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**INTERNATIONAL JOURNAL OF
 ADVANCED RESEARCH (IJAR)**

Article DOI: 10.21474/IJAR01/8300
 DOI URL: <http://dx.doi.org/10.21474/IJAR01/8300>



RESEARCH ARTICLE

ROLE OF PHARMACOTHERAPY AS DIAGNOSTIC THERAPEUTIC TEST IN MANAGEMENT OF PERSISTENCE OF PAIN ASSOCIATED WITH MYOFASCIAL PAIN DYSFUNCTION SYNDROME IN PATIENTS WITH ELONGATED STYLOID PROCESS.

Abeer Kamal¹ and Nesrine khairy².

1. Associate Professor of Oral and Maxillofacial Surgery, College Of Oral and Dental Surgery, Misr University for Science and Technology, Egypt.
2. Lecturer of Oral and Maxillofacial Surgery, Faculty of Dentistry, Cairo University, Cairo, Egypt.

Manuscript Info

Manuscript History

Received: 01 November 2018
 Final Accepted: 03 December 2018
 Published: January 2019

Keywords:

Styloid process, panoramic radiograph, myofascial pain dysfunction syndrome.

Abstract

Objectives: Study the response of cases with myofascial pain dysfunction syndrome (MPDS) associated with elongated styloid process to pharmacotherapy.

Patients and Methods: Thirty patients with 60 styloid process have been involved in the present study. They were suffering from MPDS. Styloid process length, angulation and morphology were assessed from the panoramic view bilaterally. Treatment plan for MPDS was started gradually from simple short period method (pharmacotherapy for two weeks), to conventional long period one (intraoral occlusal splint fabrication and insertion or therapeutic ultrasonic sessions for three months). The response to the treatment was used as diagnostic therapeutic test. Treatment outcome of patients with and without an elongated styloid process were compared using visual analog scale (VAS) and maximum interincisal mouth opening (MIO).

Results: Patients group with severely elongated styloid process (mean length 32.95 mm) showed no improvement after two weeks of treatment by drugs; so they subjected to intraoral occlusal splint fabrication or therapeutic ultrasonic sessions. The mean length of styloid process was 28.2 mm and mean angle was 60.73° in both sides of all subjects included in this study. Assessment of the styloid process morphology resulted in; 30 sides showed uninterrupted elongated pattern, 12 sides were pseudosegmented and 18 sides were segmented.

Conclusions: There was tendency for elongation of styloid process among patients with MPDS. Response of drug treatment in MPDS patients with elongated styloid process was questionable in this study, and the diagnostic therapeutic test is useful in detection of such cases. Persistence of pain among MPDS patients could be attributed to the elongation of their styloid process.

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Corresponding Author:-Abeer Kamal.

Address:-Associate Professor of Oral and Maxillofacial Surgery, College Of Oral and Dental Surgery, Misr University for Science and Technology, Egypt.

Introduction:-

Disorders of the temporomandibular joint are collective terms; included clinical problems involving temporomandibular joint and adjacent muscles. It can be classified either extra articular as Myofascial pain dysfunctional syndrome (MPDS) or intra articular as disk displacement⁽¹⁻³⁾. The symptoms of temporomandibular disorders (TMDs) included preauricular pain, limitation of jaw movement, joint clicking, muscle tenderness, or joint soreness, headache, earache and hyperacusis. The etiology of TMDs can be considered either environmental, social, biologic, cognitive or emotional. History of pain, physical examination followed by radiographic images was considered as the commonly used methods for diagnosis of TMDs.^(4, 5)

The styloid process is a cone-shaped thin, cylindrical, pointed bone that projects from the petrous part of the temporal bone. Three muscles and two ligaments originate from the styloid process; the most superior is the stylopharyngus muscle. The stylohyoid muscle originates near its inferior end. Styloglossus muscle arises from its tip. The ligaments that are directly related to the styloid process are the stylomandibular and the stylohyoid ligaments.⁽⁶⁻⁸⁾ The styloid process lying below the ear and anterior to the mastoid process. It exists between the internal and external carotid arteries, with the internal jugular vein and the glossopharyngeal, vagus, hypoglossal, and accessory nerves lying medial to it.⁽⁹⁾

