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Original Research Article

Effect of Dry Needling on Suboccipitalis Muscle and Orofacial Muscles in TMD Related Headache

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Abstract: ***Introduction:*** Temporomandibular disorders (TMD) related headaches is very common in the global population these days.77% of patients with TMD often complains of headache and orofacial pain. The Cartilage surrounding the joint is also affected and also the surrounding structures, clinically showing pain, stiffness, tenderness, trigger points due to bruxism, over loading due to one sided chewing, genetic factors that leads to flattening of the concavity, osteophytes and erosion of the joint margins. ***Aim and Objective:*** The aim of the study is to see the effectiveness of dry needling technique on orofacial muscles and suboccipital muscles in TMD related headache. ***Method:*** 30 patients with TMD related headache who visited the physiotherapy department and dental OPD were included in the study with patient consent. Patients were divided randomly into two groups; Group A received dry needling technique with occlusal splint at night, and Group B received medication with occlusal splint. Pain was evaluated by Visual Analogue Scale (VAS), active myofascial trigger point (AMTrP) was assessed by palpating tenderness and Functional Disability evaluation was done by Headache Index (HI). Pre-and post-intervention in both groups. Independent t-tests were used to compare the pre- and post-intervention results in both groups. ***Results:*** Experimental group who were treated with dry needling exhibited significant improvement as compared to the control group. ***Conclusion:*** Dry needling is an effective technique for reducing headache in TMD without any adverse reaction. we commend it to be a good technique for such patients.

Keywords: Temporomandibular dysfunction, dry needling, headache, orofacial.

1. INTRODUCTION

Temporomandibular disorders (TMD) with headache and orofacial pain are highly dominant conditions in the population and may signify a real current health problem [12,15]. These are mostly not related to any dysfunction, visual trauma, systemic disturbances, and chronic disturbances but can lead to impairment in activity of daily living reducing the efficacy of work both at home and office [13]. Temporomandibular Disorders (TMDs) and headache are closely associated; incidence of headache is 77% in the general population [18,19]. Migraine headache, episodic tension type headaches (ETTH), and chronic daily headaches (CHD) are more common type of headache seen in patients with TMD [8,22]. Several studies show, a strong association between headache and other dysfunctional conditions like pain during temporomandibular movement, pain and tenderness in the temporomandibular area, depression, anxiety, and lack of sleep [8]. Patients with headache and TMDs have higher level of disability index and pain in comparison to patients with TMD disorder. TMD is referred as collective complaints involving the masticatory muscles, temporomandibular joint which is the main cause for the non-odontogenic pain of mouth and face region [20]. About 31% of the adult population and 11% in

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adolescent as symptoms of TMD, which includes restricted mouth opening, crepitus/ sound during movement, headaches, jaw pain, back pain, orofacial pain, neck ache, difficulty in chewing, clenching or grinding, ear pain, shoulder pain and fatigue. TMD affects e women (15–26%) more than men (8–15%), and most common between the ages of 20 and 50 and commonly peaks in the fourth decade. TMDs can be diagnosed by patient's clinical history, clinical symptoms and by radiological investigations. The radiological investigation such as x-rays, MRI, CT scan are used to diagnose Myofascial pain, disc displacement, arthralgia, OA [14]. The Cartilage surrounding the joint is also affected and also the surrounding structures, clinically showing pain, stiffness, tenderness, trigger points due to bruxism, over loading due to one sided chewing, genetic factors that leads to flattening of the concavity, osteophytes and erosion of the joint margins [14]. TMD signs and symptoms include TMJ crepitus, deviation/ limitation on mandibular opening, tender points at the TMJ, and symptoms such as pain in the neck or head, headache, and face pain being the most dominant. Patients with TMD are twice more prone to a chronic daily headache pattern with or without a migraine biology and a linear relationship between the sever TMD symptoms. The TMD defines headache associated to TMD as a headache which occurs in the temple area secondary to TMD pain which can be modified by jaw movement, function and same headache occurs with aggravation testing by the examiner.

According to the International Headache Society (IHS) has classified secondary headache as 'pain referred from a source in the neck and perceived in one or more regions of the head and/or face'. This also stated that the pain can be unilateral or bilateral, affecting the head or face but has most commonly affected the occipital region, frontal region, or retro-orbital region. The relationship between primary headaches and TMD seems to be bidirectional [17].

The treatment management of TMD [21,26] consists of conservative and changeable forms of treatment, such as behavioural modifications, medications, and physiotherapy. Surgery is mostly not required but, in some cases, arthrocentesis is done and helps to washes out the chemical mediators of pain and inflammation in the synovial fluid. Treatment for TMD includes patient education, physiotherapy such as ultrasound therapy, dry needling, laser, exercises, and biofeedback, occlusal splint therapy, medications, occlusal adjustment, surgical intervention and combined treatment.

Physiotherapy treatment [3,10] includes trigger point release, neuromodulation, EMG biofeedback to control muscle tension, relaxation techniques to manage tension during daily activities and change in stress induced activities that induces headache. The non-pharmacological therapy recommended by the National Institution for Health and Care Excellence (NICE) is invasive needling therapy for physiotherapist. Dry needling (DN)[16] is defined as an invasive treatment procedure for reducing the pain associated with active trigger point.

