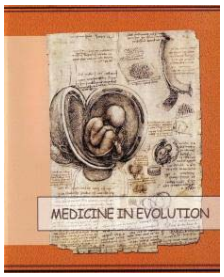
Quality of life evaluation of symptomatic TMJ patients during and after occlusal split therapy



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Abstract

Objectives: Temporomandibular disorders is a pathology that involve temporomandibular joint and masticator muscle. Numerous studies showed that TMJ pain is the second most common chronic musculoskeletal condition after chronic low back pain. In patients with TMJ pathology splint are used very often to release the pain and to put the mandible in centric relation.

Materials and methods: For evaluation of the impact of splint therapy in the patient's quality of life we have investigated 26 adult patients. We decided to use the qualitative statistical approach to evaluate the changes in the patient's quality of life, since it is a qualitative perception rather than a quantitative one.

Results: We compute the mean value m_1 of the patient's evaluation at question number 1 at each appointment. This parameter allows as to check the progress of the treatment and consequently the improvement of patient condition. We noticed a significant improvement of symptomatology.

Conclusion: Patients that experience moderate pain at the beginning of the treatment are wearing the splint for more than 16 hours per day (grade 7 average), and those with severe pain for more than 20 hours per day (grade 9average).

The most important thing is that on 90% of these cases, with severe and moderate pain, the pain disappears completely after 8 weeks.

Keywords: Temporomandibular joint pain, temporomandibular disorders, splint, disc displacement

INTRODUCTION

Aim and objectives

Temporomandibular disorders is a pathology that involve Temporomandibular joint TMJ and masticator muscle. Pain is the most prevalent symptoms in TMJ disorders and difficult to evaluate because of individual difference that could appear.

Since 1934 when ENT doctor Costa related TMD to dental malocclusion splint therapy is considered to be an effective treatment for temporomandibular disorders. [1]

The temporomandibular mandibular joint is a synovial joint and involves two separate synovial joints with upper and lower compartment which must act in unison. [2]

There can be a significant difference in the occlusion when it is dictated by the teeth versus when it is dictated by the condyles. In diagnosis and treatment planning for orthodontic patients CO-CR discrepancies are very important and they can change completely the treatment plan [3]. Different studies suggest that could be a direct correlation between CO-CR discrepancies and the probability that a patient will develop TMD pain [4,5] in the facial region is associated with temporomandibular disorder (TMD) in 70% of the time. [6]

The temporomandibular joints (TMJs) it is used in mastication and jaw mobility, and in verbal and emotional expression. Temporomandibular disorders (TMDs) include several disorders that can lead to orofacial pain symptoms. [7]

Numerous studies showed that TMJ pain is the second most common chronic musculoskeletal condition after chronic low back pain. TMJ pain can interfere with individual's daily activities, psychosocial functioning, and quality of life. It is important to accurately diagnose these complex temporomandibular disorders in order to provide the best clinical care. Both clinical history and examination, augmented as indicated with imaging, are needed for excellent TMJ intra-articular diagnoses. [8]

In cases of persistent and recurrent pain, TMD may follow a chronic course. In these cases, although TMD is not a life-threatening disease, the patients' quality of life may be reduced. [10]

TMD disorders are classified using the research diagnostic criteria (RDC) for temporomandibular disorders (RDC/TMD). The most prevalent sign and symptoms for TMD disorders are: TMJ pain and clicking, reduced range of motion, mandibular deviation during opening and closing. [8] TMD could be associated with headache, ear-related problems or cervical spine dysfunction. Temporomandibular clicking is reproduced by a distinct sound of cracking and appear when the condyle hits a mechanical obstacle. Also, it is important to make a differential diagnostic of the pain in cervical-facial region. In case of facial pain due to TMD, pain is increased during mastication. [3]

Okesson (2008) classified orofacial pain as physical (Axis 1) and psychological (Axis 2).[8]

Epidemiological studies showed that TMD are very common among adults but also in pediatric patients. Patients with joint problems complain about pain in the joint and ear regions, whereas patients with muscular pain usually describe pain in a more generalized area [9].

