Efficacy of Cervical Facet Joint Injections in Cervicogenic Tinnitus Treatment

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Abstract:

Tinnitus is a symptomatic condition of ringing, buzzing, or pressure sensation within the ear. Tinnitus can be caused by a multitude of underlying conditions. This study focused on Cervicogenic Tinnitus (CeT), which is a subtype of tinnitus caused by cervical spine abnormalities. Tinnitus is often regarded as an incurable disease, with many treatment options being unsatisfactory for patients. Additionally, CeT may be an especially common subtype of tinnitus, making focusing on it particularly important. The purpose of this study was to determine the efficacy of a novel approach to treating CeT, which is the use of Cervical Facet Joint Injections (CFJIs). Through the use of patient chart review, a sample of patients (n = 2) with CeT who had undergone treatment plans involving CFJIs were examined. Visits and operation dates were recorded, as well as patient-reported scores of tinnitus intensity that were reported during clinic visits. Initial CeT intensity was scored on a Likert scale (1-10) and each subsequent report on patients' symptoms were reported as percent improvements. A progression of CeT recovery was extrapolated from these patient-reported scores. Additionally, patient demographic data, such as age and comorbidities, were also recorded. From analysis, although no statistically significant data was derived from the chart review process, the effects of the CFJIs were significant, with relief being immediate and satisfactory, as well as decreasing over time with patients experiencing a spike in intensity during the end of treatment. The low commonality between patients suggests that CFJI efficacy can be more evident in a broader range of patients. It is from these two points that further research is warranted, so that the efficacy of CFJIs can be better represented and, hence, be implemented into common medical practice as a result.

Introduction:

Tinnitus is a common symptom characterized as conscious awareness of a sound without an external auditory stimulus.[1] This sound is usually described as a ringing or buzzing sensation within the patient's ear. Tinnitus is very prevalent, with the rates of annoying tinnitus have been reported to range from 6.6% to 18.6%, and it increases to 30% in those aged 55 years and older[2]. Tinnitus seems to plateau or even decrease around 60-80 years of age.[12]

Almost any insult to the auditory pathway, such as noise exposure, stress, and depression, can result in tinnitus. Several non-auditory conditions, such as arthritis and cardiovascular disease

risk factors, can also potentially lead to tinnitus[2]. The subtype of tinnitus being examined is caused by any trauma to the somatosensory system of the cervical spine, referred to as Cervicogenic Tinnitus (CeT)[3]. While the prevalence of CeT is unknown, in a highly selected group of patients with chronic tinnitus, as many as 43% of patients had CeT[4]. However, while the prevalence of CeT may be high, the current pathophysiology, assessment, and treatment for CeT are not well defined[5].

In clinical practice, tinnitus is often considered untreatable, with leading manual therapy journals publishing very little on tinnitus.[12] Additionally, current treatments for tinnitus have proven to heavily impact patients and their families. In the USA, UK, and the Netherlands, health costs covering tinnitus treatment can often be costly, with treatments costing thousands of EUR annually[6]. Across multiple multidisciplinary teams in multiple Western countries, treatments for tinnitus also can and often are associated with low levels of patient satisfaction[7]. Coupled with the fact that patients with tinnitus are prone to developing depression, anxiety, increased neuroticism, and decreased agreeableness[8], there is a clear need for more satisfactory and cheaper treatment alternatives for patients with tinnitus and, especially, CeT.

Excluding the use of medication, tinnitus treatment primarily involves two approaches: sound-based therapies (such as tinnitus retraining therapy, hearing aids, and sound masking therapy) and cognitive-behavioral therapies (encompassing relaxation, exposure techniques, and mindfulness-based training). While systematic reviews of randomized controlled trials have yet to conclusively demonstrate the efficacy of most interventions, cognitive-behavioral therapy stands out with the strongest evidence-based support. Manual therapy for tinnitus management currently relies on limited evidence from a handful of controlled and non-controlled studies, along with narrative reviews and case reports. The crucial role of history taking and physical examination of the cervical spine and muscle functions is emphasized in assessing potential components of somatosensory tinnitus. [12]

Specifically for CeT, there are already some alternative treatment options. One such treatment option is the use of Cervical Trigger Point Acupuncture. And, while a viable option for

improving range of motion (ROM) and neck pain, this treatment has yet to be properly shown as a viable treatment for alleviating CeT symptoms.[9]

Another treatment option is the intermittent use of a Cervical Collar (CC). Through the periodic use of a CC, the cervical spine can be realigned to a baseline posture and alleviate UPCM tension. However, further prospective research is needed to definitively declare the credibility of this treatment's past proposal.[10]

