

Pattern and causes of temporomandibular joint ankylosis: A 6-years retrospective study

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Research Article

Keywords: Temporomandibular joint ankylosis, maximum mouth opening, TMJ

Posted Date: April 14th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1546484/v1>

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Abstract

Aim: This retrospective study aimed to investigate the cause and pattern of temporomandibular joint (TMJ) ankylosis in patients who have been treated for this condition at a major urban teaching hospital.

Methods and Materials: In this study, we reviewed all the patients treated for temporomandibular joint ankylosis for six years at an urban teaching hospital between 2015 to 2021 who had sufficient information available. Demographic information as well as etiology and pattern of ankylosis, the time lapse between injury and treatment, concomitant facial injury, fragment displacement, prior condyle treatment, mouth opening before and after treatment of ankylosis, complications, and position of the ramus stump or hemicondyle in relation to the glenoid fossa, follow up period, and physiotherapy before and after ankylosis treatment.

Results: Among 32 patients with 45 involved joints, with an average age of 29.90 ± 17.08 years, mostly between 20-29 years old ($n=10$); the leading cause of temporomandibular joint ankylosis was trauma with $n=25$ (78%). The ratio of men to women was 23 to 9, and the ratio of bilateral involvement to unilateral ones was 13:9. The most common chief complaint of the patient was restricted mouth opening with $n=24$ (75%). Twenty-four patients had complete temporomandibular joint ankylosis. The mean of maximum mouth opening before surgery was 0.95 ± 0.45 cm, which increased significantly to 4.50 ± 0.50 cm ($p < 0.001$) after treatment.

Conclusions: This study showed that trauma was the most common cause of temporomandibular joint ankylosis in the studied patients. The most common chief complaint of the patient was the limitation of mouth opening. The results of this study also have shown that TMJ ankylosis is more common in men than women, and surgery is significantly effective in improving the function of TMJ in these patients.

Background

Temporomandibular joint ankylosis is a pathological condition in which the temporomandibular joint function is impaired and is associated with a reduction in maximum mouth opening [1, 2]. Maximum mouth opening can be a measure to explain the severity of ankylosis [3]. A decrease in the maximum mouth opening can impair the regular diet, speaking, and oral hygiene, resulting in increased dental caries and periodontal problems in patients [4–7]. TMJ ankylosis can be life-threatening when patients urgently need intubation. In developing patients, TMJ ankylosis can lead to facial deformity; if TMJ ankylosis is unilateral, it causes asymmetry of the mandible and its deviation of the jaw towards the injured site, and if it is bilateral, it can prevent adequate growth of the mandible [8]. Different criteria are used to classify the TMJ ankylosis (location, type of involved tissue, maximum mouth opening [4, 9, 10]. Various reasons can cause TMJ ankylosis, such as trauma, local and systemic infections, rheumatoid arthritis, Paget's syndrome, burns, local surgery neoplasm, and structural malformation [11, 12]. Some studies have offered different hypotheses about the pathogenesis of this disorder; to prove any of them, precise information is not available. The prevalence of TMJ ankylosis in developing countries such as India is

higher than in developed countries, which can be attributed to the appropriate and timely treatment of maxillofacial trauma and appropriate antibiotics to treat recurrent otitis media in developed countries [13]. Multiple techniques are used to treatment of TMJ ankylosis. This paper aimed to analyze the pattern and causes of temporomandibular joint ankylosis in patients with a history of TMJ ankylosis who underwent surgery.

Methods

Ethical statement

The ethical committee of the Shiraz University of Medical Science approved the study protocol (IR.SUMS.DENTAL.REC.1400.018). All methods were performed per the Declaration of Helsinki and a written informed consent was obtained from all subjects and/or their legal guardians.

Data Collection

From 2015 to 2021, 32 patients diagnosed with TMJ ankylosis were treated in the oral and maxillofacial divisions of teaching hospitals of Shiraz University of medical sciences. Data analysis included the etiology of TMJ ankylosis, gender distribution, age group of patients, location (unilateral versus bilateral and left-right inpatients), maximal interincisal opening, various treatment modalities, and complications in the postoperative period. The preoperative assessment included detailed patient history, physical and radiological examinations, and maximum mouth opening (MMO), measured between the upper and lower incisal edges and was recorded in millimeters using a caliper. All patients were operated on under general anesthesia using a standard preauricular approach with temporal extension when a temporalis myofascial flap was used. The questionnaire will contain patient information and measurements taken in the follow-up and information in the records of patients referred to the teaching clinics of the university. Data were presented as mean \pm s d for continuous variables and count (%) for categorical Variables, respectively and summarized in tables and figures. Paired sample t-test was used for comparing the month opening before and after treatment. All data were analyzed via SPSS for Windows, Version 16.0. Chicago, SPSS Inc.

