

# Laser Therapy and Transcutaneous Electrical Nerve Stimulation (TENS) in Temporomandibular Disorder

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**Plain English summary of protocol**  
Not provided at time of registration

## Contact information

**Type(s)**  
Scientific

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## Additional identifiers

**Protocol serial number**  
N/A

## Study information

**Scientific Title**

# Laser Therapy and Transcutaneous Electrical Nerve Stimulation (TENS) in the treatment of Temporomandibular Disorder: A randomised controlled trial

## Study objectives

Temporomandibular disorders affect the masticatory muscles, the TMJ and adjacent structures. The main symptomatology is myofascial pain and mandibular dysfunction. One of the main causes of pain is a muscle spasm that may be generated by muscle distension, contraction or fatigue. These conditions are caused by muscle hyperactivity, which, in turn, may be caused by bruxism or emotional factors, such as stress. The incidence of TMDs has been increasing, especially among women.

Both laser therapy and transcutaneous electrical stimulation are effective in the treatment of Temporomandibular Disorder (TMD)

1. Transcutaneous electrical stimulation is more effective than laser therapy in temporomandibular disorders analgesia
2. Laser therapy produces a more significant improvement in joint mobility of the temporomandibular joint (TMJ) in relation to transcutaneous electrical stimulation and the control group
3. The combination of laser therapy and transcutaneous electrical stimulation produced a significant improvement in quality of life of patients TMD.

## Ethics approval required

Old ethics approval format

## Ethics approval(s)

Human and Animal Research Ethics Committee of the Lutheran University of Brazil (Universidade Luterana do Brasil), approved on 5th July 2010, reference number: 2010-232H

## Study design

Randomised clinical equivalence trial

## Primary study design

Interventional

## Study type(s)

Treatment

## Health condition(s) or problem(s) studied

Temporomandibular Disorders

## Interventions

1. The patients were randomly divided into four groups:
  - 1.1. Control group, with 9 subjects, receiving continuous dental treatment
  - 1.2. Group laser, with 8 subjects, receiving dental treatment plus low-frequency laser therapy
  - 1.3. Group TENS, with 6 subjects, receiving dental treatment, in addition to TENS
  - 1.4. Group laser + TENS, with 7 subjects, receiving dental treatment plus transcutaneous electrical nerve stimulation and laser therapy

## 2. Laser Therapy Protocol

A previously calibrated, low-level gallium arsenide (AsGa) endophoton laser was used (KLD®,

Amparo, SP, Brazil), with a wavelength of 904 nm, energy density of 6 J/cm<sup>2</sup>, average power of 50 mW and beam area of 0.035 cm<sup>2</sup>, with continuous emission for 36 seconds per point. Laser application was performed punctually and in contact with the surface, perpendicular to the skin and bilaterally.

### 3. TENS Protocol

For the application of TENS, previously calibrated TENS Vif four 993 equipment (Quark®), manufactured in Piracicaba, in the state of São Paulo, Brazil, was used. Two channels with four rectangular silicon-carbon transcutaneous electrodes (3 cm x 5 cm) were used. These electrodes were placed bilaterally on the preauricular region and on the masseter muscle, with one channel for the right side and one for the left side. The adopted parameter was 40 Hz frequency, modulated at 50%, pulse width of 200 µs and motor threshold intensity, which was identified by visible muscle contraction.

### Intervention Type

Other

### Phase

Not Applicable

### Primary outcome(s)

1. All treatment groups showed an improvement in pain, according to the Visual Analogue Scale (VAS), after physiotherapy. The laser ( $p=0.001$ ) and laser + TENS groups were significantly better ( $p=0.005$ ) than the control group.
2. According to the RDC/TMD questionnaire, there was an improvement in the laser ( $p=0.016$ ) and laser + TENS ( $p=0.008$ ) groups compared to the control group.
3. Surface electromyography (sEMG) showed improvements in all treatment groups when comparing pre-treatment and post-treatment, but only the laser + TENS group showed improvement in both the masseter and temporal muscles in relation to the control group. The range of joint motion significantly increased only for the mandible retraction movement in the laser group ( $p=0.003$ ).

### Key secondary outcome(s)

1. There were no significant changes of the variables before and after treatment in the control group. Only the variable pain, measured by the VAS, increased from 2.0 points in the initial assessment to 4.44 points in the final assessment.
2. All treatment groups showed a significant improvement in pain, according to the VAS, after treatment. The laser + TENS group had a mean initial score of five, which was reduced to one in the final assessment. In relation to the control group, only the laser and laser + TENS groups had significantly lower values (in the laser group,  $p=0.001$ ; in the laser + TENS group,  $p=0.005$ ).
3. For the pain results obtained by the RDC/TMD axis II questionnaire, only the TENS and laser + TENS groups were different in relation to the control. Within the groups, there were improvements in pain of 17.5 points in the initial assessment to 13.83 points after treatment in the TENS group ( $p=0.016$ ) and of 17.86 points to 13.43 points in the laser + TENS group ( $p=0.008$ ).
4. In relation to the electromyographic activity of the masticatory muscles, the laser + TENS group showed significantly better mean values in relation to the control group in the activation of the left temporal muscle ( $p=0.023$ ). For the right temporal muscle, the laser and TENS groups showed significant scores in relation to the control group ( $p=0.043$  and  $p=0.05$ , respectively). For the right masseter muscle, the TENS and laser + TENS groups showed significantly greater

electrical activity than the control group. Finally, the left masseter muscle showed similar results to the right masseter muscle, and activity was significantly greater in the TENS and laser + TENS groups. However, all treatment groups showed increased electrical activity in the masseter and temporal muscles in relation to the initial assessment.

5. The range of motion of the temporomandibular joint showed significant improvement during the mandibular retraction movement only in the laser group, increasing from 6.58 degrees in the initial assessment to 11.73 degrees in the final assessment ( $p=0.003$ ) and during the opening movement only in the laser + TENS group, in which there was an improvement from 12.52 degrees in the initial assessment to 16.79 degrees in the final assessment ( $p=0.02$ ).

**Completion date**

01/12/2010

## Eligibility

**Key inclusion criteria**

Temporomandibular joint dysfunction in patients with dental treatment

**Participant type(s)**

Patient

**Healthy volunteers allowed**

No

**Age group**

Adult

**Sex**

All

**Key exclusion criteria**

1. Volunteers that did not suffer from pain in the masticatory muscles,
2. Volunteers who experienced changes in surface sensitivity
3. Volunteers who had had some type of physical therapy treatment for TMD

**Date of first enrolment**

01/08/2010

**Date of final enrolment**

01/12/2010

## Locations

**Countries of recruitment**

Brazil

**Study participating centre**

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## Sponsor information

### Organisation

Lutheran University of Brazil (Universidade Luterana do Brasil) (Brazil)

### ROR

<https://ror.org/00kde4z41>

## Funder(s)

### Funder type

University/education

### Funder Name

Lutheran University of Brazil (Universidade Luterana do Brasil) (Brazil)

## Results and Publications

### Individual participant data (IPD) sharing plan

### IPD sharing plan summary

Not provided at time of registration

### Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
<a href="#">Participant information sheet</a>	Participant information sheet	11/11/2025	11/11/2025	No	Yes