A stable TMJ joint is defined as that in which both the right and left condyles sit in the uppermost position in the temporal fossa with the disc in between while the upper and lower teeth are in maximum intercuspation with multiple equal contacts between tooth. [11]

Orthopedic instability which means that centric relation does not coincide with centric occlusion is main cause of pain in the cervical-facial pain. Since pain in the cervical region could be generated by many pathological conditions, we would focus in our study on pain caused by disfunction at the level of temporomandibular joint.

For patients with facial pain it is very important to establish a multidisciplinary approach for a successful treatment.

Many TMJ pain are related to the discrepancy between centric occlusion CO and centric relation CR. TMD treatment protocol for the pain related to CO-CR discrepancy can be performed with 3D printed splint which has to be adjusted every week in order to let the condyle reposition in the most anterior and superior position at the level of TMJ. This is a full coverage splint, suggested by Roth in 1983, with full contact on molars and premolars, with 0.005 shim stock clearance in the mandibular canine and incisor regions. [12] 3D printing is a new technology with a particular resonance in dentistry which will become an important tool for all dental fields. In patients with TMJ pathology splints are used very often used to release the pain and to put the mandible in a centric. [13]

The qualitative study reported here focuses on treatment goals and outcomes of importance to patients, and device acceptability, contextualized within individuals' experiences of their specific medical condition.

MATERIALS AND METHODS

Data for this study were collected from a survey conducted at our clinic (during 2018–2019) with adults and adolescents, more than 16th years old, who were treated with occlusal splint therapy. Qualitative approaches are well suited to the investigation of pain, inclusion criteria were patients 16 years old with TMD associated with pain. They all have discrepancy between centric occlusion and centric relation and TMJ instability. Patients present a TMJ disfunction with pain or clicking or both of this symptom. Participants were selected to be able to give informed consent.

A number of 26 patients were evaluated by a single examiner who was trained and calibrated for diagnosis according to criteria of Axis I of the Research Diagnostic Criteria for TMD (RDC/TMD). After evaluation we made a proper diagnosis and a treatment plan. In our study all of the patients were treated with splint therapy.

Our orthodontic treatment protocol of the TMJ instability includes:

1. Precise diagnostic using extra oral pictures, end oral pictures, CBCT, MRI, mounted models, clinical evaluation by an orthodontist.
2. Treatment plan was done according to precise objectives for facial aesthetic, dental aesthetic, periodontal health, TMJ, evaluation of the airways. Treatment plan was done with splint, which was adjusted every week, followed by orthodontic treatment.
3. Every 2 weeks patients received a questioner with 5 questions, and they have to respond with number from 1-10.

According to Barros et al., orofacial pain has a great impact on the quality of life of individuals with TMD, with no difference between genders. However, there is a clear correlation between the severity of TMD and the impact on the quality of life of individuals with TMD seeking treatment. [14]

For evaluation of the impact of splint therapy in the patient's quality of life we have investigated 26 adult patients. We decided to use the qualitative statistical approach to evaluate the changes in the patient's quality of life, since pain it is a qualitative perception rather than a quantitative one. In order to use such methods, as described in [15] the first necessary step is to quantize the qualitative representation and transformed it in a numerical representation on which traditional statistical method may be applied for evaluation.

At the beginning of the treatment as well as every 2 weeks, the patient is requested to evaluate the change in their quality of live by answering the following questions:

1. Do you hear a click noise in the TMJ area? Evaluate from 1 to 10 where 1 means very powerful noises and 10 means no noise.
2. Do you feel any pain in the cranio-cervical area? Evaluate from 1 to 10 where 1 means strong pain and 10 means no pain.

3. How long during the day did you wear the splint? Evaluate from 1 to 10 where 1 means did not wear it at all and 10 means 24 hours/day
4. How do you evaluate the improvement regarding the cranio-cervical pain from the last appointment? Evaluate from 1 to 10, where 1 means in changed in bad, and 10 means in changed in good.
5. Please evaluate your satisfaction regarding the ongoing treatment. Evaluate from 1 to 10 where 1 means very unhappy w and 10 means excellent.