Variations of the length of styloid process is a usual condition in the population, with average length of 25 mm. It is considered elongated when the length is greater than 30 mm. The apex of the styloid process is clinically important, because it is located between internal and external carotid arteries, just lateral to the tonsillar fossa, within the lateral pharyngeal wall. The stylohyoid ligament attached to styloid process tip and extends to the lesser cornu of the hyoid bone. It has been reported that styloid process with a length of 25 mm or more may induce Eagle's syndrome. It is characterized by multiple clinical symptoms. It includes craniofacial or cervical pain, dysphagia, sore throat, drooling, foreign body sensation, limited mouth opening, restriction of movements of the head and neck, dizziness, and in severe cases, vascular symptoms⁽¹⁰⁻¹⁵⁾. The clinical symptoms of an elongated styloid process can be misdiagnosed as temporomandibular myofascial pain dysfunction syndrome, glossopharyngeal neuralgia, salivary gland disease, or otitis media.⁽¹⁶⁾

Mineralized stylohyoid ligament has been presented radiographically in various forms. Langlais et al⁽¹⁷⁾ classified the elongated styloid processes and calcified stylohyoid ligament complexes appearance into 3 types: the Type I pattern represents an uninterrupted elongated styloid process (elongated); Type II pattern is characterized by a single pseudoarticulation (psudosegmented); it gives the appearance of an articulated elongated styloid process. Type III pattern consists of multiple pseudoarticulations (segmented). Another design of classification of elongation of the styloid process based on the pattern of calcification was proposed by the same author,⁽¹⁷⁾ there was 4 types: calcified outline; partially calcified; nodular; and completely calcified.

Different Treatment strategies have been proposed for management of MPDS, it included physical and behavioral approaches. Physically means comprise occlusal adjustment, intraoral occlusal splint fabrication and insertion, therapeutic ultra-sonic sessions and TMJ surgery. Behavioral modalities included biofeedback and stress management treatment as well as psychotherapy.⁽¹⁸⁾ It has been observed that patients with an elongated styloid process showed significantly less improvement mandibular opening without pain than did patients who did not have an elongated styloid process. Zaki et al⁽¹⁸⁾ suggested that the elongated styloid process might place structural limitations on pain-free maximum mouth opening and the result of this study support conservative management of patients with MPDS when an elongated styloid process is present.^(18, 19)

Problems associated with myofascial pain dysfunction syndrome may be confused with the complications related to the elongated styloid process or might aggravate its symptoms and the degree of its severity. The hypothesis of the present research was directed to detect the correlation between the presence of elongation of styloid process and symptoms of myofascial pain dysfunction syndrome. It also study the role of drug treatment as a diagnostic therapeutic test. It was hoped that the findings of this study might contribute in proper diagnosis and management of such problem.

Patients and Methods:-

Thirty patients with myofascial pain dysfunction syndrome MPDS were included in the present study. They were selected from those attending the out-patient's clinics, Faculty of Dentistry, Cairo University. They were examined

clinically and radiographically with panoramic radiograph. The study was approved by the institutional review board of the Faculty of Dentistry, Cairo University, Egypt. An informed consents were obtained from all patients. Clinical examination of the patients was performed according to Helkimo index. ⁽²⁰⁾ Structured form was created for data collection from all sample. Patient identification data and the results from the Helkimo index were recorded. Patients were analyzed based on the evaluation of three sub-indices: the first is symptoms of dysfunction, the second is the clinical dysfunction index, and the third is the analysis of dental occlusion.

