Journal of Health, Medicine and Nursing www.iiste.org
ISSN 2422-8419 An International Peer-reviewed Journal
Vol.41, 2017

Effects Of Inhaled Corticosteroids On Condylar Head Of Mandible In Asthmatic Patients

Hussein Haleem Jasim *

Chairman Of Oral Diagnosis Department - College Of Dentistry/University Of Wasit

Abstract :

Background : "Inhaled corticosteroids" are widely used and more efficient in management of asthma and chronic obstructive pulmonary disease. There are undesirable consequences on human bones associated to long-term treatment of corticosteroids. Several studies observed many variations that may affect the human condyles but little studies monitored effect of "inhaled corticosteroids" on these bones.

Aim of study : To observe if long-term use of inhaled corticosteroids influence mandibular condylar head in patients with asthma on CBCT image.

Materials and Methods : A study undertaken on "70 individuals" between ages 25-40 years who referred to Dental centers in Iraqi Capital for taking CBCT images of jaws between 5/2014 to 10/2016. Selected patients (35 case) have "mild to severe asthma and treated with inhaled corticosteroids used at least two times per day and for period of at least two years". Other selected individuals (35 case) have a good health status. Linear measurements of mandibular condylar head carried out on CBCT images. Measurements included condylar head width and length on both of left and right condyle.

Conclusion : There was no influence on condylar head of mandible in patients after using long-term inhaled corticosteroids.

Keywords : Corticosteroids, Inhaled-corticosteroids, Asthma, mandibular condylar head

1. Introduction

Temporomandibular joint consider one of the main joints in the human body, and it has a nigh relation to dentition and stomatognathic area [(1)]. Temporomandibular joint has numerous characteristics related to function and anatomy which give it particular features [(2,3)]. It composed of different parts which are believed to be included in preserving TMJ ability in re-modeling when development stopped also renew its configuration later [(4)]. Mandibular condylar part of TMJ regarded as the essential center of mandibular jaw functions [(5)]. Its function and situation affected by many factors as nigh muscle [(1)]. Morphology of condyle is distinguished as a round bone prominence, the higher part is concave on both side and elliptical in axial plane. In usual, a frontal distance of condylar head is longer than lateral distance [(6)] . It is measured about 15 - 20 mm laterally and 8 - 10 mm from frontside to backside [(7)] .

1.1 "Inhaled corticosteroids"

For a long-term, "Inhaled corticosteroids" are the drugs of choice in treating bronchial "asthma" as well sever cases in last years in matured individuals in different countries [(8-12)] . Yet, these drugs have several prospective undesirable consequences "systemic and local influences" [(13,14)]. It is seem that low dosages of inhaled corticosteroids have a lesser effect on action of osteoclasts and osteoblasts, in contrast, they have adverse effects in case of high dosages for a long period [(15,16)] . In spite of systemic adverse results are minimal with inhaled corticosteroids, but these effects actually will be massive in large dosages as Cushing symptoms, cataracts, reduction in production of steroid hormones by adrenal gland, contusion of skin, osteoporosis and progress retardation in children [(17,14)] .

1.2 TMJ imaging

Imaging assessment of bony changes and abnormalities that affect the TMJ considered as a valuable significant mean [(18)] 33. Many radiographic and imaging methods applied to study the TMJ morphology [(19-22)] 23,24,25,26 . Panoramic imaging could examine most of alterations in mandibular condyle in persons have TMJ complains [(23)] 34 . In spite of this radiography broadly used at diagnostic practice, but it restricted to assess precision of mandibular condyle configuration or bone condition [(24)] 35. Thence, extreme care must be taken with panoramic imaging through carrying out dimension measurements [(19,25)] 23,36.

Computed Tomography provides details involving bone evaluation [(22,24,26-31)] . Bi-planar tomography gives more exact analysis of condylar lesions than bi-planar OPG images [(32)] 39 . Studies showed that computed tomographic images can be considerably exact

for measurements of linear [22,33,34] 26,45,46 volumetric [35] 47 and geometric [34] 46 within the maxillofacial region. Traditional tomography is more advanced than MRI in evaluation of bony alterations in TMJ [36] 40. MRI also considered the most choice in assessing changes in the soft tissue of TMJ [26-30,37] 27-29,31,32,44. Many studies later, stated that cone beam computed tomographic images (CBCT) are more superior than other imaging systems for showing bony condition in mandibular condyle and diagnose the cortical surface of condyle for any attrition [19,22,38] 26,41,42. Cone beam computed tomography is a helpful tool to assess and measure the condylar measurements [39] . Other study also stated that cone beam computed tomographic images give a good visualization of temporomandibular joint bone tissue than other imaging devices [40] .