What has not been extensively studied, however, is the efficacy of Cervical Facet Joint Injections (CFJIs) in treating CeT. Examining the anatomical structures composing the central auditory system and the cervical nervous system, there is viable evidence to suggest that CFJIs can serve as a potential treatment option for CeT.[11]

When looking at these prior treatment options, it should be noted that the papers supporting these proposals suffered from critical flaws, including lack of demonstrated efficacy in the case of Cervical Trigger Point Acupuncture and scientific bias in the case of Cervical Collars. The minimally demonstrated efficacy beyond scientific bias (or complete lack thereof) serves as a detriment to the practicality of these papers' use in standardized clinical practice. The purpose of this study is to determine the efficacy of CFJIs in treating CeT by performing a chart review process of existing patient records.

Methodology:

The participants of the study were patients referred to an outpatient clinic by an ENT physician at Hackensack University Medical Center. Patients were referred based on their having suspected Cervicogenic Somatic Tinnitus. Diagnosis of this condition was ruled on the basis of patients being able to modify or relieve tinnitus symptoms by adjusting their head and neck posture, suggesting a musculoskeletal cause of their tinnitus.

After being referred to Seckin Pain Management Clinic, demographic data was collected through medical databases. This included age, gender, ethnicity, and any underlying conditions or comorbidities, as well as other notes relevant to patient care. After gathering demographic data from their visit to the outpatient clinic, patients would be scheduled for a CFJI procedure within the following weeks.

Patients who were identified to have experienced CeT were not directly addressed during this study. Rather, all patients that were included in the study were determined by meticulously searching through an EHR. First, a group of patients that had received CFJIs through the outpatient clinic (n = 116) was gathered. From that point, each patient chart determined whether or not they were referred to the outpatient clinic by the ENT physician. If the patient was, then their chart records would be further examined to determine whether or not the patient demonstrated any symptoms of CeT. At the conclusion of this search, a group of patients (n = 2) was found to have met the criteria for the study. Their medical charts were then examined further to determine the efficacy of CFJIs on the patients' treatments in a chart review process.

During chart review, the dates and time intervals that patients underwent CFJI procedures were recorded. Thorough examination of patient notes was also taken into account. Demographic data such as age, gender, and medical history were also recorded. The intensity of each patients' tinnitus was also recorded on a Likert scale (1-10) upon the initial visit. Each consecutive visit (not including visits for procedures), patients would then report how the intensity of their symptoms had mitigated as a percentage (e.g. *"60% improvement from last visit"*). In these cases, any Likert score given at the beginning of treatment was converted into a percent value, and each improvement thereafter given as a percent would be represented proportional to that original score.

Results:

The intensity of each patients' tinnitus was also recorded on a Likert scale (1-10) upon the initial visit. Each consecutive visit (not including visits for procedures), patients would then report how the intensity of their symptoms had mitigated as a percentage (e.g. *"60% improvement from last visit"*). In these cases, any Likert score given at the beginning of treatment was converted into a

percent value, and each improvement thereafter given as a percent would be represented proportional to that original score. The progression of these improvements are represented in the time progression graphs in Figures 1 and 2.

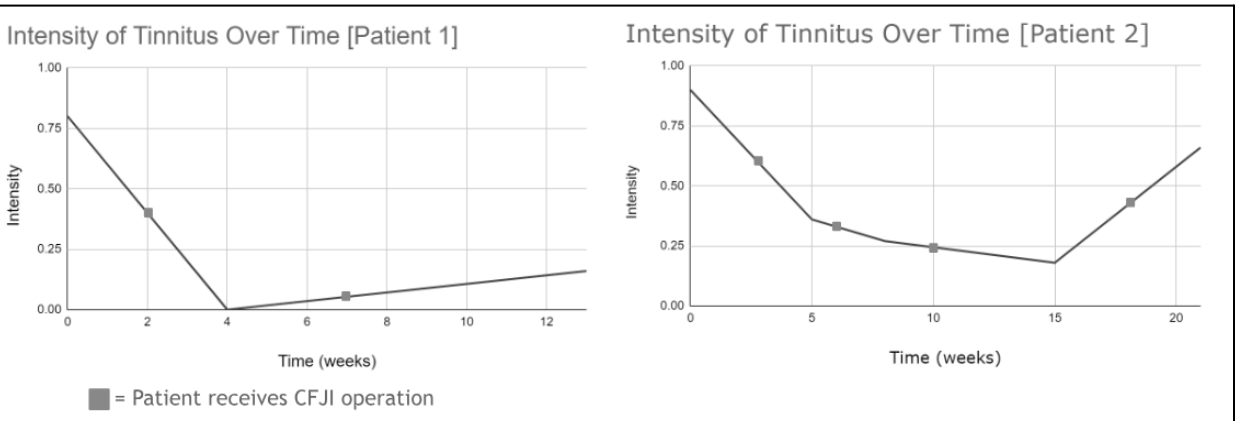

Figure 1, 2. Self-reported intensity of Tinnitus across duration of treatment, derived from patient charts

