Case Report

Resolving chronic ear pain by focused extracorporeal shockwave therapy treatment of the temporomandibular joint and the auriculotemporal nerve: A case report

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ABSTRACT

This case report aims to describe how the application of focused extracorporeal shockwave therapy to the temporomandibular joint (TMJ) and the auriculotemporal nerve effectively resolved chronic ear pain in a patient treated at a private physiotherapy practice. To the best of the author's knowledge, this procedure has not been previously reported for this rare condition. Auriculotemporal neuralgia is characterized by acute, unilateral pain in the temporal region, along with nerve sensitivity. The condition may coincide with temporomandibular disorders or present as nerve entrapment, and it is more commonly observed in women. Currently, no standardized treatment protocol exists for this condition. The patient suffered from outer ear pain for approximately 14 years, underwent treatment with focused shockwave therapy at a dosage of 1000–1500 shocks at a frequency of 8 Hz, with an intensity of 0.02–0.1 mJ/mm^2, adjusted according to the patient's pain tolerance. The patient was treated once a week for 3 weeks. The patient experienced resolution of pain after three sessions. These findings suggest that focused shockwave therapy may serve as a viable alternative method for addressing auriculotemporal neuralgia. Further research is warranted to evaluate the efficacy of this approach in a larger cohort.

Key words: Auriculotemporal, nerve, Extracorporeal shockwave therapy, Temporomandibular joint

Temporomandibular disorders (TMD) comprise a set of clinical conditions that affect the masticatory muscles, temporomandibular joint (TMJ), and related anatomical structures [1]. These disorders often present with diverse symptoms, including pain, limited jaw mobility, and various otologic complaints such as earache, tinnitus, vertigo, ear fullness, and hearing impairments [1]. The overlap between TMD and otologic symptoms is increasingly recognized, adding complexity to the diagnosis and management of these conditions. TMD affects approximately 5–31% of the population in the USA [2]. One rare but notable condition associated with TMD is auriculotemporal neuralgia (ATN). ATN is characterized by sharp, unilateral pain in the temporal region accompanied by nerve hypersensitivity [3,4]. It typically occurs more frequently in women and may either overlap with TMD or arise from nerve entrapment [3]. Despite its distinct clinical presentation, there is no established gold standard for treating ATN. However, nerve blocks remain a commonly employed intervention. In clinical practice, the management of TMD predominantly relies on non-surgical approaches. These include anti-inflammatory drug therapy, local drug injections, psychotherapy, orthopedic treatments, and physical therapy, which aim to improve jaw function and alleviate discomfort; however, they have a high recurrence rate of symptoms [4].

While these treatments show varying degrees of efficacy, the need for more effective and targeted therapies remains a priority in the management of TMD. One promising advancement in TMD treatment is focused extracorporeal shockwave therapy (fESWT). fESWT has gained substantial recognition for its ability to treat musculoskeletal and soft-tissue conditions effectively. The International Society for Medical Shockwave Treatment (ISMST) has included shockwave therapy in its guidelines for treating oral and maxillofacial disorders, including jaw and periodontal diseases [5]. fESWT operates by delivering focused acoustic waves to the affected tissue, leading to several therapeutic effects. One notable mechanism is the reduction of substance P, a neuropeptide integral to nociception and neurogenic inflammation. By lowering the concentration of substance P in the treated area, fESWT alleviates pain

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and reduces inflammation. The removal of substance P from C fibers plays a crucial role in its analgesic effects, offering a potential breakthrough in managing TMD and related disorders [6].

CASE PRESENTATION

A 78-year-old patient was experiencing chronic and debilitating ear pain for the past 14 years. The pain was specifically localized to the ear, occurring during the night while sleeping on the right side only, preventing a full night's sleep. The lack of restorative sleep significantly diminished the patient's quality of life, leading to physical and emotional strain, especially a decline in day-to-day functioning. Over the years, the patient has attempted a variety of treatment modalities, not limited to massage therapy targeting muscle tension possibly linked to the ear pain, such as manipulation techniques, traditional acupuncture, dry needling, transcutaneous electrical nerve stimulation (TENS), osteopathic interventions, and home exercises. None of the treatments resolved the cause of the nightly ear pain.

The physical examination included a thorough assessment of the cervical spine, consisting of history taking, inspection, palpation, range of motion testing, and neurological screening [7]. The examination indicated no red flags, neurological deficits, or previous trauma in the region. There was a slight reduction in cervical rotation.

Further evaluation addressed TMJ as outlined by Shaffer *et al*. [8]. Clinical patterns considered included myogenic and arthrogenic presentations. Myogenic pain was reproduced through palpation and pressure applied to the masseter region on the affected side, with discomfort localized near the ear. This discomfort was correlated with trigger points, identifiable stiff nodules within taut bands of skeletal muscle [9], primarily in the masseter, lateral pterygoid, medial pterygoid, and sternocleidomastoid muscles corresponding to the side of ear pain. Arthrogenic pain may be related to joint line pain, arthritis, hypermobility, or pain with movement. Inspection showed no palpable or audible crepitus, and the joint compression test was negative. Observation identified a slight deviation of the chin; however, range-of-motion testing did not produce discomfort or apprehension.

After the preliminary examination, we determined the origin of pain to be myogenic. Various myofascial treatments have historically failed to provide lasting relief. Identifying compression as the source of pain led to a diagnosis of auriculotemporal neuralgia [3,10], attributed to auriculotemporal nerve compression (Fig. 1) [11]. The diagnostic criteria matched those proposed for auriculotemporal neuralgia in The International Classification of Headache Disorders 3rd edition (ICHD)-III (Table 1) [3].

