

The differences in severity of temporomandibular joint disorder before and after orthognathic surgery



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Abstract

Objective: The aim of this study was to analyze the differences in the severity of Temporomandibular Joint (TMJ) disorders before and after orthognathic surgery.

Material and Methods: This type of research is analytical observation with 10 subjects, who will perform orthognathic surgery at the Oral and Maxillofacial Surgery section in the Dental and Oral Hospital and Hasan Sadikin Hospital, then perform TMJ clinical examination with the Helkimo index, filling out the Fonseca questionnaire before and after orthognathic surgery and Cone Beam Computed Tomography (CBCT) photos 7 months after orthognathic surgery. Statistical analysis

using paired data test (Wilcoxon test).

Results: The results of the paired data test calculation showed that there was a difference in the degree of severity before and after surgery which was statistically significant with results- $p < 0.05$ where after surgery there was a decrease in the severity of TMJ with using the Helkimo index and the Fonseca questionnaire.

Conclusion: Orthognathic surgery can reduce the severity of temporomandibular joint disorders, assessed by Helkimo index and Fonseca questionnaire.

Keywords: Fonseca questionnaire, Helkimo index, Orthognathic surgery, The severity of TMJ disorders

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Introduction

According to Okeson, one of the causes of Temporomandibular Joint Disorder (TMD) is skeletal malocclusion. Malocclusion is defined as a condition of dental irregularity or dental arch that is not ideal or abnormalities that can be associated with unsatisfactory aesthetic or functional function. The prevalence of malocclusion in Indonesia is still high, namely around 80% of the total population and is one of the major oral health problems after dental caries, temporomandibular joint disorders and periodontal disease.¹⁻³

Malocclusion can cause functional compromise, especially class III skeletal malocclusion or mandibular prognathism, such as disorders of the masticatory joints which can cause complaints in the form of pain and aesthetics. Patients with a mandibular prognathism or class III skeletal malocclusion have unstable occlusion, and usually accompanied by mandibular deviation that causes a high burden on the Temporomandibular Joint (TMJ) resulting in temporomandibular joint disorders. The mandibular prognathism requires that treatment is not sufficient with orthodontic treatment alone to correct TMD, but requires orthognathic surgical treatment accompanied by continuous followup care so that TMD can be corrected properly. Orthognathic surgery can improve TMJ symptoms for many patients who had no symptoms before surgery, however that in class

III malocclusion patients with TMD symptoms who underwent orthognathic surgery caused a decrease in TMJ symptoms.⁴⁻⁶

Orthognathic surgery is widely performed to correct dentofacial deformities that cause malocclusion in patients. Management of orthognathic surgery requires surgical preparation in the form of orthodontic treatment and various surgical techniques such as (Lefort Osteotomy 1,2 and Bilateral Sagittal Split Osteotomy or BSSO).⁷⁻⁹ Several experts have made various examination designs for temporomandibular joint disorders due to the broad and multifactorial etiology of temporomandibular joint disorders, including Helkimo index, Craniomandibular index, and Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD). The Helkimo index is an index that is often used compared to other indexes because it can describe easy temporomandibular joint disorders and includes risk factors for temporomandibular joint disorders.¹⁰

Subjective examination for TMD using the Fonseca questionnaire. This instrument is easy to apply for detecting TMD and can classify patients according to the severity of their TMD. Campos et al. recommends the use of the Fonseca questionnaire because it is simple, effective and accurate.¹¹ Diagnosing temporomandibular disorders can be done with investigations using radiographic examinations to strengthen clinical

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Table 1. Helkimo index and Fonseca Questionnaire

Symptom	Criteria	Score
Impaired range of movement	Normal range of movement	0
	Slightly impaired mobility	1
	Severe impaired mobility	
Impaired TMJ function	Smooth movement without joint sound and deviation ≤ 2 mm	0
	Joint sound in one or both joints and deviation ≤ 2 mm on opening or closing	1
Muscle pain	Locking or luxation of joint	5
	No tenderness to palpation	0
	Tenderness to palpation in 1-3 sites	1
TMJ pain	Tenderness to palpation in 4 or more sites	5
	No tenderness to palpation	0
	Tenderness to palpation in 1-3 sites	1
Pain on movement of the mandible	Tenderness to palpation in 4 or more sites	5
	No pain on movements	0
	Pain on 1 movement	1
	Pain on 2 more movements	5

Questions number	Questions number (Answer – No, Sometimes – Yes)
1	Is it hard for you to open your mouth?
2	Is it hard for you to move your mandible from side to side?
3	Do you get tired/muscular pain while chewing?
4	Do you have frequent headaches?
5	Do you have pain on the nape or stiff neck?
6	Do you have earaches or pain in craniomandibular joints?
7	You open your mouth?