We centralized all data and we constructed a matrix A, where each element a_{ij} represents the patient evaluation of the question ***i*** at the appointment ***j***. Having these elements, we further proceed with statistical analysis and interpretation of the collected data.

RESULTS

1. Improvement of TMJ click sound

We compute the mean value m_1 of the patient's evaluation at question number 1 at each appointment. This parameter allows as to check the progress of the treatment and consequently the improvement of patient condition.

$m_1 = \Sigma_{i=1}^{N} a_{i1}/N$, where N is the total number of patients

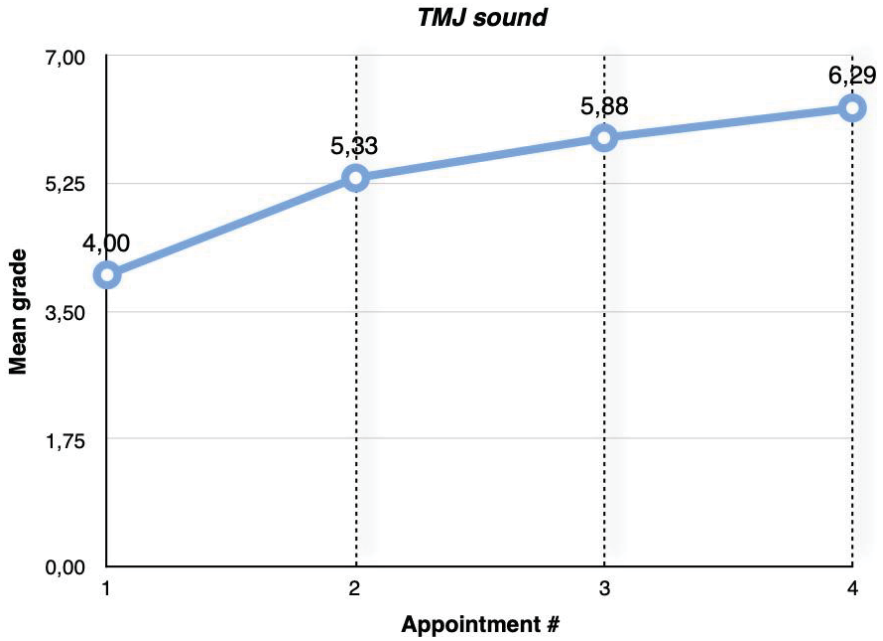

Figure 1. TMJ sound evaluation

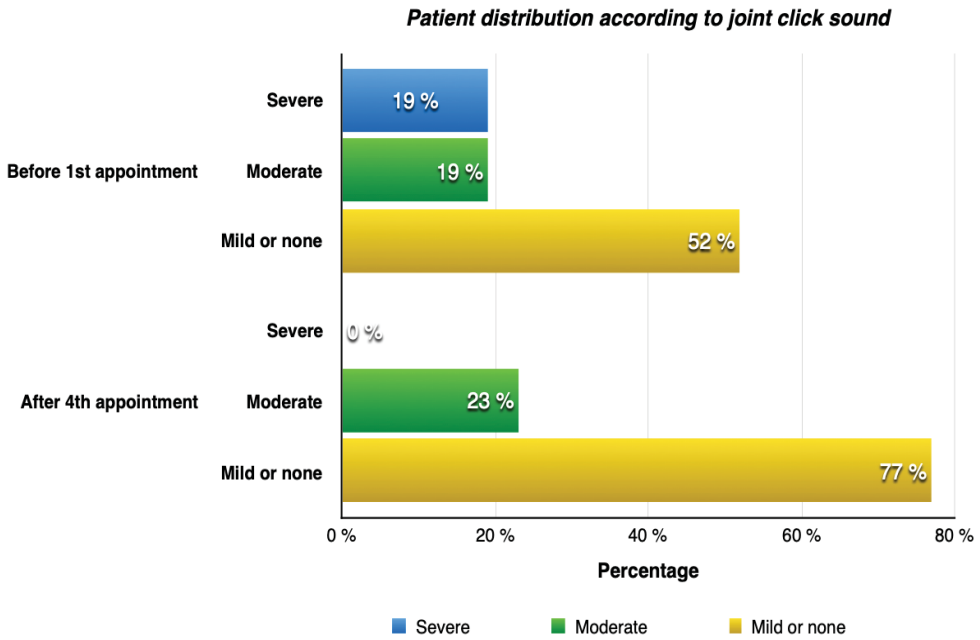

Figure 2. Patients distribution according to joint sound level

The results are presented in Figure 1. We can notice a significant improvement on the average patient perception about the TMJ click sound during mastication and speech. Patients who presented a late click at the beginning experience the best improvement at the click. In some patients with a late joint sound the click disappeared but in other patients with an earlier joint sound clicking was still present.

We are also interested to evaluate how the treatment has improved the quality of live on the investigated group of patients, and more precisely how many patients have a better perception over the TMJ sound improvement. In this context, we have established 3 levels of joint sound:

