Journal of Research in Medical and Dental Sciences
2018, Volume 6, Issue 2, Page No: 240-244

Available Online at: www.jrmds.in
eISSN No. 2347-2367: pISSN No. 2347-2545

Investigating the Morphologic Indices of the Hamulus Pterygoid Process Using the CBCT Technique

Elham Romoozi[1], Seyed Hossein Razavi[2], Parisa Barouti[3*], Mitra Rahimi[4]

[1]Oral and Maxillofacial Radiologist, Kashan University of Medical Science, Kashan, Iran
[2]Assistant Professor, Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Shahid Sadoughi University of Medical Sciences, Yazd, Iran
[3]Dentistry Student, Shahid Sadoughi University of Medical Sciences, Yazd, Iran
[4]Graduate Dentist, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

DOI: 10.5455/jrmds.20186237

ABSTRACT

Location and length of hamulus process plays a very important role in the efficiency of muscles such as tensor veli palatine, palato pharyngeal, upper part of upper throat muscle and so on. Given the importance of information on the morphology of the hamular process and capabilities and usefulness of CBCT in the diagnosis of its structure, this study takes place with the goal of investigating the morphologic indices (indicators) of hamulus pterygoid process using CBCT. This study investigates the CBCT images of 201 patients with the average age of 37 years, 102 males and 99 females. The length and width of the hamulus process on the left and right was measured. Also, the slope of this process in the sagittal and coronal planes were studied. Then variables in question were measured by a CBCT viewer. Average length of hamulus pterygoid process on the right was found to be 6.4 mm and on the left it was 6.5 mm. Average width of hamulus pterygoid process on the right was found to be 1.34 mm and on the left it was 1.35 mm. The average slope of the hamulus pterygoid process in the sagittal plane on the right was found to be 55.9 ° and on the left it was 56.7° The average slope of the hamulus pterygoid process in the coronal plane on the right was found to be 65.7 ° and on the left it was 66.5°. Average length and width of the hamulus process on the two sides did not make a statistically significant difference. But the average slope in the sagittal and coronal plane on the left was significantly higher than the one on the right. Average length of hamulus pterygoid process on the two sides was significantly higher in men than women. Average width of hamulus pterygoid process and the slope in the sagittal and coronal planes did not make any difference on both sides in both genders. Average length, width and slope of hamulus pterygoid process in the sagittal plan reduces on both sides with increase in age. But the slope of the hamulus pterygoid process in the coronal plane did not make any significant difference in different age groups on both sides. The slope of pterygoid process was towards the lateral in and in the sagittal plane the slope was towards the posterior. The morphological evaluation of the hamulus pterygoid process in the CBCT images can contribute to the tracking and management of vague non diagnostic symptoms in the palate.

Key words: Hamulus Pterygoid Process, Hamular Bursitis, CBCT

HOW TO CITE THIS ARTICLE: Elham Romoozi, Seyed Hossein Razavi, Parisa Barouti*, Mitra Rahimi, Investigating the morphologic indices of the hamulus pterygoid process using the CBCT technique, J Res Med Dent Sci, 2018, 6 (2): 240-244, DOI: 10.5455/jrmds.20186237

Corresponding author: Parisa Barouti
e-mail✉: p.barouti@yahoo.com
Received: 21/12/2017
Accepted: 14/02/2018

INTRODUCTION

The hamulus process is a small extension in the upper and lower part of medial pterygoid plate. The location, length, width of this process play a vital role in the performance of many muscles such as tensor veli palatine, palato pharyngeal, upper part of upper throat muscle and so forth. These muscles separate the mouth from the nasal cavity during swallowing. Location and length of the hamulus plays an important role in the efficiency of these muscles [1,2].

In a paper published by Sugandha Arya in 2015, hamular Bursitis was suggested as a scarce cause of soft palate and oropharynx area pains. In this paper, they stated that pterygoid hamulus bursitis may create symptoms similar to temporomandibular disorders, hidden tooth,

glossopharyngeal neuralgia, calcification of styloid ligament, stylomandibular ligament inflammation, tumors, cyst and inner ear inflammation, and when pterygoid hamulus bursitis is involved in differential diagnoses, a local anesthesia can be an excellent diagnostic tool that may differentiate between pterygoid hamulus bursitis and other causes. Pterygoid hamulus bursitis treatment can be either conservative or surgical [3].

In a study conducted by Jin-Yong Cho et al. in 2013 the pterygoid hamulus bursitis was introduced as a cause of craniofacial pains. They stated that diagnosis of pain in the soft palate and pharynx is difficult because of their association with numerous structures, and pterygoid hamulus bursitis may be suggested as a scarce cause of pains in this area [4].

