover, in the same individual, some maneuvers diminished the loudness of their tinnitus and others can augment their tinnitus loudness.

One approach we will explore is whether an analytical approach to the patterns of tinnitus modulation in an individual can be used to determine which muscle or group of muscles is involved in the modulation. With any strong maneuver, it is likely that multiple muscle groups are involved in the maneuver. By taking a Principle Component Analysis approach, we will explore the possibility that this engineering technique can identify which individual muscle or groups of muscles are responsible for the changes in the tinnitus perception. As an example, it has been our clinical impression that the sternocleidomastoid muscle is closely involved in tinnitus modulation. However, there is no single maneuver in which in isolation only one of the sternocleidomastoid muscles is forcefully contracted, yet, it is well established that the sternocleidomastoid participates in neck flexion, rotation and ipsilateral side bending. When it is involved in these several neck maneuvers, the role of other neck muscles varies with the maneuver. If an algorithm can be developed from the analysis of (a) the muscles involved and (b) the change in tinnitus perception associated with each maneuver, then we may be able to isolate the role of each individual muscle group upon tinnitus perception.

Once this is understood for an individual, then it may be possible to predict the result of excitation or inhibition of a particular muscle. For example, if our analysis determines that one particular muscle when disabled would quiet the tinnitus then attenuation of the muscle

with a botulinum toxin injection [and/or trigger point injection/acupuncture] could quiet the tinnitus. On the other hand, if the desired effect upon the tinnitus required activation of the motor/somatosensory system, then this may be accomplished by application of electrical stimulation to the muscle and/or a potent stimulator of the somatosensory system, a vibratory stimulus.It is this type of approach that we will explore in trying to achieve tinnitus attenuation through our understanding of the association between the motor/somatosensory system and tinnitus.

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