Occlusal appliances were originally made from acrylic resin and cover all or most of the teeth in one arch. The mechanisms of action of the occlusal appliances as a treatment including occlusal disengagement, restoring vertical dimension of occlusion, muscles relaxing, joint unloading, or TMJ repositioning [10,11,24].

2. MATERIALS & METHODS

Source of Data

A) Population: Subjects from physiotherapy department & dental OPD in Bhubaneshwar
B) Sample Size: 30 subjects ranging from 20-40 years satisfying the criteria.
C) Duration of study: 3 weeks (6 sessions, twice in a week with a gap of 3 days)

Method of Collection of Data:

A) Study design: Randomized experimental study
B) Sampling method: Block randomization
C) Sample size: 30 subjects

Experimental Group (Group A)- 15 Subjects
Control Group (Group B)- 15 Subjects

D) Tools used: Visual Analogue Scale (VAS), Headache Index and Active trigger point tenderness was used to assess the perceived clinical change throughout the study.

Inclusion Criteria

- Age group- 20-40 years, both male and female subjects
- Males should be clean shaved from beard
- Pain ≥ 4 in VAS
- Subjects willing to participate voluntarily
- Pain on palpation of the TMJ and associated mandibular muscles
- Orofacial pain
- Tenderness over muscles of mastication and neck muscles by palpation
- Joint sound and headache
- Participants were required to have at least one AMTrP (active myofascial trigger point) in the muscles known to refer pain to the head

Exclusion Criteria

- Any disc or facet joint pathology
- Neurological disorder
- Rheumatism
- History of spinal trauma
- Vascular and metabolic disorder
- Neoplastic disease
- Surgical procedure in the orofacial region
- Pregnancy
- Fear for needle

Procedure

32 patients fulfilling the inclusion criteria were taken in this study and were divided into two groups (20 subjects in each group). After briefing, informed consent was taken from the patients. The pre and post treatment assessment i.e. pain profile by using VAS scale, AMTrPs by trigger point tenderness grading and Headache Index were recorded on 1st day of the treatment session and at the end of 4th week. The diagnosis of AMTrPs among the orofacial muscles was conducted using manual pressure over the muscle belly and marked if it elicits the headache at the tender spot. Group A was treated with dry needling with occlusal splint at night, Group B was treated with analgesic and occlusal splints to be used at night.

Group A, was treated with Dry Needling technique for each AMTrP. Before the treatment started the skin is disinfected for the muscles i.e. suboccipitalis, masseter & temporalis. For suboccipitalis the patient position is prone lying with head and neck in neutral position the therapist stands at the head end, needle size was 0.32 mm × 13 mm was used and the angulation was 45 degrees and towards the opposite eyeball. For masseter and temporalis, the patient position was supine lying, needle size was 0.32 mm × 25mm was used and the angulation was 25-30 degrees towards the AMTrP. This is don for 6 sessions in 3 weeks and the patients were advised to wear occlusal splint at night during sleep.

Group B, were treated with medication as subscribed and with occlusal splints at night for 3 weeks.

3. STATISTICAL ANALYSIS

Differences in the total number of AMTrPs, VAS and HI between groups were analysed with Student's t-test for independent samples or with the Mann–Whitney. The data were analysed using IBM SPSS Statistics Software version 25.0. The statistical significance was established at p value < 0.05.

4. RESULTS

The descriptive and comparative study of the sample at baseline is presented in following tables.

Table 1: Descriptive and comparative study of VAS (in mm)

Group	Pre- Test	Post-Test	P value
Group A (n=16) Experimental Group	19.19±19.05	10.50±16.79	0.001
Group A (n=16) Experimental Group	19.44±19.07	17.93±16. 83	

The mean baseline VAS was 19.19±19.05 for group A and 19.44±19.07 for group B. After 6 treatment session the VAS was 10.50±16.79 for group A and 17.93±16. 83 for group B. There was significant difference between the two groups. Group A showed a better improvement in pain as compared to group B.

Table 2: Descriptive and comparative study of total no. of AMTrPs

Group	Pre- Test	Post-Test	P value
Group A (n=16) Experimental Group	17.56±8.15	10.25±6.37	0.001
Group B (n=16) Experimental Group	15.50±8.02	12.35± 7.33	

The total AMTrPs was 17.56±8.15for group A and 13.50±8.02for group B. After 6 treatment session the AMTrPs was 10.25±6.37for group A and 12.35± 7.33for group B. There was significant difference between the two groups. Group A showed a better improvement in AMTrPs as compared to group B.

Table 3: Descriptive and comparative study of Headache Index (HI)

Group	Pre- Test	Post-Test	P value
Group A (n=16) Experimental Group	11.86±6.18	3.73±4.67	0.001
Group B (n=16) Experimental Group	13.86±6.12	10.33± 4.36	

The mean baseline HI was 11.86±6.18for group A and 13.86±6.12for group B. After 6 treatment session the HI was 3.73±4.67for group A and 10.33± 4.36for group B. There was significant difference between the two groups. Group A showed a better improvement in HI as compared to group B.

