ORAL MEDICINE

EFFECTIVENESS OF AURICULAR ELECTRICAL STIMULATION IN TREATMENT OF PATIENTS WITH TEMPOROMANDIBULAR DYSFUNCTION PAIN

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ABSTRACT

Electrical stimulation of the auricle (auriculotherapy) is considered an effective analgesic technique for chronic pain. The main purpose of the present study was to determine the effectiveness of auriculotherapy on myofacial pain due to tempromandibular disorder. Using double blind evaluation method, 16 patients, 11 study and 5 control groups, were utilized for this project. Auricular points on the ear, known to show lower resistance in the tempromandibular disorder were electrically stimulated using Pointer Plus device, a hand-held probe with a concentric, bipolar, spring-loaded tip using 0-22mA at a 10Hz frequency output and 240 usec pulse width according to the manufacture instructions. Sham points were stimulated in the control group. Initial treatment followed by three consecutive treatment sessions, once weekly was conducted. Pain during talking was reported by 3(27.3%) patients was completely eliminated after fourth follow up visit, whereas pain during mouth opening, reported by 9(81.8%) patients, decreased to 5(45.5%). Pain in the jaw and frequent headache was reported by 8(72.7%) and 7(63.7%) patients and decreased to 2(18.2%). In contrast, pain during yawning was reported by 4(36.4%) patients increased to 6 (54.5%) in the fourth visit.

Positive results were noticed in the control group. Pain during yawning reported by 3(60%) decreased to 1(20%) patient and pain in the jaw in 1(20%) patient was completely eliminated and tenderness on palpation of deep masseter muscle reported by 4(80%) patients decreased to 2(40%) patients after fourth visit. Auriculotherapy is known as safe and non-invasive treatment modality. Its application to TMD pain seems to be moderately effective.

Key words: Auriculotherapy, auricular electrical stimulation, acupuncture, tempromandibular disorder, pain.

INTRODUCTION

Pain without doubt, is a major human concern influencing every aspect of life. Bonica (1968) stated that "pain has been, and continues to be, the most common symptom which impels the patient to seek medical dental counsel". Bonica's above quotation indicates that pain is the most common symptom treated by physicians, dentists and other health professionals.

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Since pain occupies most of the clinician’s day, the practitioner should have at his or her fingertips knowledge of pain mechanism and treatment methods, including drug therapy, neurosurgery, psychiatry, manual therapy (massage and manipulation), temperature therapy, electrotherapy (acupuncture and transcutaneous electrical nerve stimulation- TENS), needle acupuncture, auricular electrical stimulation (auriculotherapy), biofeedback, hypnosis, meditation, relaxation therapy and cognitive coping skills.\(^2\)

Acute pain is one of the most sensory functions in the warning system of the body, but chronic pain persist long after all possible healing or long after pain can serve any useful function. It is no longer simply a symptom of injury or disease but a pain syndrome, which is a medical problem that requires urgent attention. Most important to recognize is that treatment methods, which are normally effective in acute pain, are not necessarily effective for chronic pain.\(^2\)

A major concern in dentistry is chronic pain in tempromandibular dysfunction. The consensus statement of the National Institute of Health Technology Assessment Conference on the Management of Tempromandibular Disorders assert that professional education is in need to ensure proper and safe practice in the treatment of musculoskeletal facial pain. They also recommend that the vast majority of tempromandibular disorder (TMD) patients should receive initial management using noninvasive and reversible therapies. This is due to the fact that most individuals experience improvement or relieve of symptoms with conservative treatment. Initial management was defined as first treatment the patient receives after seeking care.\(^7\)

The National Institute of Health Technology reported that the most promising approaches to management and treatment of patients with persistent TMD pain and dysfunction may result from evidence-based practice and patient-centered care. They indicated that relaxation and cognitive behavioral therapies are effective approaches in managing chronic pain. They also recommended that physical therapy approaches be scientifically evaluated, as well as alternative medicine modalities.\(^3\)

Abundant literature deals with the causes, symptomatology and treatment of TMD pain problem. However acupuncture and auriculotherapy, as an alternative medicine, received little attention in this area although it has proved quite useful in treatment of chronic pain in other parts of the body, and can be extremely effective adjunct to whatever treatment chosen by the clinician.\(^2\)

Auricular electrical stimulation is the stimulation of the auricle of the external ear for the diagnosis and the treatment of health conditions in other parts of the body. It is a form of ear acupuncture where the stimulation is achieved by the insertion of acupuncture needle whereas the term auriculotherapy refers to electrical stimulation of reflex point on the surface of the ear.\(^4\)

The aim of this research was to evaluate the effectiveness of Auricular Electrical Stimulation in treatment of patients suffering from myofacial pain due to tempromandibular dysfunction.

**MATERIALS & METHODS**

**Patients’ selection**

Twenty-two adult, non-pregnant females with myofacial pain visited the Oral Medicine clinic of the Maxillofacial Surgery and Diagnostic Sciences Department at King Saud University, between August 2001 and January 2002 were included in this study. All patients were referred by clinicians at the College of Dentistry for treatment of myofacial pain and fulfilled the criteria for diagnosis of TMD based on Klauser description.\(^5\) They had pain described as dull ache in the masticatory muscles area, often accompanied by restricted mandibular motion and / or clicking sounds in the tempromandibular joint (TMJ).