Table 2. Normal value of condyle distance against fossa glenoid

	Sagittal Section		Coronal Section
Anterior Joint Space	1.3 mm	Lateral Joint Space	1.8 mm
Superior Joint Space	2.5 mm	Central Joint Space	2.7 mm
Posterior Joint Space	2.1 mm	Medial Joint Space	2.4 mm

examination. A large amount of literature has been published showing that CBCT has the advantage of accurately imaging the temporomandibular joint by measuring the volume and surface of the condyles and is helpful in treating patients with temporomandibular joint dysfunction.¹² The aim of this study was to analyze differences in the severity of TMJ disorders before and after orthognathic surgery in patients. in the Oral and Maxillofacial Surgery Section of Hasan Sadikin Hospital and Dental Hospital Padjadjaran University.

Material and Methods

This study used data collection based on purposive sampling conducted from December 2019 to August 2020 in the oral and maxillofacial surgery of Hasan Sadikin Hospital and Unpad Dental Hospital. All study subjects received the same pre and post orthognathic surgery treatment. The total sample in this study was 10 samples. All samples were subjected to clinical examination before and after orthognathic surgery using the Helkimo index Table 1 which assessed impaired range of movement, pain when moving the jaw, impaired TMJ function, temporomandibular joint pain and muscle pain.¹⁰

The next examination, namely anamnesis before and after orthognathic surgery using Fonseca questionnaire, the patient was asked to choose one answer: yes, no, or sometimes. Each "yes" answer is given a score of 10, 'sometimes' is given a score of 5, and 'no' is given a score of 0. The results of all the answers are then accumulated and used to assess the degree of severity of TMD.¹¹ Table 1.

Additional examination as a supporting examination is by CBCT 7 months after orthognathic surgery by looking at the shape of the condyle and the TMJ calculation on CBCT seen from the ratio of anterior, superior, posterior, lateral, central joint space, media with a ratio of 1:2:1 in normal conditions Table 2.¹² All examination results are collected and data processed using statistical analysis Wilcoxon test. This research has obtained the approval of the research ethics commission of Padjadjaran University Bandung number 295/UN6.KEP/EC/2020.

Results

The results of the study of 10 samples with skeletal malocclusion who had undergone orthognathic surgery obtained 7 (70%) of 10 samples with pain disorders when moving the jaw before surgery, as many as 6 (85.7%) samples experienced improvement after orthognathic surgery, 9 (90%) of 10 samples experienced clicking sound before surgery, 1 (11.1%) samples of clicking complaints disappeared after surgery, 6 (60%) of 10 samples had complaints of TMJ pain before surgery, 1 (16.6%) samples felt pain TMJ disappeared after surgery, and 7 (70%) of the 10 samples complained about the limitation of maximum opening of the mouth and the limitation of moving the jaw laterally before surgery, 5 (71.4%) samples had an increase in maximal opening after surgery.

The percentage for assessing TMJ dysfunction

Table 3. Statistic before and after orthognathic surgery with Wilcoxon - Mann/Whitney test

	Before Surgery	After Surgery
No Dysfunction	1	2
Mild Dysfunction	0	7
Moderate Dysfunction	4	1
Severe Dysfunction	5	0

After Surgery: No dysfunction (20%), Mild dysfunction (70%), Moderate dysfunction (10%)

Table 4. Statistic before and after orthognathic surgery with Wilcoxon -Test

	Before Surgery	After Surgery
No Dysfunction	2	9
Mild Dysfunction	5	1
Moderate Dysfunction	3	0
Severe Dysfunction	0	0

After Surgery: No dysfunction (90%), Mild dysfunction (10%)

Table 5. Percentage of TMJ dysfunction from clinical symptom examination

	Sagittal		Coronal
AJS (Anterior Joint Space)	right:2,20mm; left: 2,16mm	LJS (Lateral Joint Space)	right:1,96mm; left: 2,39mm
SJS (Superior Joint Space)	right:2,30mm; left: 2,56mm	CJS (Central Joint Space)	right:2,22mm; left: 2,51mm
PJS (Posterior Joint Space)	right:1,94mm; left: 2,03mm	MJS (Media Joint Space)	right:2,27mm; left: 2,65mm

using the Helkimo index was obtained from 1 (10%) sample without TMJ dysfunction to 2 (20%). Mild TMJ dysfunction to 7 (70%), moderate TMJ dysfunction from 4 (40%) to 1 (10%), and no sample had severe TMJ dysfunction after orthognathic surgery.

