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The Effects of Dry Needling on Tinnitus: A Case Study Report

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Case Report

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Abstract

Background: Tinnitus is the perception of sound when there is no acoustic source external to the ears. Zenner, et al. proposed conductive, sensorineural, and central as the generation sites for tinnitus. Although dry needling has been primarily suggested to treat pain, scholars have explored dry needling for its positive effects on inflammation and function. In this case study the clinician used dry needling under the premise that the patient's tinnitus was of sensorineural origin due to cranial nerve V and cranial nerve VII inflammation.

Case Presentation: A 48-year-old male with a chief complaint of left ear tinnitus. During examination, sensation, reflexes, range of motion, strength, and cranial nerve function were all noted at intact or functional with the exception of the left vestibular cochlear nerve. A novel dry needling protocol was created and resulted in an immediate resolution of left ear tinnitus. Although symptoms returned, full resolution of tinnitus was reported after five dry needling sessions.

Discussion: Dry needling following an adapted Integrated Dry Needling® approach alleviated tinnitus after five sessions. The proposed mechanism for tinnitus resolution was cranial nerve V and cranial nerve VII dysfunction, which was decreased after each dry needling session.

Limitations: The clinician did not assess the temporomandibular joint, control for diet or medications, and was unable to quantify the pathophysiological mechanism of resolution.

Keywords: Dry Needling; Tinnitus; Cranial Nerve V; Cranial Nerve Vii

Background

Physicians Janet Travel, David Simons, Karel Lewit, and Chit Chan Gunn are widely considered the pioneers of dry needling for neuro-musculo-skeletal dysfunctions within Western medicine [1,2]. Since the 1940's, dry needling has evolved into three leading models: myofascial trigger point, radiculopathy, and spinal segmental sensitization. Despite this evolution, foundational to each model is the use of a dry needle and needle effect [1-7]. A dry needle can be described as the use of a monofilament needle without a substance, whereas wet needling involves the use of a needle to deliver a substance into the body. One of the most common substances for neuro-musculo-skeletal dysfunctions is cortisone. The needle effect can loosely be defined as the phenomenon of an analgesic effect following the removal of a needle from the skin [2]. Today, clinicians have a variety of certification agencies which include, Integrative Dry Needling, American Academy of Manipulative Therapy, Functional Dry Needling, Myopain Seminars, and the Dry Needling Institute to name a few [3-7].

Since the turn of the century, dry needling has become one of the most popular interventions for outpatient physical therapist [8,9]. This is evident by thirty-six states that have laws permitting physical therapist to dry needle [10]. Of the remaining fourteen, only six states explicitly prohibit physical therapist from dry needling, while the other eight have are silent [10]. Despite this uptick of popularity, usage, and governing laws the scientific literature to support the use of dry needling is moderate at best.

Most of the dry needling literature is focused on pain management [11-17]. Kietrys, et al. [11] concluded from their systematic review and meta-analysis that dry needling was more effective at reducing pain when compared to a sham or placebo for upper-quarter myofascial pain [11] Liu, et al. [17] concluded from their systematic review and meta-analysis that dry needling was more effective at reducing pain when compared to a sham or placebo for neck and shoulder pain [12]. Morihisa, et al. [13] summarized in their systematic review that dry needling was effective at reducing pain for lower-quarter myofascial pain. Both Vier, et al. [14] and Tesch, et al. [15] reported in their systematic reviews that dry needling increased the pain pressure threshold of patients with orofacial pain. In addition, Boyles et al concluded from their systematic review that trigger point dry needling was an effective treatment for reducing pain and tenderness, irrespective of location [16]. Despite the evidence of support for dry needling, scholars still stress the importance of conducting more high-quality randomized control trials and reporting dry needling protocols [11-18]. Of note, there is low to no evidence to support dry needling as more effective than other therapeutic interventions such as wet needling, rehabilitation, and low-level laser for reducing pain [11-18].

Tinnitus is the perception of sound when there is no acoustic source external to the ears [19]. Zenner, et al. [20] proposed conductive, sensorineural, and central as the generation sites for tinnitus. Conductive is be a result of vibrations of the middle ear [20]. Sensorineural can be a result of outer hair cells, inner hair cells, auditory nerve, or extrasensory structures such has the temporomandibular joint (TMJ). Central is involving any origination along the central auditory pathway [20]. Irrespective of the cause, tinnitus is eventually processed by the central auditory nervous system and consciously perceived in the auditory cortex [19]. The clinical practice guidelines for tinnitus released by the American Academy of Otolaryngology Head Neck and Surgery Foundation clarified that clinicians should ensure they distinguish between bothersome and non-bothersome tinnitus [21]. For patients with bothersome tinnitus the suggested interventions are patient education, hearing aid evaluation, sound therapy, and cognitive behavioral therapy [21]. For patients with non-bothersome tinnitus the suggested intervention is patient education [21]. In addition, the panel recommended against the use of medications such as antidepressants and anticonvulsants, dietary supplements such as melatonin, zinc, and Ginkgo biloba, transcranial magnetic stimulation, and acupuncture for bothersome tinnitus [21]. This case study used dry needling under the premise that the patient's tinnitus was of sensorineural origin.