Increasing hamulus process length causes complicated symptoms in the soft palate and pharynx, e.g.symptoms such as sharp pain in the pharynx and palate that can be restricted or extended to the ear and temporomandibular joint. This pain can be spontaneous or start with touching or drinking liquids. Therefore. Awareness of the morphology of this structure and close interpretation of radiographs may provide very useful information in the diagnosis of pains in the mouth cavity [5-8].

Diagnosis ofprolonged hamulus process in this areais possible via radiographs such as cephalometry, waters and submentovertex, but due to restrictions of conventional radiography, its diagnosis is difficult. CT scan images may allow the close evaluation of craniofacial structures by eliminating conventional radiography problems, but, regretfully, it imposes great dose and costs to the patient. Recently, CBCT provides the clinician with 3-d images for lower doses and costs and it paves the way for close evaluation [9].

Therefore, given the importance of awareness of the morphology of the hamular process and capabilities and usefulness of CBCT in the recognition of its structure, we decided to investigate the morphology of pterygoid using CBCT.

MATERIALS AND METHODS

For the purpose of this research 201 patients who had attended a private Oral and maxillofacial radiology with the prescription of CBCT implant treatment were examined. The average age of the sample under study was

Measurement of Hamulus process length:the distance between the connection point of the process with the medial pterygoid plate and the end of Hamulus process was measured using the software.

Measurement of Hamulus process width: The widest part of the Hamulus process observed on the coronal plane was measured using the software.

Measurement of Hamulus process slope:2 lines were drawn along the Hamulus process and anterior nasal spine and the angle formed was measured using the software and the slope of the process (lateral and medial of the process on the coronal plane) and (posterior and anterior on the sagittal plane) was determined.

The data was entered into SPSS IV. MRI Pearson correlation test, t-test and ANOVA were carried out in order to investigate measurements made with respect to age, sex and comparison of the two sides.

RESULTS

In this stucy, 201 patients who had come to the private mouth, mandible and face implant surgery operations with the prescription of CBCT treatment were examined in our study. The average age of the sample under study was 37±8.9 ranging in age from 15 to 59 years 102 people of which were males and the rest, that is, 99 people were females.

The average of the morphological indices of the hamulus pterygoid in both sides are shown in table 1. Among the morphological indices only the slope of the hamulus pterygoid process on the left and right sides of the coronal plate made statistically significant difference and the slope of the hamulus pterygoid process on the coronal plane was greater on the left side.

Table 1. average of morphological indices of hamulus pterygoid process on both sides

	Direction	Number	Average	P-value
Length	right	201	6.4	0.548
	left	201	6.5	
Width	right	201	1.34	0.199
	left	201	1.35	
Sagittal plane slope	right	201	55.9	0.002
	left	201	56.7	
Coronal plane slope	right	201	65.7	<0.001
	left	201	66.5	

Table 2. Average morphologic indices of hamulus pterygoid process on both sides in both genders

	Direction	Male	Female	P-value
Length	right	6.6	6.4	<0.001
	left	6.6	6.4	<0.001
Width	right	1.35	1.33	0.3
	left	1.37	1.34	0.12
Sagittal plane slope	right	56.2	55.7	0.15
	left	57	56.5	0.15
Coronal plane slope	right	65.9	65.6	0.49
	left	66.6	66.4	0.65

Average of morphological pterygoid process by gender are shown in table 2. among the morphological indices, only average length of hamulus pterygoid process made statistically significant difference between males and females.

Average morphologic indices of hamulus pterygoid on both sides by age groups has been shown in table 3.

Given the results of ANOVA, the length and width of the hamulus pterygoid process on the left and right significantly relate to age, and the length of hamulus process on both sides increase with age. ANOVA was used for investigating changes made in the hamulus pterygoid process on the sagittal and coronal planes with age. Using ANOVA, it was found that the hamulus pterygoid process slope on the sagittal plane was significantly related with age, that is, on both sides, the hamulus pterygoid slope decreases with age, whereas the hamulus pterygoid slope on the coronal plane was not significantly related to age.

On the other hand, in all images under investigation, the hamulus pterygoid on the coronal plane sloped laterally and on the sagittal plane it sloped posteriorly.