1.3 "Consequences of Corticosteroids"

Effects of these drugs on action of "osteoclast" are argumentative, on other hand, these consequences were most likely interposed on "osteoblasts" causing "bone resorption". They also essentially stop the road on calcium transit by "enterocytes", in addition, they influence action or metabolism of Vit. D, plus secondary repressive influence Ca re-absorption by kidney, creating a high concentration of calcium in blood. Furthermore, these drugs have secondary consequences on human bones by modifying of some "hormones" activity. During first dosages, these drugs raise "parathyroid hormone" action, this may be due to reduction in the transport process of intestine and over renal lack of calcium; a well, there is proof that corticosteroids promote the parathyroid hormone action on osteoblasts. Many studies stated that they more possibly cause significant influences on local couriers of cells through osseous structure , including expansion factors and cytokines [41-43] .

Glucocorticoids raise fracture rate of bone, particularly at spongiosa regions. Sometimes, the risk of fractures happen with high bone density in those on glucocorticoids which are more occurred than do similar fractures related with influential post-menopausal osteoporosis. As well, with minimal oral dosages, its reported to be associated with adverse results on bone [44]. Moreover, it had found that powerful corticosteroids "inhaled or topical" given in large dosages might be associated with undesirable significant influences like resorption of bone [45].

2. Material and Methods

A study undertaken on "70 individuals" between the ages 25-40 years who referred to Dental centers in Iraqi Capital for taking CBCT images of jaws between 5/2014 to 10/2016. Selected patients (35 case) have "mild to severe asthma and treated with inhaled beclomethasone 100-250 mcg or budesonide 200 mcg or fluticasone propionate 125-220 mcg used at least two times per day and for period of at least two years". Other selected individuals (35 case) have a good health status. Individuals are reported of probability that the results may be used for research objectives.

2.1 Criteria of Individual's Selection :

1. No history of : Osteoporosis, Hyperparathyroidism, Cushing syndrome, Diabetes Mellitus or any disease affect the metabolism of bone.
2. No taking for some drugs as Bisphosphate, Vitamin D, estrogen, Calcium and parathyroid hormone.
3. No previous history of maxillofacial trauma.
4. No facial deformity and asymmetry.
5. No previous maxillofacial surgery.
6. With no orthodontic treatment and dental prosthesis.
7. No Mandibular and maxillary 3rd molar impaction
8. All individuals should be at most normal occlusion.
9. No history of condylar fracture or resorption.
10. No TMJ ankyloses, hyperplasia and tumors.
11. No joint diseases.

2.2 Measurements of condylar dimensions :

For each selected individual (patients and healthy individuals), Thirty five CBCT images of jaws were taken, so that the total number of TMJ images included in the study were seventy images for patients group and seventy images for control group. The linear measurements were carried out on the CBCT images of TMJ.

These measurements used to determine the maximum distances between specific anatomical points on the condylar head of mandible. This done by measuring the maximum distances on the condylar images in lateral and frontal views. The anatomic landmarks, anatomic points and linear measurements included in this study were based on Schlueter et al [35] criteria as follows :

» **M-L:** Represent a condylar width, which is the distance between M and L points, referring to a maximal dimension of the condylar head of mandible on frontal view. (Figure 1-A)

» **A-P :** Represent a condylar length, which is the distance between A and P points, referring to a maximal dimension of the condylar head of mandible on lateral view. (Figure 1-B)

» **M :** Represent a medial condylar surface which is most high medial point of condylar head of mandible on frontal view.

» **L :** Represent a lateral condylar surface which is the most high lateral point of condylar head of mandible on frontal view.

» **A :** Represent an anterior condylar surface which is the most high anterior point of condylar head of mandible on lateral view.

» **P :** Represent a posterior condylar surface which is the most high posterior point of condylar head of mandible on lateral view.