Results

In this study, the information was collected from 2015 to 2021. finally, the information of 32 patients with temporomandibular ankylosis was included in the study and analyzed. The age range of patients 4 to 74 years with a mean age was $29/90 \pm 17/08$ years, most of which belonged to the age group of 20 to 29 years with a frequency of 10 people (31/3%). 71/9% were men. The ratio of men to women was 23 to 9. Demographic characteristics are summarized in table 1.

The frequency distribution of the cause of ankylosis, unilateral versus bilateral and left-right in patients, is shown in Table 2. This table showed that the most common cause of trauma was 78/1% (n=25). Bilateral / Unilateral ratio 40/6% to 59/4% it was. In terms of left and right, 34/4% (n = 11) was left, 25% (n = 8)

was right and others (n = 13) on both sides was involved. Regarding the type of previous condylar fracture, most cases were related to intracapsular fracture with 53.3% (frequency n = 24). The details of this analysis are shown in table 3. Figure 1 shows the frequency of complete or incomplete ankylosing in patients. The criteria in the study were maximum mouth opening greater than and less than 5 mm. Based on this, out of 32 patients, 24 patients had complete temporomandibular joint ankylosis. The duration between injury to treatment is highly variable and varies from one year to 41 years. The mean was 10.25 ± 11.14 years. Follow-up time after treatment varied from 1 month to 6 years, or a mean of 2.42 ± 1.43 years, or the middle was two years. The frequency distribution of the cause of the trauma is summarized in table 4, which was mostly related to car-motorcycle accidents. The patient's main complaint frequency was summarized in table 5. The results showed that the most chief complaints were related to mouth opening limitation alone, about 75%. Table 6 shows the frequency distribution of treatment type, jaw relationships, and Ramus position relative to the glenoid fossa. The results of this table show that the highest frequency of surgical intervention was (57/78%) that related to Condylectomy together with Coronoidectomy, and in terms of the occlusion highest frequency of occlusion (50.0%) belongs to class 2 and in terms of Ramus position compared to glenoid fossa 75% of all subjects were middle position. In 6 out of 32 patients, 18.75% had complications due to surgery, such as drooping eyebrows and eyelids and incomplete closure of the lips. The average maximum Mouth opening before surgery was 0.95 ± 0.45 cm which increased significantly to 4.02 ± 0.50 cm ($p < 0.001$) figure 2.

Discussion

Temporomandibular joint ankylosis (TMJA) is one of the disorders that can impair the function of the masticatory system [14]. TMJA usually occurs in the first and second decades of life. According to a study by Elgazzar, the prevalence of TMJA was higher in patients aged 11-20 years [15]. Also, in a study conducted by Gaurav et al. on 44 patients with TMJA, it was reported that about two-thirds of the patient were under 15 years old [6]. However, in our study, we reported that the most affected age group belonged to the age of 20-29 years with a frequency of 10 people (31/3%); we think this discrepancy is because, in our study, the age of the patients was recorded at the time of treatment and not at the onset of the disorder.

The prevalence of TMJA in men is often higher than in women. In our study, 71/9% of patients were male, and the ratio of male to female involvement was 23 to 9.

Many reasons can lead to TMJA. Various studies have identified trauma as the common cause of TMJA. For example, in a study by Roychoudhury in India, trauma was an etiological factor in 86% of cases [7]. Also, in a study conducted by Zhi et al. In china, trauma was the cause of the TMJ ankylosis in 83.33% of patients [16]. In our study, trauma was the cause of TMJA in 78/1% of patients, and in most cases, trauma was caused by motor-car accidents (n=13). Different criteria are used to classify the TMJ ankylosis (location, type of involved tissue, the extent of the fusion). In our study, we used the extent of the fusion. According to this system, a patient with a maximum mouth opening lower than 5 mm is considered complete ankylosis, and a maximum mouth opening of more than 5 mm is considered

incomplete ankylosis. Based on this, out of 32 patients, 24 patients had complete temporomandibular joint ankylosis.

