Effect of occlusal splint on temporo-mandibular joint symptomatology

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Abstract

Aim: To evaluate the effect of hard occlusal splint for treatment of the patients of temporo-mandibular joint symptomatology – pain and mouth opening. Methods: On evaluation and examination, patients with temporo-mandibular disorders were selected whose impression was taken using Biostar material which was hard in consistency with 0.5mm x 125mm thickness was used to prepare occlusal splint. A total of 10 patients who were included in the study were assessed for pain using visual analog scale and improvement in mouth opening before and after splint therapy for 3 months. The mouth opening and pain were measured before using the splint. The prepared splint was delivered to patients. The patients were advised to use the splint regularly for at least 12 hours a day particularly during night. The mouth opening and pain assessment were done at one month, two month and three month follow up and were compared with base line values. Results: The mean mouth opening at baseline was 35.8±2.39 mm which increased gradually and significantly at each follow-up visit. There was a significant increase in mouth opening by 4.2 mm and 4.0 mm at 3rd month when compared to baseline and 1st follow up respectively. There were no subjects free of pain at baseline while at the final visit, most (80%) of the subjects were free of pain and only 20% patients had mild pain. Conclusions: Clinical response to the occlusal splint was good in patients who presented with pain and limited mouth opening.

Key words: Limited mouth opening; Occlusal splint; Temporomandibular joint pain.

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Introduction

Temporomandibular joint is a part of craniomandibular joint, called as ginglimoarthroidal joint where condyle articulates with cranium in glenoid fossa that is separated by articular disc which is fibrocartilageneous in nature (1). Functionally articular disc serves as a non-ossified bone that permits the complex movement of the joint during chewing, speaking and deglutition. Any problem in this anatomy will lead to immediate or delayed symptoms of Myofacial pain dysfunction syndrome [MPDS], internal derangement [ID] and Degenerative joint disease [DJD] (2). The most common condition affecting the temporomandibular region is the myofacial pain dysfunction disease, which is characterized by pain and masticatory muscle spasm with limited jaw opening. This needs conservative measures such as soft diet, analgesics and occlusal splint therapy. Temporo-mandibular disorders [TMDs] are a collective term that refers to problems involving the masticatory muscles, the temporo-mandibular joint or both. Before starting with any surgical intervention non-surgical management (3) provides with better understanding of the patient and pathologic condition to be repaired. Initial non-surgical phase extending from 3-6 months answers whether pain is of psychological origin, related to Para functional habits and enlightens accuracy of diagnosis. This phase also helps in reduction of pain, dysfunction and thus promoting healing. It is approached by 3 treatment modalities. These 3 modalities are concerned about acute pain, cyclic pain and chronic pain respectively. One of the three treatment modalities is directed towards patients with chronic pain caused due to previous tissue damage which after healing has changed the pattern from acute to chronic pain (4). Such type of chronic pain is also associated with functional disturbances of masticatory system for which stabilization occlusal splints are commonly used (5). When properly adjusted, they provide a good method of eliminating occlusal interferences, reducing neuromuscular activity, and obtaining stable occlusal relationship. Though effectiveness of stabilization is questioned, there is enough evidence of reduction of hyperactivity of elevator muscles using occlusal splints, which decrease muscle tone and reduce spasm. The present study aimed to evaluate the effect of hard occlusal splint for treatment of adult patients with temporomandibular joint symptomatology like pain and limited mouth opening.

Material and methods

The study was conducted on patients reporting to the department of Oral and Maxillofacial Surgery of PMNM Dental College and Hospital, Bagalkot, India.

Method of collection of data

Final sample for the present study constituted 10 subjects who agreed to provide written informed consent. Pain was assessed verbally using visual analogue scale and mouth opening by inter-incisal measurements at maximal. Pain was categorized based on visual analogue scale as absence of pain, mild, moderate and severe. Patents were asked to report pain on 10 rating scales as 0- no pain, 1-3 mild pain, 3-6 moderate pain 6-10 as severe pain. The following inclusion and exclusion criteria were considered in order to collect the final sample.