DISCUSSION AND CONCLUSION

Hamulus process is a small process in the extreme lower part of the medial pterygoid plate. Location, length and slope of this process plays a vital role in the performance of several muscles such as tensor veli palatine, palato pharyngeal, upper part of upper throat muscle and so on [1,2]. Prolongation (increasing in length) of the hamulus process leads to complicated symptoms in the area of soft palate and throat, such as sharp pain in the pharynx and palate that can be restricted or extended to the ear and temporomandibular joint [5-8]. Therefore, awareness of the morphology of this structure and close interpretation of the radiographs may provide very useful information in line with the etiology of pains in the oral cavity.

Age group			15-29	30-44	45-59
Length of hamulus pterygoid process	Right	average	6.75	6.36	6.29
		SD	0.32	0.31	0.2
		minimum	6.1	6	6
		maximum	7.5	7.5	6.8
		Nr. of Samples	79	71	51
		P- value	< 0.001		
	left	average	6.76	6.38	6.34
		SD	0.32	0.3	0.22
		minimum	6.1	6	5.9
		maximum	7.5	7.2	6.8
		Nr. of Samples	79	71	51
		P- value	<0.001		
Width of hamulus pterygoid process	Right	average	1.39	1.31	1.31
		SD	0.12	0.11	0.12
		minimum	1.1	1.1	1.1
		maximum	1.5	1.6	1.6
		Nr. of Samples	79	71	51
		P- value	<0.001		
	left	average	1.4	1.34	1.3
		SD	0.12	0.11	0.11
		minimum	1.1	1.1	1.1
		maximum	1.7	1.5	1.6
		Nr. of Samples	79	71	51
		P- value	<0.001		
slope of hamulus pterygoid process on the sagittal plane	Right	average	57	55.5	55
		SD	2.6	2.5	2.2
		minimum	52	51	52
		maximum	62.5	62.3	62.3
		Nr. of Samples	79	71	51
		P- value	<0.001		
	left	average	57.7	56.4	55.8
		SD	2.5	2.4	2.3
		minimum	52.5	52.5	52
		maximum	63.3	54	63.8
		Nr. of Samples	79	71	51
		P- value	<0.001		
slope of hamulus pterygoid process on the coronal plane	Right	average	66	65.4	65.9
		SD	2.4	2.3	2.5
		minimum	61	61	60
		maximum	69.5	69.2	70
		Nr. of Samples	79	71	51
		P- value	<0.343		
	left	average	66.8	66.3	66.4
		SD	2.3	2	2.4
		minimum	61	62	60
		maximum	70	70	70
		Nr. of Samples	79	71	51
		P- value	<0.397		

Given the importance of awareness of the morphology of the hamular process and capabilities of CBCT in the recognition of its

structure, we decided to investigate the morphological indices of the hamulus pterygoid process using the CBCT.

In this stucy, 201 patients who had come to the private mouth, mandible and face implant surgery operations with the prescription of CBCT treatment were examined in our study. The average age of the sample under study was 37±8.9 ranging in age from 15 to 59 years 102 people (50.7%) of whom were males and the rest, that is, 99 people (49.3%) were females.

Understanding the importance of investigating the hamulus pterygoid process, Fuy et al. examined patients with pterygoid process syndrome. They concluded that the clinical manifestations are atypical, rather, symptoms, local treatment, radiography and CT are the right methods of diagnosis. Surgery is a simple, safe and effective method of treating the pterygoid hamulus syndrome [5].

Also, Bandini et al. examined a patient with pterygoid hamulus syndrome who was suffering from a lingering pain in the pharynx. The clinical examination showed that the hamulus process was painful when touched. Further investigation revealed that there is a hypertrophy of the process on both sides.

In another similar study, Jin-Yong Cho, suggested pterygoid hamulus bursitis as the cause of the craniofacial pains. He stated that recognition of pain in the area of soft palate and pharynx is difficult due to its association with numerous structures, and said that pterygoid hamulus bursitis may be proposed as a scarce cause of the pains felt in this area [4].

In line with this issue, Naidoo et alexamined patients who suffered from pain in the area of maxillofacial for 30 years. During this time, they were on pain control drugs (pain killers and psychotherapy). Finally their pain was relieved by the anesthetic surgery, opening part of the anterior of the molar teeth and removing the elongated hamular process [11].

MehriKhueivand also stated that elongation on both sides of the process must be viewed as the etiological factor of the hamular process syndrome and said that examining the morphology of the hamular process, may contribute to the tracking and management of the implicit and vague symptoms that may be associated with the morphology of the hamular process and its elongation in the oral cavity [2].

In a study, Orhan investigated the morphological indices of the hamular process and said that information on the morphology of these structures are helpful in the interpretation of the radiography and provides valuable information on the differential diagnosis of unknown pains in the oral cavity and pharynx. Due to potential problems related to the morphology and elongation of the hamular process, oral and maxillofacial radiologists must examine radiographs very closely [6].