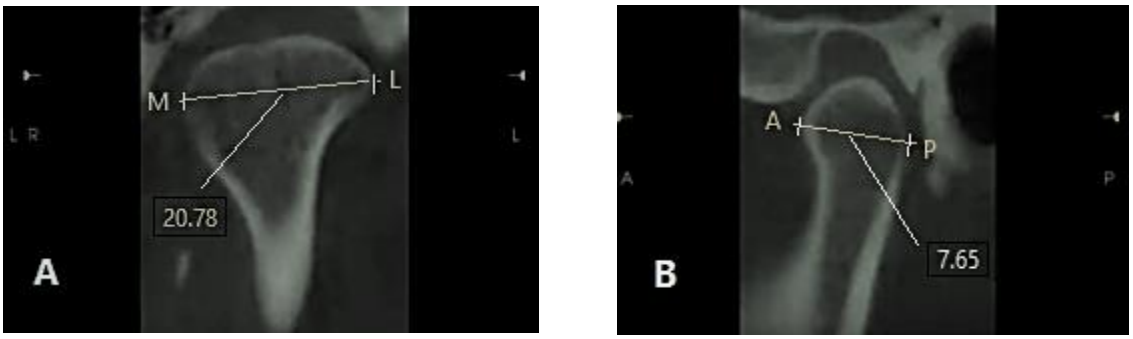

Figure 1: Linear measurements on frontal (A) and lateral (B) views of the left mandibular condyle (M: medial, L: lateral, A: anterior, P: posterior)

3. Results :

An average A-P distance of healthy group was 7.80 mm and 7.63 mm in patients group, while an average M-L distance of healthy group was 20.81 mm and 20.49 mm in patients group.

Statically analyses showed no significant difference of a whole average of A-P and M-L distances (both gender) in comparing between the two groups. (Table 1).

Table 1. Average linear measurements of the mandibular condylar head in patient and healthy group :

Groups	Gender	A-P distance (mm)	M-L distance (mm)
Healthy	M	7.84 ± 0.50	**21.40 ± 1.28**
	F	7.76 ± 0.54	**20.23 ± 1.41**
	Total	7.80 ± 0.52	**20.81 ± 1.34**
Patients	M	7.69 ± 0.48	**20.93 ± 0.61**
	F	7.58 ± 0.56	**20.05 ± 1.25**
	Total	7.63 ± 0.52	**20.49 ± 0.93**
P-value	M	0.2	**0.054**
	F	0.1	**0.57**
	Total	0.0551	**0.1**

4. Discussion :

Many researchers tried to assess mandibular condylar. Changes in the shapes of human condyle were observed by previous study [46] . It has been observed that many of the normal changes of condylar morphology occurred due to many factors as gender, age, facial and malocclusion type, occlusal and functional force, in addition to right and left condyles [47] .

On other side, Hasegawa stated that alterations in status and extent of condyle differ depending on prior posture of meniscus [48] , another study stated that shape of condyle was correlated to age of individual [49] .

Some researchers stated that inhaled corticosteroids may or not influence bone formation and resorption in different ages [50-55] , but many researchers concluded that if oral corticosteroids taken for a long time in patients with asthma, this cause remarkable reduction in Ca absorption and marked bone resorption [56-59] .

Another study found that there was marked decrease in bone consistency in patients with asthma treated with high dose corticosteroids for three to five years treatment in opposite to patients taking no or less dose [60] .

This study observed the possible effects on human condyles at asthmatic patient after long term use of inhaled corticosteroids using cone-beam computed tomography.

Linear measurements carried out through both right and left mandibular condyles of asthmatic and healthy individuals (Both genders) by using CBCT images, so the lateral views used to measure the antero-posterior distance (AP) while the frontal views used to measure the medio-lateral distance (ML). Statistical analyses found that there was no significant effect on these distances when we compared the total average of both distances between healthy individuals and inhaled corticosteroid treated asthmatic patients. These conclusions are somewhat similar to several studies [61-64] .

The possible reasons of these results are absorption of inhaled corticosteroids in healthy individuals may be faster than patients with pulmonary disease [65] . Other possible causes may be due to varied techniques in corticosteroids inhalation, varied means used in corticosteroids inhalation, in addition to different procedures of inhalation means, in turn all of these factors may affect corticosteroid levels transmitted to lungs and in turn into GIT [66] .

References

1- Al-Koshab M, Nambiar P, John J. Assessment of condyle and glenoid fossa morphology using CBCT in South-East Asians. PLoS One 2015;10:e0121682

2- B. Blasberg, “Temporomandibular disorders,” in Burket's Oral Medicine Diagnosis and Treatment, M. S. Greenberg and M. Glick, Eds., Elsevier, India, 2003. 2-

3- J. P. Okeson, Functional Anatomy and Biomechanics of the Masticatory system, 2003.