The sample comprised 7 male and 23 females. Age ranged from 19 to 49 year with mean 29.7 year. They were complaining of pain or discomfort, limited mouth opening, clicking, and tenderness of the masticatory muscles, upper part of trapezius and sternomastoid muscles. No evidence of radiographic findings concerning the temporomandibular joints. Inclusion criteria: patients suffered from MPDS with the tenderness of muscles of mastication. Exclusion criteria includes: patients with internal derangement or with rheumatoid arthritis and pregnant female.

Radiographic assessment of the styloid process:

The panoramic radiograph was imported to Mimics software (Mimics Edition 15, materialize Innovations, Leuven, Belgium). The length of the styloid process was measured bilaterally in the panoramic radiographs, through straight line extending from the lowest point of the external acoustic meatus to the apex of the process. (Figure 1). The angle of the styloid process was measured in relation to the true horizontal line on both sides. The length and angulation were measured twice by the two researchers and the mean was obtained in order to disable the inter-observer error. The morphological image of the styloid process was attained and classified according to the classification proposed by Langlais ⁽¹⁷⁾ into uninterrupted elongated pattern, psudosegmented or segmentd.

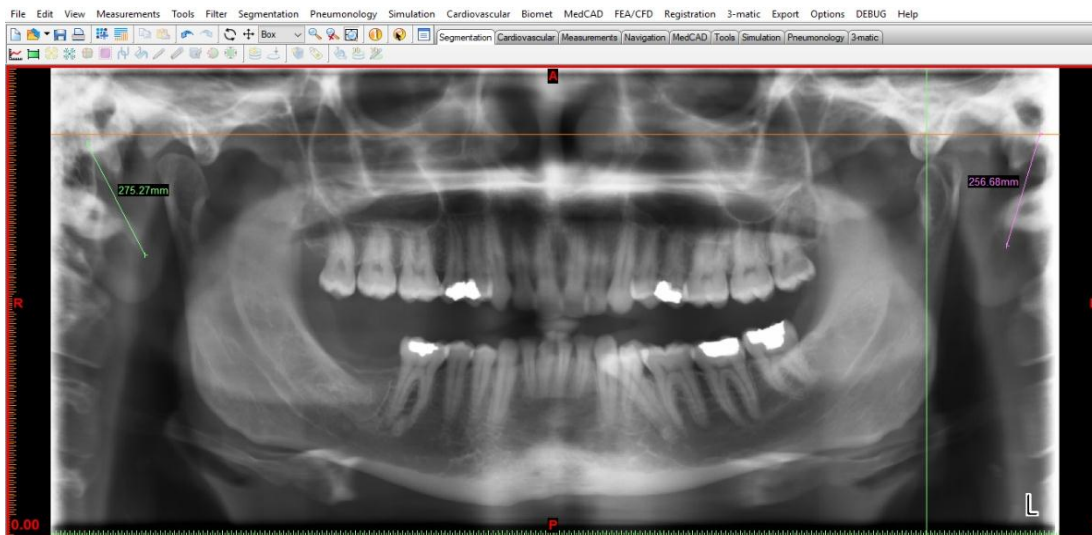


Figure 1:-Panoramic view displaying the measurements for styloid process bilaterally.

Diagnostic therapeutic test:

Pharmacotherapy were started as simple short time diagnostic therapeutic test for all the group for two weeks. It included, muscle relaxant (Mylogin capsule: chlorzoxane 250 mg, Paracetamol 300 mg. GlaxoWellcome), anxiolytics (Calmpam: Bromazepam 1.5mg. GlaxoWellcome) and non-steroidal anti-inflammatory drug (Cataflam: Diclofenac Potassium 25 mg. Novartis Pharmaceuticals). Intraoral occlusal splint fabrication and insertion or therapeutic ultrasonic sessions (10 sessions /every other day) were utilized as long time treatment method (three months) for cases that showed no response to drug treatment.

So the sample (30 patients) was distributed into two groups according to the response to the diagnostic therapeutic test: Group I contained 19 patients responded and recovered after the drug treatment and group II comprised 11 patients not respond to drug and needed the another treatment method.