Inclusion criteria:
- Patients complaining of pain related to temporomandibular joint on palpating temporo-mandibular joint and external auditory meatus.
- Limited mouth opening less than 40 mm due to temporo-mandibular joint pain.
- Age group 25-35 years of age.
- Presence of complete dentition

**Exclusion criteria:**
- Patients with pain due to odontogenic or otitis infection.
- Presence of other conditions associated with temporomandibular joint symptomatologies like Eagle’s syndrome, Multiple myeloma, Multiple sclerosis.
- Patients with degenerative joint disease secondary to osteoarthritis or rheumatoid arthritis and those with marked impairment of the joint mobility.
- Patients with muscular pain (where a painful response was elicited upon palpation of the masticatory muscles) and Para functional habits like bruxism, nail biting, betel nut chewing
- Edentulous patients
- Patients who are systemically compromised and on medication

The patients supporting inclusion criteria were evaluated. Clinical examination of temporomandibular joint and radiographs were taken (panoramic and TMJ view - open and closed mouth) for all the subjects those who met the inclusion and exclusion criterion (3), temporomandibular joint pain was considered as present when the temporomandibular joint showed tenderness to palpation through external auditory canal (6) while a mouth opening of less than 40mm was considered as limited mouth opening. On evaluation and examination, patients with temporomandibular disorders with symptoms were selected for treatment and follow up was done for 1st, 2nd and 3rd month.

Cast model of the patient was prepared on which splint was prepared.

**Splint preparation procedure**
Impression was taken with alginate material and cast poured with gypsum. Biostar material, hard in consistency of 0.5mm x 125mm thickness was selected for preparing an occlusal splint over the cast. The cast was oriented in biostar machine with biostar material covering over the cast, the code of biostar material according to thickness and consistency was 101 indicating 20 seconds each for burning and cooling. The code was entered in biostar machine which automatically fixes the adequate temperature to burn.

After adequate burn of material to efficient temperature and cooling, cast was removed with the adapted biostar material from the biostar machine. Excessive biostar material, that was found over the cast was cut and trimmed to fit adequately over occlusal surfaces of teeth till the necks of the teeth. The prepared splint was delivered to patients and examined for any impingement or irritation over soft tissues. Patients were questioned after occlusal splint use regarding discomfort with the use of splint during follow up visit. Patients were advised to use splint regularly for at least 12 hours a day particularly during night and were advised to keep splint in water when not using.

**Statistical methods**
One way ANOVA was used to assess statistical difference between mouth openings at baseline and subsequent follow ups. Post hoc Tukey cramer test was used for multiple comparison of mouth opening at baseline and each follow ups.

**Results**
The mean values for mouth opening before splint application and at different follow ups are presented in table 1. The mean mouth opening at baseline was 35.8±2.39 mm which increased gradually and significantly at each follow-up visit. At third visit, mouth opening was observed to be 40±2.10 mm.
Occlusal splint!!! Respite or an encumber?

**Table 1:** Mouth opening at baseline and subsequent follow-ups

<table>
<thead>
<tr>
<th></th>
<th>Mean ± Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>35.8±2.39</td>
</tr>
<tr>
<td>1st follow-up</td>
<td>36.0±2.49</td>
</tr>
<tr>
<td>2nd follow-up</td>
<td>38.4±2.45</td>
</tr>
<tr>
<td>3rd follow-up</td>
<td>40.0±2.10</td>
</tr>
</tbody>
</table>

One way ANOVA, p<0.001

Table 2 presents intergroup comparison at different follow ups. Post hoc Tukeys test revealed significant difference between baseline and 3rd month during which mouth opening increased by 4.2 mm. Moreover, a significant 4 mm increase in mouth opening was observed at 3rd month follow up when compared to 1st follow up.