The patient presented with moderate to severe unilateral pain with a numerical pain rating scale (NRPS) of 8/10, near the auriculotemporal nerve's emergence, and not explained better by another ICHD-III diagnosis.

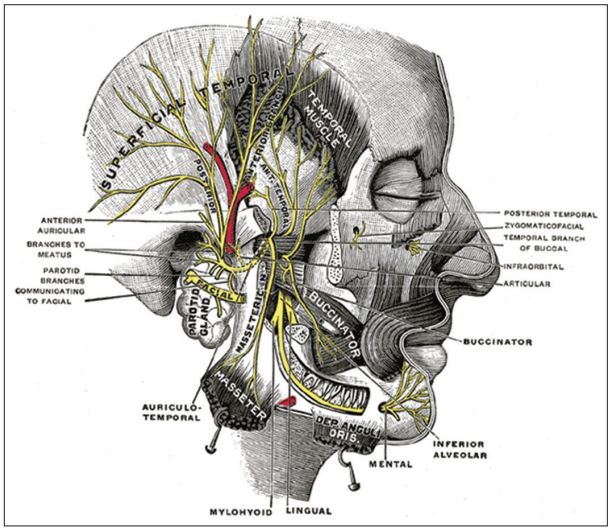

Figure 1: Mandibular division of the trigeminal nerve (Gray's Anatomy) [11]

Table 1: Proposed diagnostic criteria for auriculotemporal neuralgia include the following conditions [3]

Criteria	Condition
A	Unilateral pain
B	Pain in the auriculotemporal nerve area
C	Pain with at least one of these traits: 1. Recurring paroxysmal attacks lasting seconds to minutes 2. Moderate to severe intensity 3. Shooting, stabbing, or sharp quality
D	Pain with one of the following: 1. Dysesthesia and/or allodynia during innocuous stimulation 2. Tenderness over nerve branches 3. Trigger points near the auriculotemporal nerve's emergence
E	Pain temporarily relieved by local anesthetic block of the affected nerve; if not, but other criteria met, it is probable auriculotemporal neuralgia
F	Not explained better by another ICHD-III diagnosis

ICHD-III: The International Classification of Headache Disorders 3rd edition

The compression of the auriculotemporal nerve is caused by sleeping on the painful side (Table 1) [4]. Historically, the patient had not been treated by fESWT, and as fESWT has been shown to have a therapeutic effect on the concentration of substance P, by lowering the concentration and thereby pain relief [6], fESWT was chosen as the treatment modality, and accepted by the patient. The treatment plan suggested was three treatments with 1-week intervals [11]. fESWT was applied to the patient lying prone or sitting with the head rotated to the opposite side of the side being treated [11]. The TMJ was palpated, coupling agent was applied over the TMJ (Fig. 1), after which the probe was applied. About 1000–1500 shocks were given at 8 Hz frequency, intensity of 0.02 - 0.1 mJ/mm^2 (depending on the patient´s pain response) with stand-off II (15 mm), using a fESWT device (Chattanooga, Intelect Focus Shockwave) [12]. The patient was treated once a week for 3 weeks.

Pre-treatment Assessment

Pain at night, on an 11-point NPRS, 0–10 graded, where 0 indicates no pain, and 10 indicates maximum pain. Quality of sleep: Graded on an 11-point NPRS 0–10 graded where 0 indicates "slept well," and 10 indicates "no sleep." Follow-up: After the last treatment and 6 months after the last treatment. The pre-treatment values were pain 8/10 and sleep quality 7/10. Post-treatment values after 3 treatments 2/10 pain, 4/10 sleep. After 5 months, 0/10 pain, 2/10 sleep quality.

DISCUSSION

The present case demonstrated substantial reductions in pain and notable enhancements in quality of life. Prior conservative management strategies, such as massage therapy, manipulation techniques, traditional acupuncture, dry needling, TENS, osteopathic interventions, and home exercises, did not yield significant improvements in either pain levels or quality of life for the patient [9].

fESWT is a physical therapeutic approach targeting soft tissue and musculoskeletal pathologies, utilizing high-intensity acoustic waves generated by electrohydraulic, electromagnetic, or piezoelectric devices. This modality is designed to address localized pain with minimal adverse effects. Extracorporeal shockwave therapy has been shown to enhance local blood circulation, reduce adhesions, stimulate bone remodelling, and alleviate pain [4,5].

The auriculotemporal nerve, a branch of the mandibular nerve, provides sensory innervation to several anatomical regions on the lateral aspect of the head, including the jaw, ear, and scalp, and it supplies the external auditory meatus, innervating the skin of this region. Nerve irritation may be caused by compression [10,11]. Consequently, fESWT was administered with the acceptance of the patient, being consistent with the ISMST, as an accepted experimental treatment modality.

The positive outcome observed may be attributable to the impact of fESWT on pain modulation, potentially through its therapeutic action on the anterior auriculotemporal nerve. Current evidence suggests that fESWT may mimic the effects of capsaicin by reducing substance P concentrations [4].

A limitation of this case report is the inability to conclusively identify the auriculotemporal nerve as the direct site of intervention. Definitive confirmation would require advanced imaging, such as magnetic resonance imaging, or diagnostic nerve block procedures, which were not feasible in this context. Furthermore, there are no comparable studies, and the study warrants further investigation in larger comparative studies. A cooperation between physiotherapists and dentists may therefore be advantageous in future studies, as the inclusion of larger samples of patients and comparing treatment methods, as the condition may be more common in otologic settings.

CONCLUSION

The treatment of the auriculotemporal nerve by fESWT seems feasible and effective. The treatment has shown no side effects and is non-invasive compared to nerve-block interventions. Future studies, including larger samples of patients, are warranted.

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