Untreated fractures of the zygomatic arch can cause extracapsular temporomandibular joint ankylosis. In our study of 25 patients with 33 involved joints with temporomandibular joint ankylosis due to the trauma, n=1 patients had an untreated zygomatic arch fracture without any condylar fracture. Among the other 24 patients with 32 involved joints, TMJA was caused by condylar fracture; in 30 condyles, the fracture pattern was intracapsular, and in 2 condyles, it was extracapsular. A study was performed by Long X et al. on the relationship between temporomandibular joint ankylosis and condylar fractures; the results showed that ankylosis is usually caused by intracapsular injuries [17]. Also, According to a study conducted by Dongmei He et al. on the 40 involved joints, the condylar fracture pattern in 37 joints was intracapsular [18]. Miyamoto et al. concluded from an animal study that intracapsular condylar fracture increased the risk of ankylosis of the TMJ [19]. In our study, the leading chief complaint of patients was a restriction in mouth opening. In all of the studies performed on patients treated for TMJA, maximum mouth opening increased significantly after surgery. Westermark reported 12 patients with TMJ ankylosis treated based on this study; maximum mouth opening in patients with ankylotic joints improved from 3.8 mm before surgery to 30.2 mm after surgery [20]. In our study, The mean of maximum mouth opening before surgery was 9/5 mm, which increased significantly to 40/02 mm after surgery. Therefore, to improve the quality of life of these patients, this disorder should be diagnosed and treated as soon as possible. The management of TMJA is very challenging [21]. Different techniques for the management of TMJA have been devised in studies [8]. Surgical interventions mainly include gap arthroplasty, interpositional arthroplasty, and hemi or total joint replacement [10, 22, 23]. In the present study, all patients were treated by gap arthroplasty with interpositional flap; condylectomy with coronoidectomy was performed in most cases.

Following surgery for treatment of TMJA, various complications such as re ankylosis, restriction in mouth opening the mouth, damage to the facial nerve, and malocclusion can occur, of which re ankylosis and mouth opening limitation are the most common [9, 24, 25].

Conclusion

TMJA was more predominant among males than their female counterparts in the present study. Of note, trauma was identified as the most common cause of TMJA. The majority of patients were surgically treated with condylectomy with coronoidectomy. We suggested that early detection and surgical intervention to release the ankylosed joint improves the patient's quality of life.

Declarations

Ethics approval and consent to participate: The ethical committee of Shiraz University of Medical Sciences evaluated and approved the study protocol (IR.SUMS.DENTAL.REC.1400.020). All methods were

performed per the Declaration of Helsinki and a written informed consent was obtained from all subjects and/or their legal guardians.

Consent for publication: Not applicable.

Availability of data and materials: The datasets generated during and analyzed during the current study are not publicly available since the manuscript has not been accepted yet, but are available from the corresponding author on reasonable request.

Competing interests: The authors state that they have no financial or non-financial conflicts of interest regarding this research.

Funding: The study was funded by investigators and did not receive external funding.

Authors' contributions: "HE, GM, ST, FS Methodology, investigation, writing- original draft preparation, FS, ST, and HE resources, writing-review and editing, project administration, funding acquisition, formal analysis. All authors have read and approved the final version of the manuscript."

Acknowledgments: This manuscript was extracted from a thesis by Fatemeh Salari as a part of fulfillment to obtain a DMD degree.

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Tables

Table 1. Age and gender distribution of patients.

Variables	Mean (sd) / count (%)
N	32 (100)
Age, year	29.90 ± 17.08 range (4 -74)
0-4	1 (3.1)
5-9	2 (6.3)
10-19	6 (18.8)
20-29	10 (31.3)mod
30-39	5 (15.6)
40-49	2 (6.3)
50-59	4 (12.5)
60+	2 (6.3)
Gender	
Male	23 (71.9)
Female	9 (28.1)

Table 2. Cause of ankylosis, Unilateral vs. Bilateral and left /right in patients with ankylosis.		
Cause of ankylosis		Count, (%)
Trauma		25 (78.1)
Congenital Pierre robin sequence		1 (3.1)
Dislocation of TMJ		1 (3.1)
Ear infection		1 (3.1)
Hyperplasia		2 (6.3)
Previous surgery		1 (3.1)
Seizure		1 (3.1)
Unilateral / Bilateral		19 (59.4) / 13 (40.6)
Position	Left	11 (34.4)
	Right	8 (25.0)
	Bilateral	13 (40.6)
Data expressed as the number (%) of patients		

Table 3. Distribution of Previous condylar fracture Extracapsular (below the neck) or Intracapsular (condylar head and neck) fracture

Previous condylar fracture	Count (%)
Extracapsular (below the neck)	2(4/4%)
Intracapsular (condylar head and neck)	24(53/3%)
No fracture	19(42/2%)
Total	45(100)