- **Severe** - corresponding to scoring from 1 to 3
- **Moderate** - corresponding to scoring from 4 to 7
- **Mild and no sounds** — corresponding to scoring from 8 to 10.

We evaluated each patient answer to question 1 before the first appointment and after the 4th one and classified them according to the 3 groups above. The percentage of patients in each group have been evaluated at the beginning of the treatment and after 4th appointment. The results are presented in Figure 2, and we can observe a dramatic improvement, in the group of patients with severe sound, the clicking has disappeared after 4 appointments and the group of patients with mild or no sound has increased significantly from 52% to 77% of all patients.

2. Pain evaluation

We compute the mean value m_4 of the patient's evaluation at question number 4 at each appointment.

$\boxed{m_4 = \Sigma_{i=1}^{N} a_{i4}/N}$, where N is the total number of patients.

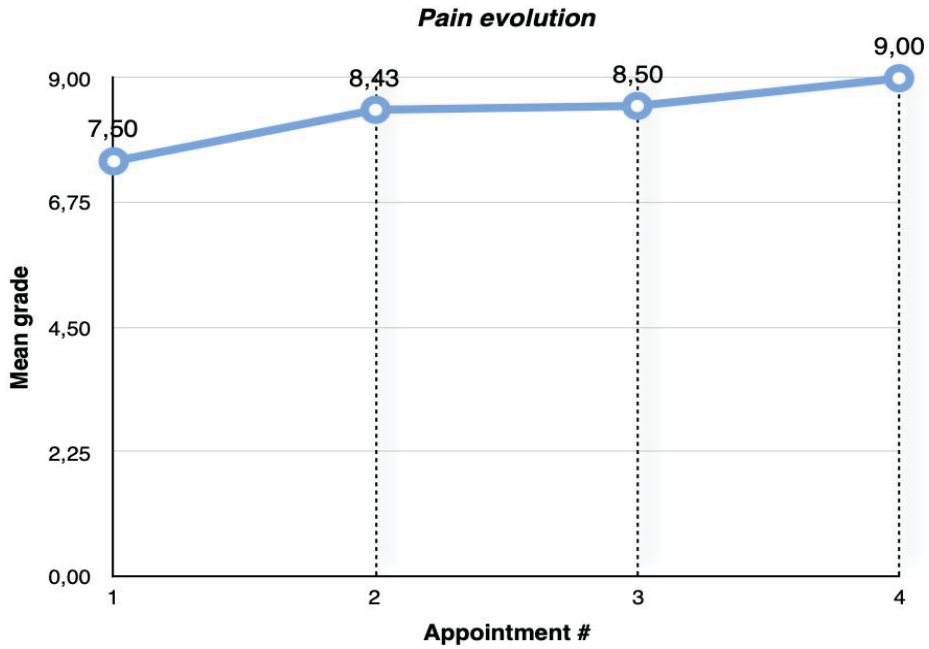

Figure 3. Pain evolution

Results are presented in Figure 3. We can clearly see that the perception of pain is much less after just 4 appointments, from a moderate pain on average to mild-no pain value on average. Pain is the most important factor in degradation/improvement of the patient quality of live and therefore the result clearly show that the split therapy drastically decreases the pain level on symptomatic TMJ patients.