No adverse effect was reported with the intervention. Patients treated with dry needling commonly reported light post-needling soreness in the muscles as a side effect of the technique which was normalized within 48 hours without any measures.

5. DISCUSSION

TMDs are musculoskeletal and neurologic in nature. There are many associated conditions to TMD pain that reflect common etiologic factors and type of pain, this includes displacement of joint, osteoarthritis, malocclusion, connective tissue disorders, neuropathic pain disorders, migraine and headaches [8,18,19]. Patients with TMD mostly suffers from headache and cannot address the main problem due to contributing factors that might lead to failure to resolve the pain.

Studies had revealed that many patients suffering from headaches are under treatment and under many medications for years. According to Francis, patients with headache do not realize that headaches might be cause of TMD and they typically do not seek treatment from dental practitioners.

There is significant evidence in relationship between TMD and headaches. The most protuberant etiological theory for TMD involvement in headache pain is that it occurs as a result of a dysfunctional masticatory system. Lynn described the presence of interactions among structures of the craniomandibular complex, and stated that, when the muscle groups are unbalanced, physiological changes occur that lead to symptoms of tension-type headaches. Rauhala *et al*., concluded that 25 patients suffering from facial pain combined with TMD was most probably of myogenic origin.

In this study, we found that in patients treated with, DN produced positive effects on headache index as a factor of headache intensity and frequency, decreasing trigger point tenderness, improvement in functional evaluation. These results would support the hypothesis that, in patients with headache related to TMD, where the referred pain from active TrPs in the suboccipital and orofacial muscles reproduces the headache pain pattern, the application of DN can be an effective approach for these patients.

The mechanisms of TrP therapy can be effective for reducing pain remain hypothetical [29]. Possible mechanisms included in reduction of TrP activity, restoration of the length of the muscle sarcomeres, reactive hyperaemia within the TrP taut band, temporary elongation of the connective tissue, or reduction of sensitization mechanisms associated to TrPs [30]. Although the pathophysiology of trigger points is still not cleared, muscle overload associated with repetitive and prolonged activities and low-level muscle contractions may produce changes in the fibre structure, localized tissue stiffness, and the blood flow properties of the biochemical setting [31].

The effect of dry needle may improve the fibre structure, the localized tissue stiffness, and the local circulation of the biochemical milieu associated with the trigger point [28]. The change of local blood flow and the induction of local twitch responses through DDN may improve ischemia, hypoxia, and the presence of analgesic substances such as substance P and the calcitonin gene-related peptide [2,28]. This corresponds with the decrease in pain and local tenderness after the DN of a trigger point, which persisted at least 1 week after therapy in the study.

This randomized controlled trial aimed to evaluate the effect of DN on the total number of AMTrPs in all muscles contributing to headache related to TMD, as well as on the pain intensity and perceived clinical change in headache. While prior evidence exists regarding the effects of DN on headaches [26] there is a scarcity of studies exploring its impact specifically on TTH. Participants who received the intervention experienced a decrease in the total number of AMTrPs and a decrease in headache intensity, as evidenced by the post hoc analysis. Additionally, they reported a significant improvement in the perceived clinical outcomes. It has been found that AMTrPs have higher levels of pro-inflammatory cytokines such as interleukin-1β and tumour necrosis factor-α compared to latent MTrPs and areas in the muscle that are not classified as MTrPs. These findings suggest that AMTrPs are associated with an inflammatory and sensitizing milieu. An interesting study in a rabbit model found that one session of DN in the biceps femoris with MTrP enhanced the beta-endorphin levels in the biceps femoris muscle containing the taut band and serum, and reduced substance P in the biceps femoris and the ipsilateral corresponding segment of the L2–L5 dorsal root ganglion [48]; this shows the potential beneficial effect of the performance of one DN session on the MTrP with an in-and-out needle movement, eliciting as many local twitch responses as possible, in the inflammatory and sensitizing milieu related to AMTrPs.

In this study, the subjects in the treatment Group A obtained a positive significant clinical change compared to the subjects in the control group (Group B). These DN results have also been observed in other types of patients, such as those with neck pain [16] or cervicogenic headaches [22]; however, in those studies, DN was not the only treatment technique used. In this study, we did not register any serious adverse event apart from the usual post-needling soreness considered a side effect of the technique, with some authors considering this post-needling soreness to be a physiological consequence of the local twitch response.

Additionally, in this study, we reported that DN improved in VAS, AMTrP, and headache index. This significant improvement was observed at 6 sessions of treatment in 3week post-treatment as compared with baseline in both group ($p < 0.001$). Changes of mean scores in the group A who were treated with DN and occlusal splints showed greater improvement ($p < 0.01$).

6. CONCLUSION

Dry needling on orofacial muscles and suboccipital muscles has shown positive effects in reducing the headache related to TMD.

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