Table 4. Cause of trauma frequency

Cause of trauma	Count (%)
Car to Car Accident	2(8%)
FD	10(40%)
Motor Car Accident	13(52%)
Total	25(100%)

Table 5. Distribution of Chief complaint

Chief complaint	Count (%)
mouth opening	24 (75.0)
mouth opening /asymmetry	3(9/4%)
mouth opening/pain	1 (3.1%)
mouth opening/pain/asymmetry	4(12/5%)
Total	32 (100)

Table 6. Distribution of type of treatment, occlusion, the position of the ramus	
Variables	Count (%)
Type of treatment	
Condylectomy	11 (24/44%)
Condylectomy + Coronoidectomy	26 (57/78%)
Coronoidectomy	8 (17/78%)
Occlusion	
Class 1	9 (28.1%)
Class 2	16 (50.0%)
Class3	5 (15.6%)
Edentulous	2 (6.2%)
Position of the ramus	
Lateral	8 (25.0%)
Middle	24 (75.0%)
Medial	0(0%)

Figures

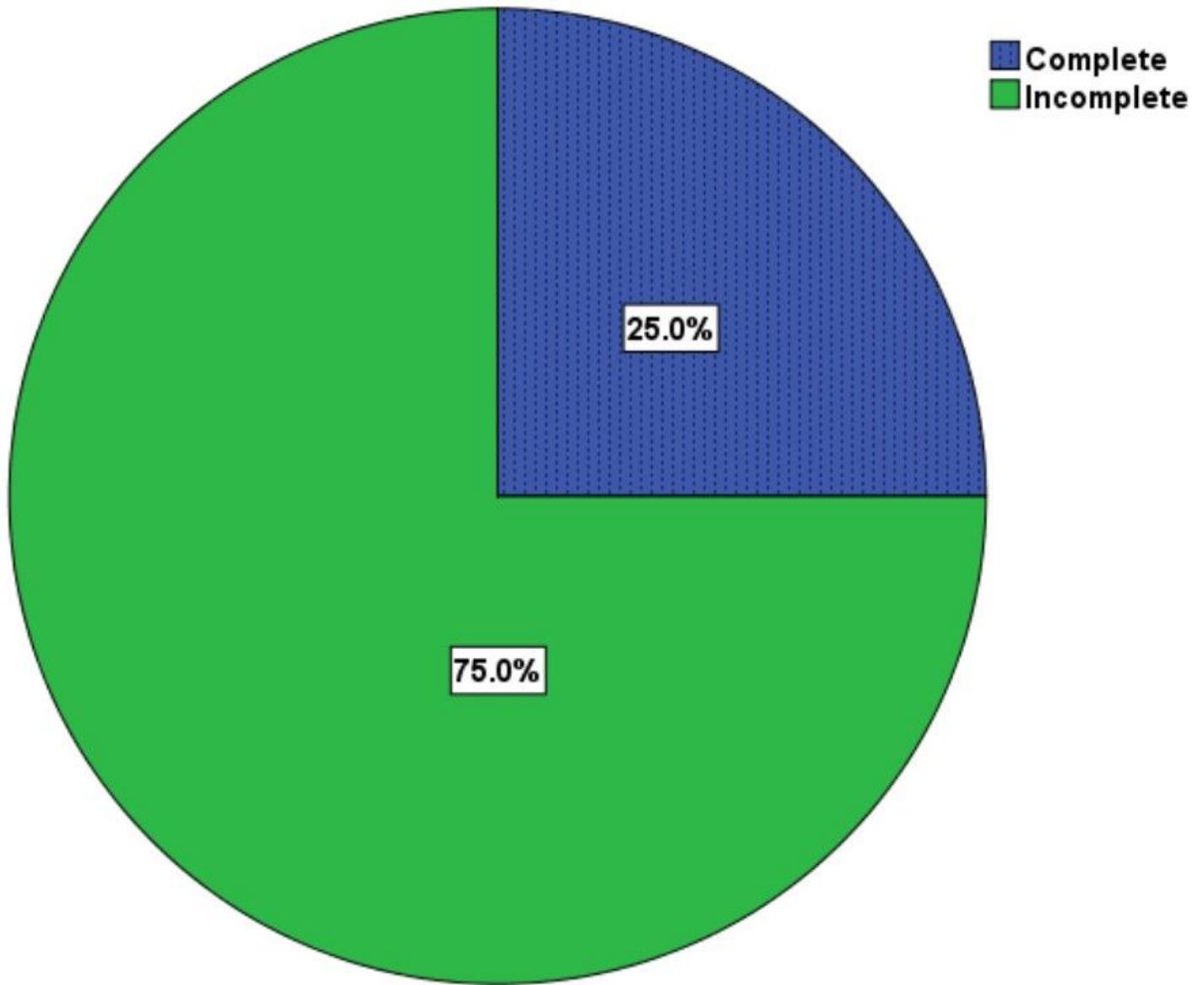


Figure 1

frequency of complete or incomplete TMJ ankylosis in patients.