The results of the analysis of the paired data test calculations (before and after) with the Wilcoxon test found that there were differences in the degree of severity based on the Helkimo index before and after orthognathic surgery which was statistically significant with p-result (0.0013) <0.05 where after surgery there were there was a decrease in the severity of the TMJ [Table 3](#).

Anamnestic examination using the Fonseca questionnaire obtained results from 10 samples, there were 2 (20%) samples who did not experience TMJ dysfunction before surgery and increased to 9 (90%) samples who did not experience TMJ dysfunction after surgery, 5 (50%) samples with Mild dysfunction before surgery was reduced to 1 (10%) sample with TMJ dysfunction after orthognathic surgery, and 3 (30%) sample with moderate TMJ dysfunction to none had moderate TMJ dysfunction after orthognathic surgery.

The results of the paired data test calculation

(before and after) with the Wilcoxon test found that there was a statistically significant difference in the severity of the TMJ before and after surgery with a result-p (0.0011) <0.05 where after surgery there was a decrease in the severity of TMJ [Table 4](#).

The supporting examination performed in this study was using CBCT TMJ 7 months after orthognathic surgery. TMJ image shows that the condyle shape in 10 samples is conical / normal. The image of the TMJ position when the condyled mouth is located in the glenoid fossa 7 samples, and 3 samples of the left condyle are located more anteriorly and laterally than the glenoid fossa. The average distance between the glenoid fossa and the condyles in the sagittal and coronal sections is not normal [Table 5](#).

Discussions

The results of this study showed that there was a decrease in TMD in patients, this is in accordance with the opinion of Kim et al, stating that (66%) class III malocclusion patients who experienced TMD before surgery showed improvement after retreating the mandible, and showed a decrease in TMD symptoms.¹⁷ Complaints of TMJ pain in this study there was no decrease, because according to Sefidroodi et al.¹³ that the Helkimo index is not able to clearly determine pain because it only assesses the facial expression and patient response, and can also be caused by the different sensitivity of patients to the pressure applied during the examination, so that it can lead to less significant results on TMJ palpation examinations. Kim had the same results as this study, (66%) class III malocclusion patients who had TMD before surgery showed improvement after retreating the mandible, (11.6%) showed a decrease in TMD symptoms.^{7,13}

Proffit et al and Panula et al. found that similar to this study, changes in complaints of clicking sounds were not significant within 7 months due to the morphological and histological changes of TMJ requiring long adaptation. Clicking sometimes does not improve due to changes in the contact surface due to movement of the proximal segment, rigid or semirigid fixation after surgery can cause rotation or tilt of the condyle axis, causing displacement of the condyle which affects condyle function.⁶

The Fonseca questionnaire is a simplified history-taking index that allows identifying TMD and simultaneously classifying patients according to TMD severity, so this questionnaire is often used for the examination of TMD.¹⁴ Pahkala and Kellokoski studied 82 patients with TMD and reported that orthognathic surgery reduced TMD

effectively. Kim et al, said 7 (70%) patients who had at least one of the preoperative symptoms showed improvement after 7 months after surgery.⁷ Previous studies indicated that there was a large difference between doctors' opinions about TMD symptoms after orthognathic surgery, because they needed additional examinations. to detect TMD using the Fonseca questionnaire.¹⁵

CBCT is a supporting examination to see the best TMJ condition, so this study adds CBCT examination after orthognathic surgery. The results of the CBCT study showed that there was still TMD in all patients, this is in accordance with a study conducted by Holzinger et al, of 16 patients who underwent orthognathic surgery then performed CBCT 1 year after orthognathic surgery, there was no significant change in condyle position against glenoid fossa. because the condyles require adaptation of the environment around the TMJ to a new position, and many other factors can influence the position of the TMJ. The drawback of this study is that it does not compare the appearance of the condyles to the glenoid fossa with CBCT before and after orthognathic surgery.^{12,15}

Conclusions

Orthognathic surgery can reduce the severity of temporomandibular joint disorders for patients in the Departments of Oral and Maxillofacial Surgery Hasan Sadikin Hospital and Dental Hospital Padjadjaran University. The helkimo index assessment and the Fonseca questionnaire showed a consistent and very significant reduction in the severity of the temporomandibular joint disorder. Observation over a longer period of time accompanied by CBCT photo analysis is necessary to see changes in the anatomy of the temporomandibular joint.

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Conflict of Interest

The authors report no conflict of interest.

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