Maximum interincisal opening (MIO) in millimeters and visual analogue scale (VAS) were recorded as calipers for comparison between the simple and long- time treatment options. The measurements of the two calipers were

recorded at three interval, before the start of treatment, two weeks and 3 months after the end of treatment. Correlation has been done between different therapeutic method and radiographic assessment of the styloid process using the two calipers MIO and VAS.

Statistical Analysis:

Pearson’s correlation has been performed to detect if there was significant difference between measurements of left and right sides of the sample. Data of length, angulation, and morphology of styloid process were analyzed among the examined group. T-Test for Independent means of length and angulation of the styloid process between the two treatment groups were performed. One-Way Analysis of variance (ANOVA) test for Repeated Measures were done for the significance of the treatment. P-value well set as significant when less than 0.05

Results:-

Results of radiographic assessment of the styloid process:

Regarding the assessment of the length of styloid process among the selected sample it was detected that the length of the right side ranged from 20.1 mm to 37.1 mm with mean 28.1 mm. At the left side the length was ranged from 21.22 mm to 37.18 with mean 28.3 mm. Evaluation of the angulation of styloid process revealed that, the angle of the right side ranged from 46.64° to 74,79° with mean 61.4°. At the left side the angle was ranged from 40.12° to 77.36° with mean 60.06°. Pearson’s correlation was detected that there was no significant difference between measurements of left and right in this sample. So the sample was considered to include 60 styloid process with mean length 28.2 mm and mean angle 60.73°.

Studying of the styloid process morphology resulted in; 30 out of 60 were uninterrupted elongated (50%), 12 out of 60 were pseudosegmented (20%) and 18 out of 60 were segmented (30%). (Table 1, Figure 2)

Table 1:-Percentage of morphology distribution of the right and left styloid process among selected group.

Shape	Uninterrupted elongated	Pseudosegmented	Segmented
Number	30	12	18
Percentage	50%	20%	30%

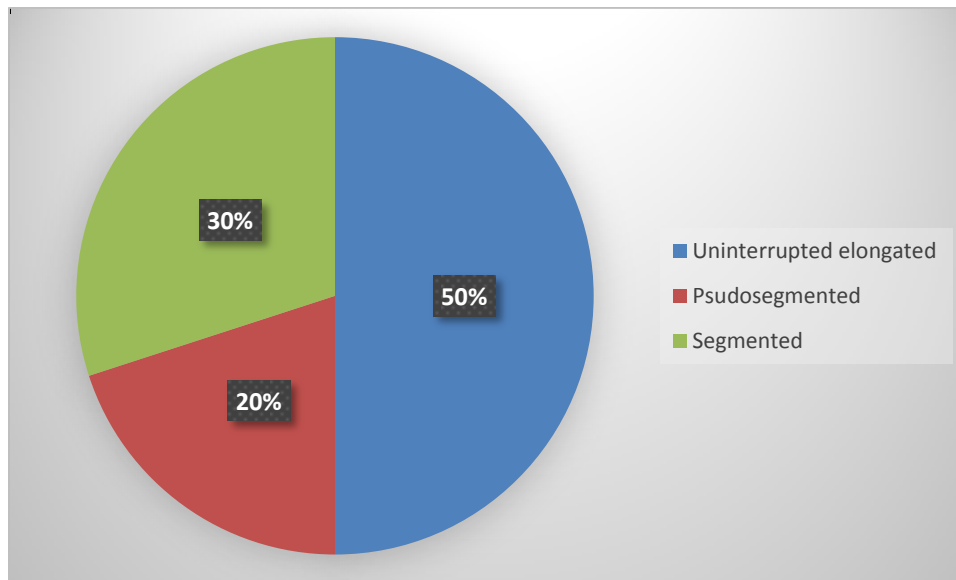


Figure 2:-Pie chart represented the percentage of morphologic distribution of the right and left styloid process among selected group.