Subjects were randomly divided by random access into 2 groups of 11 patients each. Explanations of nature of treatment as part of a research project were given to all participants in the project and a consent form was signed. Medical history was reviewed to exclude any patient with systemic causes of facial pain and or neuralgia or using pacemakers.

**Equipment**

Pointer Plus device was used to electrically stimulate the surface of both ears at auricular acupuncture points following Oleson manual.\(^4\) The device has a hand-held probe with a concentric, bipolar, spring-loaded tip that is pressed against the ear. It produces auditory signals and delivers electrical current below perceptible threshold (Fig 1). Treatment with auriculotherapy took 15 minutes using 0-22mA at a 10Hz frequency output and 240usec pulse width according to the manufacture instructions.
groups were advised to be aware of dull pencil like
pressure from the auricular probe as it is pressed
against the ear.

Evaluation
Examiner 3, blind to first evaluation and treat-
ment, re-evaluated the subjects at first, second and
fourth week follow up visits. Evaluation of subjects for
pain, tenderness and mouth opening were in the same
manner as the initial visit using a new copy of the
screening form.'

Examiners Standardization
The clinical examination and recording of data
were conducted by two examiners who where
trained prior to the study using scale to measure
amount of pressure during palpation to be 11b only.

Statistical Analysis
Completed history questionnaire and clinical find-
ing were coded and entered into SPSS V.10 data file.
Descriptive statistic was used to examine the differ-
ence between study and control group.

RESULTS
All participating patients completed history and
comprehensive examination. Six patients from the
control group withdrew after the initial and second
visits. Sixteen female patients, eleven in the study
and five in the control group comprised this project.
Number of patients with pain at various locations is
presented in Table #1.

In the study group: 8 (72%) patients reported pain in
the jaw, decreased to 2(18.2%) patients, 7(63.7%)
patients had pain in the temple area decreased to
3(27.2%) and frequent headache dropped from 7(63.7%)
to 2(28.2%) patients in the fourth follow-up visit.
Four (36.4%) and 3(27.3%) patients experienced
pain in the ear and the cheek respectively, increased to
6(54.6%) patients in the fourth follow-up visit. Jaw joint
pain increased in the second and third visits, dropped
back to original 4(36.4%) patients in the fourth follow-
up visit. This is presented in Table #1 and Fig #2.

The control group showed different response to
auriculotherapy at the follow up visits. Jaw joint pain
was experienced by 1(20%) patient, was doubled to
2(40%) whereas, jaw and cheek pain were reported by
<table>
<thead>
<tr>
<th>Location of Pain</th>
<th>Visit 1</th>
<th>Visit 2</th>
<th>Visit 3</th>
<th>Visit 4</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Visit 1</td>
<td>Visit 2</td>
<td>Visit 3</td>
<td>Visit 4</td>
<td></td>
</tr>
<tr>
<td>Pain during</td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Mouth Opening</td>
<td>72.7%</td>
<td>72.7%</td>
<td>54.5%</td>
<td>45.5%</td>
<td>20%</td>
</tr>
<tr>
<td>Pain during</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Talking</td>
<td>27.3%</td>
<td>27.3%</td>
<td>0%</td>
<td>0%</td>
<td>20%</td>
</tr>
<tr>
<td>Pain during</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Yawning</td>
<td>36.4%</td>
<td>63.6%</td>
<td>45.5%</td>
<td>54.5%</td>
<td>60%</td>
</tr>
<tr>
<td>Pain during</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Chewing</td>
<td>45.5%</td>
<td>36.4%</td>
<td>36.4%</td>
<td>36.4%</td>
<td>0%</td>
</tr>
<tr>
<td>Pain in the Jaw</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Pain in Jaw Joint</td>
<td>4</td>
<td>9</td>
<td>7</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Pain in the ear</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Cheek Pain</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Pain in Temple area</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Frequent Headache</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Tenderness on Palpation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preauricular area</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>2</td>
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<tr>
<td>Superficial Masseter muscle</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>1</td>
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<tr>
<td>Deep Masseter muscle</td>
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<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
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<tr>
<td>Temporalis muscle</td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>5</td>
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<tr>
<td>Lateral Pterygiod muscle</td>
<td>11</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Abnormal Range of Mouth Opening</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

1(20%) patient and dropped to 0%. Jaw joint pain was reported by 1(20%), increased in the second and third visits then decreased to 2(40%) at the fourth visit. This is presented in Table #1, and Figs #2 & #3.

In the study group, tenderness on intraoral palpation of temporal muscle was reported by 9(81.8%) patients, decreased to 5(45.5%) on fourth follow up visit, while tenderness of lateral pterygiod muscle was felt by 11(100%) patients decreased to 9(81.8%) and that of deep masseter tenderness was experienced by 6(54.5%), slightly decreased to 5(45.5%). Preauricular tenderness was reported by 7(63.6%) patients, which
slightly decreased to 6 (54.5%) in fourth follow-up visit. Pain on palpation of the superfacial masseter increased from 2 (18.2%) to 5 (45.5%) patients as presented in Table #1. There was slight or no improvement regarding muscle tenderness in the study group.