4- V. Hegde, “A review of the disorders of the temperomandibular joint,” Journal of Indian Prosthodontist Society, vol. 5, no. 2, pp. 56–61, 2005.

5- Enlow DH. Crescimento facial. 3ª ed. São Paulo: Artes Médicas; 1993. p. 88-96.

6- Yale SH, Allison BD, Hauptfuehrer JD. An epidemiological assessment of mandibular condyle morphology. Oral Surg Oral Med Oral Pathol. 1966 Feb;21(2):169-77.

7- Standring S (2005) Gray’s anatomy the anatomical basis of clinical practice, (39th edn). Elsevier Ltd. 519- 530.

8- Raissy HH, Kelly HW, Harkins M, Szefler SJ. Inhaled corticosteroids in lung diseases. Am J Respir Crit Care Med. 2013;187:798–803.

9- Ernst, P., J. M. FitzGerald, and S. Spier. 1996. Canadian asthma consensus conference: summary of recommendations. Can. Respir. J. 3:89– 100.

10- International Asthma Management Project and NHLBI Institute. 1992. International consensus report on diagnosis and treatment of asthma. Eur. Respir. J. 5:601–641.

11- Hoshino T, Toda R, Aizawa H. Pharmacological treatment in asthma and COPD. Allergol Int 2009;25:341-6.

12- Monge RM, Montaner AE, Benitez MF et al. Consensus statement on the management of paediatric asthma. Allergol Immunopathol (Madr) 2006;34:88-101.

13- Irwin RS, Richardson ND. Side effects with inhaled corticosteroids: the physician's perception. Chest 2006;130: 41S-53.

14- Kelly HW, Nelson HS. Potential adverse effects of the inhaled corticosteroids. J Allergy Clin Immunol 2003;112: 469-78.

15- Geddes, D. M. 1992. Inhaled corticosteroids: benefits and risks. Thorax 47:404–407.

16- Boyd, G. 1994. Effect of inhaled corticosteroids on bone. Respir. Med. 88(Suppl. A):45–52.

17- Raissy HH, Kelly HW, Harkins M, Szefler SJ. Inhaled corticosteroids in lung diseases. Am J Respir Crit Care Med. 2013;187:798–803.

18- Tecco S, Saccucci M, Nucera R, Polimeni A, Pagnoni M, Cordasco G, et al. Condylar volume and surface in Caucasian young adult subjects. BMC Med Imaging. 2010;10: 28

19- Honey OB, Scarfe WC, Hilgers MJ, Klueber K, Silveira AM, Haskell BS, et al. Accuracy of cone-beam computed tomography imaging of the temporomandibular joint: comparisons with panoramic radiology and linear tomography. Am J Orthod Dentofacial Orthop. 2007 Oct;132(4):429-38.

20- Ishibashi H, Takenoshita Y, Ishibashi K, Oka M. Age-related changes in the human mandibular condyle: a morphologic, radiologic and histologic study. J Oral Maxillofac Surg. 1995 Sep;53(9):1016-23.

21- Alkhader M, Ohbayashi N, Tetsumura A, Nakamura S, Okochi K, Momin MA, et al. Diagnostic performance of magnetic resonance imaging for detecting osseous abnormalities of the temporomandibular joint and its correlation with cone beam computed tomography. Dentomaxillofac Radiol. 2010 Jul;39(5):270-6.

22- Ludlow JB, Laster WS, See M, Bailey LJ, Hershey HG. Accuracy of measurements of mandibular anatomy in cone beam computed tomography images. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2007 Apr;103(4):534-42.

23- Crow HC, Parks E, Campbell JH, Stucki DS, Daggy J. The utility of panoramic radiography in temporomandibular joint assessment. Dentomaxillofacial Radiology. 2005;34(2):91–95.

24- Brooks SL, Brand JW, Gibbs SJ, Hollender L, Lurie AG, Omnell KA, et al. Imaging of the temporomandibular joint: a position paper of the American Academy of Oral and Maxillofacial Radiology. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1997 May;83(5):609-18.

25- Laster WS, Ludlow JB, Bailey LJ, Hershey HG. Accuracy of measurements of mandibular anatomy and prediction of asymmetry in panoramic radiographic images. Dentomaxillofac Radiol. 2005 Nov;34(6):343-9

26- Petrikowski CG (2004) Diagnostic imaging of the temporomandibular joint. In: White SC, Pharoah MJ. Oral radiology principles and interpretation. (5thedn), Mosby 538-575.

