

Hyperacusis-induced Pain: Understanding and Management of Tonic Tensor Tympani Syndrome (TTTS) Symptoms

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Most clinicians providing tinnitus and hyperacusis therapy agree that hyperacusis can be defined as an abnormal intolerance, heightened sense of volume and physical discomfort in response to certain sounds, which other people can tolerate comfortably. Sounds that are typically difficult to tolerate are loud/impact/sustained sounds, particularly if they are unexpected or in close proximity.

Hyperacusis can be a consequence of a conscious and/or subconscious sense of threat that sounds which are difficult to tolerate are potentially damaging or will exacerbate pre-existing aural symptoms such as tinnitus. However, there are a proportion of patients who develop hyperacusis as a result of neurological injuries, damage and disorders, without necessarily developing a threat response to sounds.

Hyperacusis patients can suffer greatly from frequent or constant pain, often triggered or aggravated by everyday sounds, without underlying aural or TMJ pathology. This has been linked to tonic tensor tympani syndrome (TTTS) by Jastreboff and Hazell [1] and Westcott [2].

TTTS is an involuntary condition where the centrally mediated reflex threshold for tensor tympani muscle activity is lowered, resulting in a frequent spasm or myoclonus [3-6]. This can trigger symptoms in and around the ear from tympanic membrane tension, alterations in middle ear ventilation and trigeminal nerve irritability without objectively measurable dysfunction or pathology [7-10].

Symptoms consistent with TTTS can include: a sharp stabbing pain in the ear; a dull earache; tinnitus, often with a clicking [11,12], rhythmic or buzzing quality; a sensation of aural pressure or blockage [8,9] tympanic flutter [13] pain/numbness/burning around the ear, along the cheek and the side of the neck; [7,8], mild vertigo and nausea [8,9]; a sensation of "muffled" or distorted hearing [14] and headache. Central pain sensitization can develop from chronic trigeminal neuralgic TTTS-induced pain.

Tensor tympani spasm has been implicated in a range of conditions including Meniere's disease, for which sectioning of the tensor tympani muscle has been a suggested treatment [15,16] and the secondary otologic symptoms, such as tinnitus, ear pain and other symptoms in and around the ear, which can develop in myofascial pain syndrome [16,17] temporomandibular disorder (TMD) and TMJ dysfunction [8,9,18,19].

It has been my clinical experience that the specific symptom cluster consistent with TTTS can become involuntarily triggered in patients with an anxiety-based 'need to protect' the health of their ear or their hearing from a perceived threat, in a primary pathway different to secondary TTTS developing in patients from TMD, TMJ dysfunction or other causes.

In many patients with hyperacusis, the threat triggering these symptoms comes from exposure to sounds which become perceived as unpleasant, difficult to tolerate or intolerable. As hyperacusis develops, these sounds begin to appear unnaturally prominent and increasingly louder. Following exposure to some or many of these sounds, a temporary increase in tinnitus (if present) and/or hyperacusis may be noticed, and escalating sensations in the ear may develop consistent with TTTS, such as ear pain, a fluttering sensation or an intermittent

fullness. This reaction can generalise to include more and more sounds. For people with severe hyperacusis, pain may be constant or present most of the time, further increasing following exposure to intolerable sounds. For others, pain may develop for a period of time after exposure to intolerable sounds.

A high prevalence of these symptoms has been investigated and documented in hyperacusis patients [13,20]. In a multiclinic study analysing data collected on 345 patients by eight tinnitus clinics in Australia, Spain and Brazil, most hyperacusis patients (81.1%) were shown to develop ≥ 1 symptoms consistent with TTTS [20]. This rises to 91.3% in those diagnosed with severe hyperacusis. In this study, 74.0% of hyperacusis patients with the symptom of dull ache in the ear and 66.7% of those with the symptom of sharp pain in the ear reported those symptoms developed or were exacerbated by loud/intolerable sound exposure.

These symptoms have not been widely acknowledged or investigated in hyperacusis patients and tend to be overlooked once an underlying pathology has been excluded. The development or exacerbation of these symptoms following exposure to loud/intolerable sounds can reinforce the belief in hyperacusis patients that their ears are no longer able to physically tolerate these sounds, or that these sounds are causing damage to their ears/hearing, and should be avoided. If patients are not given an explanation of their symptoms, the resultant anxiety and distress can play a role not only in tinnitus and hyperacusis escalation but also in limiting the degree of efficacy of therapeutic intervention. Explaining TTTS provides validation, reassurance and helps reduce anxiety, which can have an immediate effect on reducing the symptoms [13,20].

TTTS symptom desensitisation can be achieved using a Tinnitus Retraining Therapy (TRT) approach to hyperacusis therapy, with the addition of cognitive behavioural therapy (CBT) strategies to reframe maladaptive beliefs and manage auditory and TTTS symptom hypervigilance [20].

For those with hyperacusis due to neurological damage, hyperacusis therapy and desensitisation strategies will only be effective to manage an anxiety/threat overlay.

For patients with chronic TTTS-induced pain, medical management includes medication for nerve pain: Endep or Lyrica (Pregabalin) [13]. A musculo-skeletal physiotherapist can provide exercises to relax the

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facial muscles in and around the ear and guidance in locating muscle trigger points in the neck, shoulder and arm. Patients carrying out these exercises plus gentle self-massage of their trigger points report benefit in reducing the intensity of their pain and in managing flare-ups. Interestingly, in some hyperacusis patients, this can also reduce hyperacusis severity [13].

As the nerves and muscles in and around the ears are complex and interconnected, and we don't fully understand how they may be contributing to TTTS symptoms, surgical cutting of the tensor tympani muscle is a last resort and in my experience generally only partly effective in symptom reduction [13].

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