Range of mouth opening remained almost the same throughout the project for 10 (90.9%) of the study and 5 (100%) patients of the control groups. Table #1 and Figs #2 and #3 summarizes the results.

DISCUSSION

In recent years, the popularity of acupuncture in Western culture has increased.9 However, efforts to evaluate scientifically the effect of acupuncture remain hindered by methodological problems.10,11 Several research projects demonstrated that acupuncture systemically elevate pain threshold and produce dental analgesia.12 Treatment of pain is known to be influenced by many factors such as origin and duration of pain, placebo effect, and therapist ability.13 In addition; the effect of treatment may be affected by the knowledge of whether one is receiving real or placebo type of treatment during the study. Therefore; random assignment and patients blinding were important in the design of this study to ensure that the two groups did not differ in either pretreatment characteristic or in subjects' ability to identify which treatment they received.

In this study it was difficult to have a blinded practitioner, but it was possible to compensate by including blinded evaluator as suggested by Eskinazi.6 In the study group jaw and temple pain together with frequent headache decreased. Ear and cheek pain although increased in second and third visits they dropped back again in the fourth visit. Because pain is, by definition a sensory and emotional experience, the patient's self-report of the pain experience is considered the "Gold Standard" in pain research, and thus the validity of these self-report measures is assumed. They are further validated by the fact that they co-vary with other measure of outcome.14 Pain during chewing and mouth opening in the control group, increased in second visit, but declined later. This may be explained as more awareness by the patient to these types of pain after initial history and examination. This explanation also applies to jaw joint, ear and cheek pain in the study group. Frequent headache and temple pain, both 63.7%, decreased at fourth visit to 18.2% and 27.3% respectively giving noticeable relieve indicated by some of the patients. Auriculotherapy effect on range of mouth opening seems not effective in both groups. This could be explained that the effect of auriculotherapy is mostly on pain and not on muscle spasm and fatigue that contribute to range of opening.4 Although tenderness on palpation in deep masseter, temporalis, lateral pterygoid and preauricular areas did not improve dramatically yet, it did decrease to a variable extent. Best results were noticed in temporal muscle tenderness and least in superfacial masseter muscle, which increased in the fourth visit.

There is no previous similar study related to TMD on human to compare our results. However auriculotherapy elicited good results in other neurological disorders.15 It was demonstrated on experimental animals that electrical acupuncture stimulation reduces edema response compared to animals treated with sham point.16 Negative results with auriculo-therapy were reported by Melzack to produce a placebo effect on chronic pain when evaluated by McGill Pain Questionnaire.17 Positive changes demonstrated in the control group can be explained as the normal pain fluctuations overtime in an untreated group. Moreover; it was difficult to choose a suitable control because the placebo effect induced can not be assumed to be the same as that induced by a drug. This is also true in a number of medical conditions received nonspecific placebo treatment, which had shown to have measurable therapeutic effect.5
It was postulated that acupuncture do not simply reduce the experience of pain, which is the more immediate effect, but also facilitate the natural healing process of the body. It is important to treat the deeper, underlying condition and not just the symptomatic representation of the problem. Both body acupuncture and auriculotherapy were reported to effect deeper physiological changes. It was also indicated that auriculotherapy facilitate natural, self-regulating homeostatic mechanisms of the body by diminishing over active bodily functions or increasing underactive physiological processes.

Auriculotherapy, as a diagnostic tool, can be used to help uncover an underlying dysfunction by reducing or eliminating chronic pain. The inability to make correct diagnosis would be the result in treatment failure. The first symptoms that appear in a craniomandibular dysfunction are due to the dysfunction itself. If the dysfunction persist morphological changes can occur and can be accompanied by chronic pain which can be an independent and self-perpetuating problem, hiding the symptoms of the original complain, complicating the diagnosis. This may explain the unchanged mouth opening range, in the study group that was noticed in the second and third visits after the relief of pain. Results of this study, shows that pain during talking was completely eliminated after fourth visit whereas pain due mouth opening (81.8%) decreased to (45.5%) after fourth visit. In contrast, yawning pain increased from 36.4% to 54.5% in the fourth visit, which could have been hidden by other types of pain. Ramer reported that by relieving chronic pain, the underlying dysfunction become more apparent so that proper treatment can be prescribed.

Auriculotherapy is known to be free of side effects compared to medications and surgical approaches to treat TMD pain. The National Institute of Health Association statement at 1996 conference recommended a safe and reversible treatment of TMD at the initial visit. Auriculotherapy for TMD pain in the initial visit seem to be promising because it is noninvasive, safe and with no known side effect. Data could not be correlated due to sample size. We may conclude that auriculotherapy has a moderate effect on TMD pain.

Further studies on effect of auriculotherapy on TMD pain or other types of pain using bigger samples are recommended.

REFERENCES