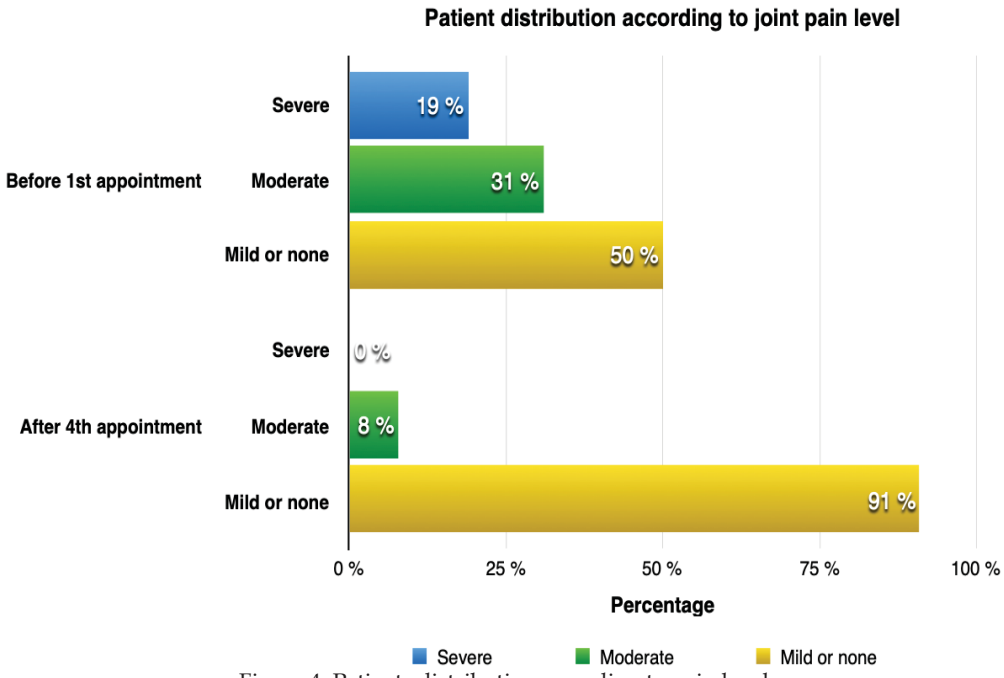

Figure 4. Patients distribution according to pain level

Were also interested to evaluate the effect of the therapy on the quality of live on the investigated group of patients, and we investigated how many patients have a better perception over the pain after the treatment. In this context, we have established 3 levels of pain level:

- **Severe** - corresponding to scoring from 1 to 3
- **Moderate** - corresponding to scoring from 4 to 7
- **Mild and painless** – corresponding to scoring from 8 to 10.

We evaluated each patient answer to question 2 before the first appointment and after the 4th one and classified them according to the 3 groups above. The percentage of patients in each group have been evaluated at the beginning of the treatment and after 4th appointment.

The results are presented in Figure 4, and we can observe again a dramatic improve, the group of patients with severe has pain disappear after 4 appointments and the group of patients with mild or no pain has increased significantly.

3. Patient satisfaction

During and after the therapeutic phase the patient satisfaction is the ultimate indicator of the treatment success. In this respect we evaluate the average patient satisfaction with the treatment by computing the mean value m_5 of the patient's evaluation at question number 5 at each appointment.

$\boxed{m_5 = \Sigma_{i=1}^{N} a_{i5}/N}$, where N is the total number of patients

The results are shown in Figure 5, where we can notice a significant improvement over the patient satisfaction during the 4 appointments. After the first appointment this indicator is rather low because of the initial discomfort cause the splint wearing, combined with a rather small decrease of pain and joint sound at this stage of the treatment. At the 4th appointment we can notice a high increase of patient satisfaction because at this stage, the improvement on general state (much less pain and less joint sound) has much bigger impact on the patient well-being than the discomfort cause by splint wearing.