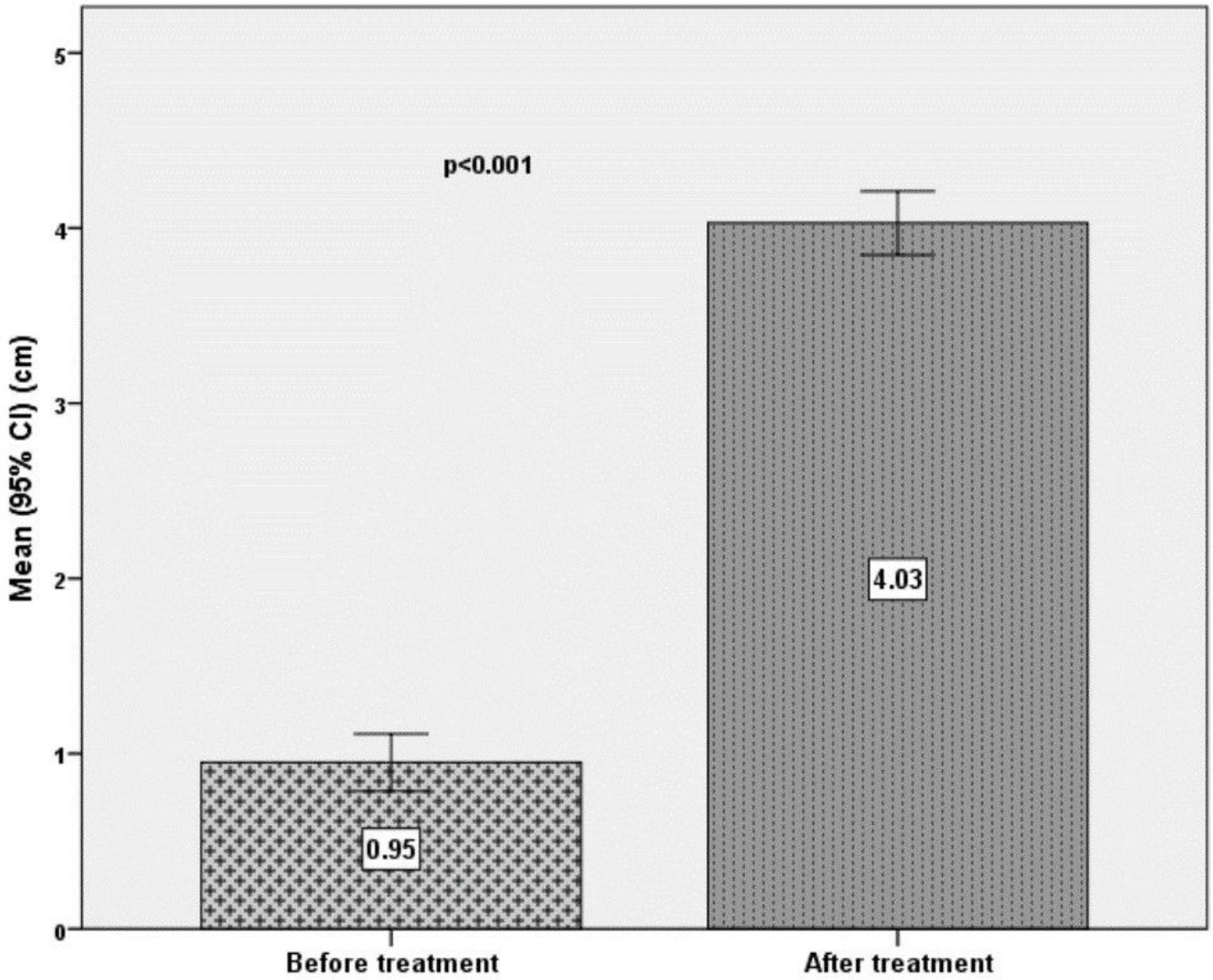


Figure 2

means of patient's maximum mouth opening before and after treatment.