[Figure 1] Patient 1 was 67 years-old and suffered from Spondolyosis without Myelopathy and Cervical Radiculopathy. They received 2 CFJI procedures during the entirety of their treatment process. Experiencing CeT at the time of their primary visit (Week 0), Patient 1 reported a tinnitus intensity of 8/10 (scored 0.80 in intensity). They were then scheduled to receive a CFJI at Week 2. During their second visit to the clinic (Week 4), Patient 1 reported a 100% improvement in the intensity of their tinnitus (scored 0.00 in intensity). A follow-up CFJI was then scheduled to be given at Week 7. During their third visit to the clinic (Week 13), the patient reported a 20% improvement in the intensity of their tinnitus (scored 0.16 in intensity).

[Figure 2] Patient 2 was 34 years-old and suffered from Bilateral Cervical Pain and Pressure headaches at the time of their primary visit, and received 4 CFJI procedures during the entirety of their treatment process (Figure 2). Experiencing CeT at the time of their primary visit (Week 0), Patient 2 reported a tinnitus intensity of 9/10 (scored 0.90 in intensity). They were then scheduled to receive a CFJI at Week 3. During their second visit to the clinic (Week 5), the patient recorded a 60% improvement in the intensity of their tinnitus (scored 0.36). They were then scheduled to receive a CFJI at Week 6. During the third visit to the clinic (Week 8), the patient reported a 70% improvement in their condition from their primary visit (scored 0.27 in

intensity). A follow-up CFJI was then scheduled to be given at Week 10. During the fourth visit, the patient recorded an 80% improvement in their condition from their primary visit (scored 0.18 in intensity). A final CFJI was then scheduled to be administered at Week 18. During the fifth visit to the clinic (Week 21), the patient reported a tinnitus intensity of 0.66.

Discussion:

Without the benefit of a sizable sample to examine, the intent of this analysis was to examine the trends demonstrated by the two cases to determine whether further research is warranted. Observing the change in tinnitus intensities over the course of the treatment process, the use of CFJIs resulted in considerable relief for patients, with consecutive visits resulting in increasing relief. However, in both cases, there was a point where recovery slowed and the intensity of tinnitus began to increase again.

This phenomenon of slowing recovery and even regression in recovery may be due to the nature of CFJIs. However, because of the low patient sample, this phenomenon could also be explained by incomplete or vague patient charts. Apart from the limitations caused by the low sample size, patient charts were not always very descriptive, nor were they void from bias. Each extrapolated value of the intensity of patients' tinnitus were derived from patient-reported claims to the physician. Additionally, the single-numerical nature of the patient-reported intensity score lacked descriptive nuance when it came to how the patients interacted with their CeT. For example, intensity of tinnitus could be measured by how much it irritates the patient *or* by how much it impedes the progression of the patient's life.

Despite the lack of statistical significance, the low commonality between patients suggests that this problem can be more evident in a broader range of patients, for this problem may occur in patients of vastly different age groups, different genders, different lifestyle practices, and of different comorbidities. The effects of CFJIs were significant in that relief was immediate and satisfactory and relief decreased over time, with patients experiencing a spike in intensity during the end of treatment. Although other studies have shown large prevalence of CeT, the lack of clinical screening for tinnitus in these cases warrants further research into the efficacy of CFJIs.

In future studies, in order to provide further insight into the effective potential of CFJIs in treating CeT, a more sizable patient population should be examined so as to derive statistically significant data to warrant standardized use in treatment plans, as well as a complementary examination of a control group of patients with CeT, who did not receive CFJIs, to be examined along the progression of their recovery process. Moreover, scoring of tinnitus intensity should not be extrapolated from patient charts and should instead be derived from an administered questionnaire or other process where patients can provide consistent and accurate scores of *multiple* facets of their experience with CeT (e.g. How CeT impacts their ability to focus, how CeT impacts their happiness, how CeT impacts their ability to perform daily tasks).

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