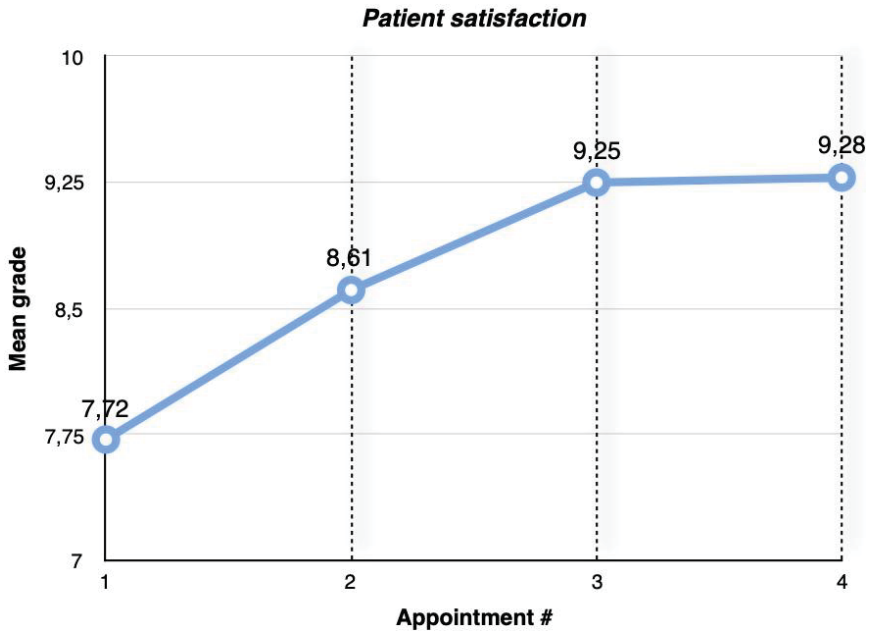

Figure 5. Patient's satisfaction evaluation

DISCUSSIONS

The purpose of this study was to evaluate patient's satisfaction after splint therapy.

CO-CR discrepancy can produce TMD and pain. Current literature stated that anteroposterior condylar position might be related with TMD. In a previous study, the

condyle was positioned more posteriorly in Class II, division 2 patients, and this might cause severe TMD by more physical loading. [16] Previous study demonstrated that adequate temporomandibular space would be necessary to avoid excessive compression of the disc. [17]

In this study authors demonstrate that pain and joint sound could be improved with the use of splint therapy as shown in other studies before. Also, that quality of life of patient treated Another study suggests that TMJS should be investigated for orthodontic patients to prevent TMD. [18]

For patients who have TMD pain or an unstable musculoskeletal position, orthodontists can consider resolving the TMD symptoms before any orthodontic treatment has begun. Internal derangement of the temporomandibular joint (TMJ) can be treated using a full-arch maxillary stabilization splint. [19.20]

Deprogramming splint therapy followed by occlusal equilibration treatment could improve symptoms in patients with TMD.

TMD pain could interfere with everyday activities like speaking and eating. Pain could be located in the ear region, could be muscular pain at the temporal zone or in the cervical aria. Splint therapy is the first choice in improving this type of patient quality of life.

CONCLUSIONS

The splint therapy protocol requires that earring time to be 24 h per day except the when brushing and cleaning the teeth. However, this recommendation is not respected fully by all patients and we want to evaluate in our study the impact of splint wearing time on the TMJ pain amelioration.

First conclusion we quickly saw was that in the case of patients that experience mild to no pain at TMJ level at the begging of the therapy (pain scoring from 8 to 10) the splint wearing time is in average 4.8, meaning less than 12 hours per day. For these patients the discomfort caused by the splint wearing is more important since the pain does not exists. On the contrary the patients that experience moderate pain at the beginning of the treatment are wearing the splint for more than 16 hours per day (grade 7 average), and those with severe pain for more than 20 hours per day (grade 9 average).

But the most important thing is that on 90% of these cases, with severe and moderate pain, the pain disappears completely after 4 appointments.

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