Results of pharmacotherapy as diagnostic therapeutic test:

Follow up of the sample after 2 weeks from the start of pharmacotherapy indicated that 63.3% (19 patients) have recovered completely. The other 36.7% (11 patients) showed no response and were switched to other methods of treatments. (Table 2) They were 3 male and 8 females, with mean age 32 years. On comparison the results of length

and angulation of styloid process between the two groups, it was detected that the mean length was greater in group II (11 patients) than group I significantly with mean and standard deviation equal to 32.95+7.7 and p value < .00001. The angulation also greater but was not statistically significant. (Table 3 & Figure 3).

Table 2:-Dividing the sample into two according to the diagnostic therapeutic test.

	Group I	Group II	
	Pharmacotherapy	Splint	Ultrasonic
No. of Pt.	19	7	4
Percentage	63.3%	23.3%	13.4%

Table 3:-T-Test for Independent Means of length and angulation of the styloid process between the two treatment groups

	Mean length + SD	T	p-value	Mean angle + SD	T	p-value
Group I	22.65+4.47	9.75	< .00001	59.63+2.79	1.3	0.1
Group II	32.95+7.7			62.64+10.15		

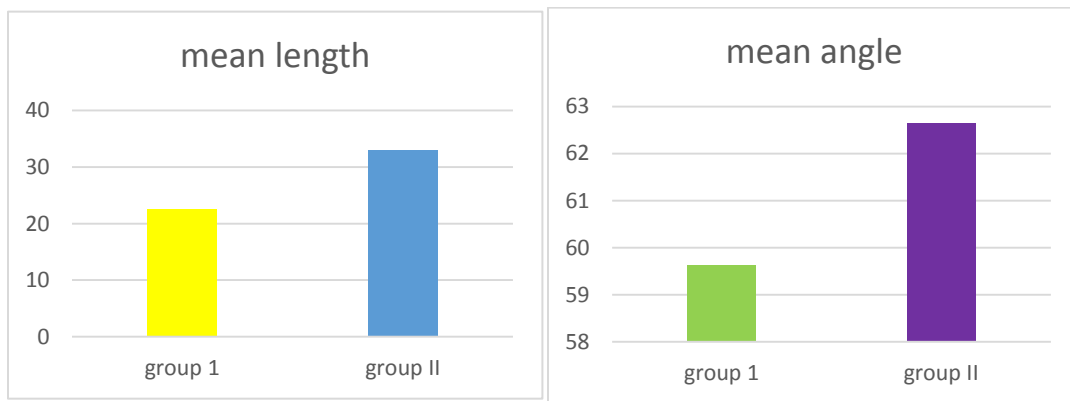


Figure 3:-Mean of the length and angulation between the two groups

Group I (patients improved after two weeks with drug treatment), (19 patients) (Table 2) the mean length of styloid process was 22.65 mm, and mean angulation was 59.63 °. (Table 3) The maximum interincisal opening increased significantly with p-value < .00001. The Visual Analogue Scale also was significantly decreased with p-value < .00001. (Table 4 & Figure 4). This progress also continue after 3 months with no complaints.

Table 4:-One-Way ANOVA for Repeated Measures for MIO and VAS for the group I after 2 weeks and 3 months follow up period

	MIO			VAS		
	pre	2 w	3m	pre	2 w	3m
Mean + SD	24.35 ± 5.58	33.59 ± 3.17	35.52 ± 2.55	7.84 ± 1.09	2.68 ± 1.03	1.63 ± 0.81
F-ratio	38.67			344.74		
p-value	< .00001			< .00001		