Case Presentation

A 48-year-old male with a referral diagnosis of headaches was seen for physical therapy care. Upon examination, the patient clarified that his primary complaint was left ear tinnitus. He explained that his tinnitus began over a year ago but has been constant over the last six months. He further explained that he seen his primary care physician, two neurologists, and an ear nose and throat physician and no one was able to adequately diagnosis his tinnitus.

Physical Examination

The patient completed a battery of test. Light touch, temperature, and sharp touch was intact on his face in addition to all dermatomes. Triceps, brachioradialis, biceps, and patella reflexes were normal. No functional deficits were found in cervical range of motion or strength (Table 1). No functional deficits were found in shoulder range of motion or strength (Table 2). Thoracic, lumbar, and lower extremity range of motion was assessed, but not recorded. A 4/5 was recorded for a gross manual muscle-testing screen for the lower extremity. Cranial nerves (CN) I-XII were intact, with the exception of CN VIII– vestibular cochlear of his left ear. Cranial nerve VIII was assessed via the Weber and Rinne test which both were positive for the left ear. His vestibular ocular reflex was intact, and no deficits were noted with smooth pursuit. Dix hall-pike, roll test, head shaking, and Valsalva were all negative. Lastly, there was no report of diplopia, dizziness, dysarthria, drop attacks, dysphasia, nausea, numbness, or nystagmus prior to or during testing.

Motion	Degrees	Functional Strength Grade
Flexion	60	4/5
Extension	80	4/5
Right rotation	70	4/5
Left rotation	75	4/5
Right lateral flexion	40	5/5
Left lateral flexion	45	5/5

Table 1: Cervical Range of Motion and Functional Strength.

Motion	Degrees	Manual Muscle Testing Strength Grade
Flexion	Right – 170 Left - 165	4/5
Extension	Right – 45 Left - 40	4/5
Abduction	Right – 170 Left - 170	4/5
Adduction	Right – Not tested Left –Not tested	4/5
External rotation	Right – 80 Left - 75	5/5
Internal rotation	Right – 95 Left - 85	5/5
Horizontal adduction	Right – not tested Left – Not tested	Not tested
Horizontal abduction	Right – Not tested Left	Not tested

Table 2: Shoulder Range of Motion and Functional Strength.

Treatment

The therapist was certified through the Integrative Dry Needling Institute. Treatment consisted of ½ inch 14mm thickness needles at the zygomatic arch, stylomastoid foramen, supraorbital notch, infra-orbital foramen, mental foramen, and tragus for twenty minutes. The patient was not given any instructions following the treatment sessions.

Outcome

Immediately following the initial session, day 1, he reported a 50% tinnitus decline, which returned in full one week later. After the second session, day 16, the patient reported full resolution of tinnitus, which returned after one month. After the third session, day 45, the patient reported full resolution of tinnitus. Based on the first three sessions the patient was instructed to return monthly for the next two months. At fourth session, day 80, although the patient reported no tinnitus the treatment protocol was continued. At the fifth session, day 116, he reported full resolution of tinnitus, but the treatment protocol was continued. Following the fifth session the patient was discharged. Six months after the fifth session the patient was contacted via phone for follow-up and the patient reported that his tinnitus is still fully resolved.

Discussion

Dry needling following an adapted Integrated Dry Needling→ approach alleviated tinnitus after five sessions. At a six month follow-up the tinnitus was still resolved. With an underlining assumption of a tinnitus sensorineural origin, dry needling was able to restore normal auditory function within six months. Zenner, et al. [20] proposed that tinnitus could originate from a sensorineural site [20]. More specifically, tinnitus could originate from dysfunctions in extrasensory structures such as cranial nerves and TMJ [20]. Since the TMJ was not adequately assessed, the proposed primary mechanism for tinnitus resolution was cranial nerve dysfunction. CN V is the largest CN and provides sensory innervation to the face, along with motor innervation to muscles of mastication. Similarly, CN VII provides motor innervation to the face. Based on the radiculopathy model of dry needling, needling along any pathway of CN V and CN VII provided local or systemic affects to reduce and subsequently resolve the patient's tinnitus. This case study supports the use of dry needling for tinnitus of sensorineural origin.

Limitations

The results from this case study should not be generalized to all patients with tinnitus. The clinician did not adequately assess the TMJ, which could have been a primary tinnitus generator. Since the TMJ receives innervation from the cranial nerves, then it's plausible the tinnitus would resolve once the muscles of mastication where needled. In addition, the clinician was also unable to control for current medication or diet changes. Although current guidelines recommend against diet changes, inflammation could have been a plausible explanation as a primary tinnitus generator. Lastly, the clinician was unable to control for or quantify the exact mechanisms of resolution. The resolution of tinnitus could have resulted from local effects, systemic effects, or a combination of the two. More studies are warranted to clarify the effects of dry needling on tinnitus.

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