27- Dixon DC (1991) Diagnostic Imaging of the Temporomandibular Joint. Dent Clin North Am 1: 53-74.

28- Delbalso AR (1990) Radiography of the Temporomandibular Joint. In: Delbalso AR (Ed.), Maxillofacial Imaging. Saunders 607-634.

29- Dixon DC (1994) Indications and techinques for imaging the Temporomandibular Joint. In: Zarb GA, Carlsson GE, Sessle BJ, Mohl ND (Eds.), Temporomandibular joint and masticatory muscle disorders. Mosby 435-459.

30- Payne M, Nakielny RA (1996) Temporomandibular Joint Imaging. Clin Radiol 51: 1-10.

31- Vilanova JC, Barceló J, Puig J, Remollo S, Nicolau C, et al. (2007) Diagnostic Imaging: Magnetic Resonance Imaging, Computed Tomography, and Ultrasound. Semin Ultrasound CT MR 28: 184-191.

32- Hansson LG, Westesson PL, Eriksson L (1996) Comparison of tomography and midfield magnetic resonance imaging for osseous changes of the temporomandibular joint. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 82: 698-703.

33- Berco M, Rigali PH Jr, Miner RM, DeLuca S, Anderson NK, Will LA. Accuracy and reliability of linear cephalometric measurements from cone-beam computed tomography scans of a dry human skull. Am J Orthod Dentofacial Orthop. 2009 Jul;136(1):17.e1-9.

34- Moreira CR, Sales MA, Lopes PM, Cavalcanti MG. Assessment of linear and angular measurements on three-dimensional cone beam computed tomographic images. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009 Sep;108(3):430-6.

35- Schlueter B, Kim KB, Oliver D, Sortiropoulos G. Cone beam computed tomography 3D reconstruction of the mandibular condyle. Angle Orthod. 2008 Sep;78(5):880-8.

36- Katakami K, Shimoda S, Kobayashi K, Kawasaki K (2008) Histological investigation of osseous changes of mandibular condyles with backscattered electron images. Dentomaxillofac Radiol 37: 330-339.

37- Schmitter M, Gabbert O, Ohlmann B, Hassel A, Wolff D, et al. (2006) Assessment of the reliability and validity of panoramic imaging for assessment of mandibular condyle morphology using both MRI and clinical examination as the gold standard. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 102: 220-224.

38- Kicos LT, Ortendahl DA (1990) Magnetic resonance imaging of the temporomandibular joint. In: Delbalso AR Maxillofacial Imaging. Saunders 675-695.

39- Neto JV, Estrela C, Bueno MR, Guedes OA, Porto OCL, et al. (2010) Mandibular condyle dimensional changes in subjects from 3 to 20 years of age using Cone-Beam Computed Tomography: A preliminary study. Dental Press J Orthod 15: 172-181.

40- A. Petersson, "What you can and cannot see in TMJ imaging—an overview related to the RDC/TMD diagnostic system," Journal of Oral Rehabilitation, vol. 37, no. 10, pp. 771–778, 2010.

41- Reid IR. Pathogenesis and treatment of steroid osteoporosis. Clin Endocrinol 1989;30:83-103.

42- Reid DM. Corticosteroid-induced osteoporosis. In: Smith R, ed. Osteoporosis 1990. London: Royal College of Physicians of London, 1990: 99-117.

43- Lukert BP, Raisz LG. Glucocorticoid induced osteoporosis; pathogenesis and management. Ann Intern Med 1990;112:353-64.

44- Ton FN, Gunawardene SC, Lee H, Neer RM. Effects of low-dose prednisone on bone metabolism. J Bone Miner Res. 2005;20(3):464-470

45- Saag KG, Zanchetta JR, Devogelaer JP, et al. Effects of teriparatide versus alendronate for treating glucocorticoid-induced osteoporosis: thirty-six-month results of a randomized, double-blind, controlled trial. Arthritis Rheum. 2009;60:3346-3355.

46- Ross BR, Johnston MC (1994) Developmental anomalies and dysfunction. In: Zarb GA, Carlsson GE, Sessle BJ, Mohl ND (eds). Temporomandibular joint and masticatory muscle disorders. Mosby 221-222.