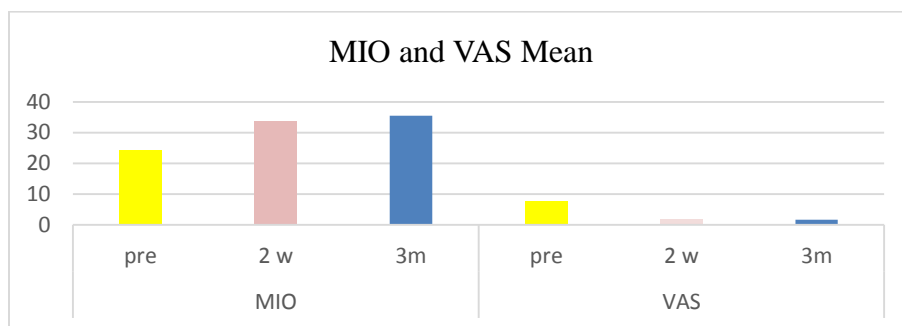


Figure 4:-Mean of MIO and VAS for group I after 2 weeks and 3 month

Regarding the remaining 36.6% (11 patients) (Group II), they were improved after 3 months with other treatments modalities. The mean length of the styloid process was 32.95 mm and angulation was 62.64° (table 4). Seven cases were improved after fabrication of occlusal splint. The remaining 4 patients their MPDS symptoms disappear after receiving 10 ultrasonic session every other day. The maximum interincisal opening was increased significantly after three months with mean 36.25 mm and p-value < .00001. Visual analogue scale also decreased significantly with p – value < .00001. (Table 5 & Figure 5).

Table 5:-One-Way ANOVA for Repeated Measures of MIO and VAS for the improved 11 patients (group II) after 3 months follow up period.

	MIO			VAS		
	pre	2 w	3m	Pre	2 w	3m
Mean + SD	22.9 + 3.72	22.82 + 3.98	36.25 + 2.17	8.18 + 0.83	8 + 1.13	1.1 + 0.67
F-ratio	53.57			366.17		
p-value	< .00001			< .00001		

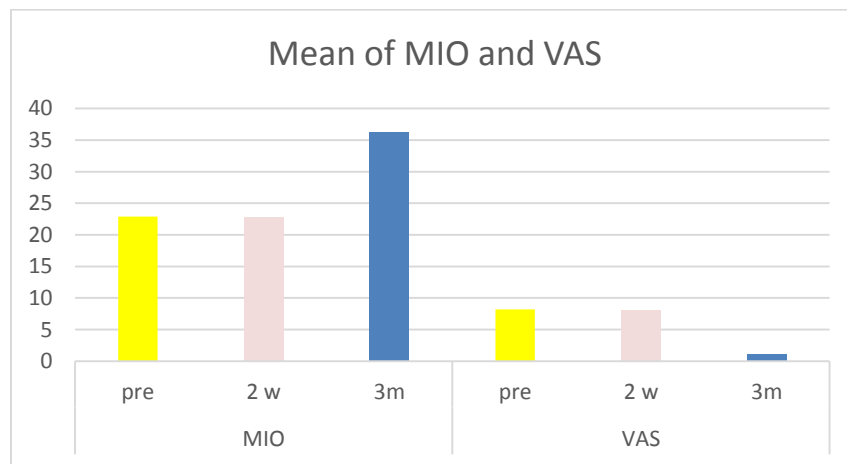


Figure 5:-Mean of MIO and VAS for group II after 2 weeks and 3 months

Discussion:-

Considerable attention has been directed to study diagnosis and different modalities for management of myofascial pain dysfunction syndrome; however the morphological changes that may occur in the styloid process due to or as a result of MPDS have been overlooked. Symptoms associated with the elongated styloid process, is rather difficult to differentiate or aggravate the MPDS. The present study focuses on assessment of the length, shape and angulation of the styloid process in patients sample suffering from myofascial pain dysfunction syndrome. The consequence of this research may contribute to exploration of the possible vague persistent complaint associated with some cases of MPDS. It will help in the selection of proper line of treatment for such group of patients.