Various studies have also investigated the morphology of the hamulus pterygoid process. In a study conductged by Kromptic-Nemanic et al. in 2006 the relationship between hamulus pterygoid process and hard palate in children was investigated. In this study, children showed shorter hamulus process length, which increased in adults ranging in age from 21 to 59; again this figure downturned in the age range of 60-100, a result that is consistent with the results of the present study.

Orhan et al. conducted a research aiming at evaluation of the hamulus pterygoid process using CBCT. This study reported the average width and average length of the process to be 1.7 mm and 5.4 mm respectively. Average length and width of the hamular process on the left and right were not significantly different in statistical terms. Additionally, they concluded that the process has a lateral slope on the coronal plate and a posterior slop on the sagittal plane [6]. Difference in the measurements made in that study and those carried out in the present study can be attributed to difference in the size of the population cohort under study, but the present study is in good consistency with that study in determining the slope of the hamulus process on the sagittal and coronal planes.

Mehri Khoubivand et al. reported the length of 7-9 mm and the width of 104-1.6 mm for the hamulus process in a study she carried out in 2014. Their study showed the average overall slope of the process coronal plane to be 60.6˚ on the coronal plane and 58.9˚ on the sagittal plane. Also the overall result of measurements proved higher in males than in females. Furthermore, they concluded that this process have lateral and

posterior slopes on coronal and sagittal planes [12]. Difference in the results of the said study and the present study can be attributed to population under study, however, the two studies are consistent in terms of slopes on the sagittal and corronal planes.

In conclusion, one can infer that awareness of the morphology of the hamulus process is useful in the interpretation of the radiographs and provides valuable information in the differential diagnosis of unknown pains in the oral cavity and pharynx. Because of the potential problems posed by the morphology and increased length of the hamulus process, maxillofacial Radiologists must evaluate radiographs with a focus of attention on the morphology and increased length of the hamulus.

REFERENCES

1. White SC, Pharoah MJ. Oral Radiology-E-Book: Principles and Interpretation: Elsevier Health Sciences; .2014
2. Khoubivand M, Ghaffari R, Anjomshoa M. Morphological Evaluation of Pterygoid Hamulus through Mprcone-Beam Computed Tomography Images. Bull Env Pharmacol Life Sci. 2015;.4:144-50
3. Arya S, Singhal P, Vengal M, Patil N, Bhateja S. Hamular bursitis: difficult to diagnose in orofacial pain. Pakistan Oral and Dental Journal. 2015;35(1)
4. Cho J-Y, Cheon K-Y, Shin D-W, Chun W-B, Lee H. Pterygoid hamulus bursitis as a cause of craniofacial pain: a case report. Journal of the Korean Association of Oral and Maxillofacial Surgeons. 2013;39(3):.134-8
5. Fu Y, Peng J, Chen W. The pterygoid hamulus syndrome with the main discomfort of pharynx. Lin chuang er bi yan hou ke za zhi= Journal of clinical otorhinolaryngology. 2004;18(3):.134-5
6. Orhan K, Sakul BU, Oz U, Bilecenoglu B. Evaluation of the pterygoid hamulus morphology using cone beam computed tomography. Oral Surgery, Oral Medicine, Oral Pathology ,Oral Radiology, and Endodontology. 2011;112(2):e48-e.55
7. Sasaki T, Imai Y, Fujibayashi T. A case of elongated pterygoid hamulus syndrome. Oral diseases. 2001;7(2):.131-3
8. Putz R, Kroyer A. Functional morphology of the pterygoid hamulus. Annals of Anatomy-Anatomischer Anzeiger. 1999; 181(1):.85-8
9. Kumar V, Ludlow J, Mol A, Cevidanes L. Comparison of conventional and cone beam CT synthesized cephalograms. Dentomaxillofacial Radiology. 2007; 36(5):.263-9
10. Bandini M, Corre P, Huet P, Khonsari R. A rare cause of oral pain: The pterygoid hamulus syndrome. Revue de stomatologie, de chirurgie maxillo-faciale et de chirurgie orale. 2015;116(6):.380-3
11. Naidoo S, Roode GJ, Butow K-W. Palatal pain due to exostosis of the posterior palatal spine in a cleft patient. .2014
12. .Krmpotić-Nemanić J, Vinter I, Marušić A. Relations of the pterygoid hamulus and hard palate in children and adults: anatomical implications for the function of the soft palate. Annals of Anatomy-Anatomischer Anzeiger. 2006;188(1):69-.74