**Table 2:** Intergroup comparison in mouth opening at different follow-ups and baseline

<table>
<thead>
<tr>
<th></th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td></td>
</tr>
<tr>
<td>1st follow-up</td>
<td>-0.2</td>
</tr>
<tr>
<td>2nd follow-up</td>
<td>-2.6</td>
</tr>
<tr>
<td>3rd follow-up</td>
<td>-4.2*</td>
</tr>
<tr>
<td>1st follow-up</td>
<td></td>
</tr>
<tr>
<td>2nd follow-up</td>
<td>-2.4</td>
</tr>
<tr>
<td>3rd follow-up</td>
<td>-4.0*</td>
</tr>
<tr>
<td>2nd follow-up</td>
<td></td>
</tr>
<tr>
<td>3rd follow-up</td>
<td>-1.6</td>
</tr>
</tbody>
</table>

*Post hoc Tukeys Cramer test, p<0.05

Table 3 shows the severity of pain assessed by visual analog scale at different follow ups. It is clear from table 3 that 60% subjects experienced severe pain at baseline which disappeared on subsequent visits. Moderate pain was reported by four (40%) subjects at baseline while there were no subjects with this kind of pain at 2nd and 3rd follow-ups. It was interesting to note that there were no subjects free of pain at baseline while at the final visit, most of the subjects were free of pain and 20% (2) subjects had mild pain.

**Discussion**

Temporomandibular joint syndrome are primarily of muscle origin (8), stretched or contracted muscle for a period of time may eventually result in painful symptoms and even exhibit tenderness (9). Though muscles of mastication are culprits of over stretching and contractions, some of the authors believe that lateral pterygoid is primarily involved because of its role in deviation of the mandible (7).

Various studies have been done regarding the effect of occlusal splint on temporomandibular joint symptomatology. Clinical evidence supporting the existence of occlusal splint treatment modality in reducing the temporomandibular symptomatology was provided by Carraro et al., (4). It is difficult to predict the outcome in an individual patient at the beginning of treatment in the early stage. The major objectives of wearing a splint are to reduce mechanical loading on the articular surfaces (10) and to address hyperactivity of the masticatory muscles (11). Few of the studies have reported that chances for dysfunctional symptoms are more towards improvement than towards complete remission and concluded that both pain and symptomatology were benefitted with occlusal splint therapy and similar results were observed in our study (3,4,7).

Huber et al., concluded in his study that visual analogue scale is more accurate in pain intensity rating demonstrating intense sensory pain levels so in our study pain levels were recorded with visual analogue scale (12). Greene et al., revealed that the splint therapy was
effective in management of TMJ symptomatology of the treated patients with 87% positive response (13) and in our study there was an 80% reduction in pain following splint therapy for 3 months.

Mouth opening was assessed by inter incisal measurement by Zawawi et al., who strongly suggest that the ability to position three finger in the mouth during dental examination is a convenient index when assessing normal maximum mouth opening (14). Sensitivity of this method was questionable because of variability of finger size according to sex, age and individuals. Considering these limitations we have employed caliper to measure inter-incisal distance (3). Our study revealed a mean increased mouth opening of about 5mm within three month duration of splint therapy which is in favor of another study by Kai et al., (3) in which the mean increase in inter-incisal distance was 17mm. This difference can be attributed to the long term follow up of 1 year.

Though significant results were observed in the present study, the precise role of occlusal splints cannot be outstated based upon these study results as there are limitations such as short follow up periods and small sample size which should be focused in future studies.

Conclusions

It was observed from the study findings that clinical response to hard occlusal splint was good in patients who presented with pain and limited mouth opening. Pain was severe and mouth opening was very limited at baseline which became better compared with each follow-up visit. Thus, it can be concluded from the study that the stabilization occlusal appliances can be used as a short term treatment modality for temporomandibular disorder.

References

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