The measurements of the styloid process in the present study was performed on panoramic radiographs by the use of Mimics software. It is more precise than measurements through direct tracing. For this reasons the obtained results is more accurate and reliable than previous studies^(8, 14, 21-26). Each radiograph was measured twice and the measurement is recorded automatically when the program displays the individual values for each patient. The means of the two measurements were then examined in order to exclude the possible individual human error between readings.

In this research the treatment plan was used as therapeutic diagnostic test. It was started from simple method (pharmacotherapy) for short period (two weeks) to conventional long period method (splint and ultrasonic for three months). It has been observed that cases of longer styloid process did not respond to simple method; this may indicate that the elongated styloid process may be considered as complicating factor in myofascial pain dysfunction syndrome. This hypothesis was supported by the findings of Zaki et al⁽¹⁸⁾

This study revealed that there was a tendency for elongation of the styloid process among patients with MPDS. This finding is in accordance with the Study of de Andrade et al ⁽²¹⁾. These data show that the elongation of the styloid process should not be considered a rare finding in adults and some consideration should be given to study these changes; especially in patients with MPDS, the incidence of elongation appears to be higher and require further explorations.

The current investigation emphasized that the causal and/ or the results of MPDS has a relationship with styloid process elongation. The disruption of muscle tone is considered as a major contributing factor in occurrence of MPDS, and it is the same factor responsible for the elongation of the styloid process too. There are three established theories, each of which attempts to explain the mechanism of TMJ pain dysfunction syndrome from a different perspective: the theory of occlusal disharmony, the psychological theory and the trigger point theory. Pressure on trigger point produce pain radiate to the particular area can be recorded and defined by the patient. This explanation is in concordance with many authors ^(18, 21, 27, 28).

In the present research the pain associated with MPDS might be aggravated by the elongate styloid process that usually induces contraction of the stylopharyngeal muscle with consequently stretching of adjacent cranial nerves. The ossification of stylohyoid ligament leads to irritation and proliferation of granulation tissue that compress the structures in this area. The styloid process and stylohyoid ligaments present in very overcrowded space that filled with numerous blood vessels and cranial nerves. Any elongation, angulation may result in inflammatory changes impinge on the surrounding important structure leading to pain sensation. This explanations is concordant with study of Josef et al ⁽²⁹⁾ Fini et al ⁽³⁰⁾ and Jain et al ⁽³¹⁾ as the ossification of muscular tendons lead to irritation and abnormal length associated with an abnormal angulation.

The results of this study showed the alterations in the morphology of the styloid process in patients with MPDS. It was observed that 50% of the patients presented with uninterrupted elongated type, 20% with pseudoarticulation and the remaining 30 % showed segmented type. This results are coexisting with the study of Ferrario et al ⁽²¹⁾ and de Andrade et al ⁽²¹⁾. The appearance of segmented and psudosegmented shape of elongated styloid process might be attributed to fracture and medialization of the ossified stylohyoid ligament, the disturbed repair associated with the continuous movements of the hyoid bone and proliferation of granulation tissue. This clarification is in accordance with Langlais et al ⁽¹⁷⁾, Fini et al ⁽³⁰⁾ and Jain et al ⁽³¹⁾. These data indicated that the morphological change of the styloid process should be considered on studying patients with MPDS. It can be concluded that the incidence of changes seems to be higher in this group of patients. Radiographic analysis must be obtain for assessment of the styloid process at various levels.

The coexistence of elongated styloid process with its signs and symptoms may explain the persistence of pain and dysfunction in some cases associated with MPDS. The difference in length of the styloid process might be the cause of persistence of pain in the second the group. This may cause irritation to the important anatomical structures. The tip of the styloid process may press on the carotid arteries, might be irritate the last four cranial nerves, and internal jugular vein or may extend to invade the tonsil causing painful symptoms. So it can be concluded that difficult cases of MPDS should direct the attention of surgeons towards the existence of elongated styloid process. The outcomes of the present study expand the viewpoints for the further research on this area regarding the myofascial pain dysfunction syndrome.

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