47- Neto JV, Estrela C, Bueno MR, Guedes OA, Porto OCL, et al. (2010) Mandibular condyle dimensional changes in subjects from 3 to 20 years of age using Cone-Beam Computed Tomography: A preliminary study. Dental Press J Orthod 15: 172-181.

48- Hasegawa H, Saitoh I, Nakakura-Ohshima K, Shigeta K, Yoshihara T, Suenaga S, Inada E, Iwasaki T, Matsumoto Y, Yamasaki Y. Condylar shape in relation to anterior disk displacement in juvenile females. Cranio 2011; 29: 100110.

49- Karlo CA, Stolzmann P, Habernig S, Müller L, Saurenmann T, Kellenberger CJ. Size, shape and age-related changes of the mandibular condyle during childhood. Eur Radiol 2010; 20: 2512-2517.

50- Godfrey S, Balfour-Lynn L, Tooley M. A three- to five-year follow-up of the use of the aerosol steroid, beclomethasone dipropionate, in childhood asthma. JAllergy Clin Immunol. 1978;62:335-339.

51- Graff-Lonnevig V, Kraepelien S. Longterm treatment with beclomethasone dipropionate aerosol in asthmatic children with special reference to growth.AlleTv. 1979;34: 57-61.

52- Ninan TK, Russell G. Asthma, inhaled corticosteroid treatment, and growth. Arch Dis Child. 1992;67:703-705.

53- Konig P, Hillman I, Cervantes C, et al. Bone metabolism in children with asthma treated with inhaled beclomethasone dipropionate. J Pediatr. 1993;122:219-226.

54- Wolff AH, Adelsberg B, Aloia J, Zitt M. Effect of inhaled corticosteroid on bone density in asthmatic patients: a pilot study. AnnAllergy. 1991;67:117-121.

55- Packe GE, Douglas JG, McDonald AF, Robins SP, Reid DM. Bone density in asthmatic patients taking high dose inhaled beclomethasone dipropionate and intermittent systemic corticosteroids. Thorax. 1992; 47:414-417.

56- Morris A. Need AG, O'Loughlin PD, Horowitz M, Bridges A, Nordin BEC. Malabsorption of calcium in corticosteroidinduced osteoporosis. Calcif Tissue Int. 1990;46:305-308.

57- Sambrook P, Birmingham J, Kempler S, et al. Corticosteroid effects on proximal femur bone loss. J Bone Miner Res. 1990;5: 1211-1216.

58- Luengo M, Picado C, Del Rio L, Guafiabens N, Montserrat JM, Setoain J. Vertebral fractures in steroid dependent asthma and involutional osteoporosis: a comparative study. Thorax. 1991;46:803-806.

59- Reid IR, Evans MC, Wattie DJ, Ames R, Cundy TF. Bone mineral density of the proximal femur and lumbar spine in glucocorticoid-treated asthmatic patients. Osteoporos. Int. 1992;2:103-105.

60- Louis-Philippe Boulet, Joanne Milot, Louise Gagnon, Patrice E. Poubelle, And Jacques Brown. Long-Term Influence of Inhaled Corticosteroids on Bone Metabolism and Density Are Biological Markers Predictors of Bone Loss? Am J Respir Crit Care Med Vol 159. pp 838–844, 1999

61- Solberg WK, Hansson TL, Nordström B. The temporomandibular joint in young adults at autopsy: a morphologic classification and evaluation. J Oral Rehabil 1985;12:303-321.

62- Raustia AM, Pyhtinen J. Morphology of the condyles and mandibular fossa as seen by computed tomography. J Prosthet Dent 1990;63:77-82.

63- Lee DH, Oh SH, Suh CH, Kim JB. A study on the size of TMD patient's condyle head. J Korean Assoc Oral Maxillofac Surg 2001;27:417-422.

64- Olate S, Cantín M, Alister JP, Uribe F, Navarro P, Olate G, de Moraes M. Relación entre el tamaño condilar y la asimetría facial transversal en individuos con hiperplasia condilar. Int J Morphol 2013; 31: 937-941.

65- Singh SD, Whale C, Houghton N, et al. Pharmacokinetics and systemic effects of inhaled fluticasone propionate in chronic obstructive pulmonary disease. Br J Clin Pharmacol 2003; 55: 375-81.

66- Pouw EM, Prummel MF, Oosting H, Roos CM, Endert E. Beclomethasone inhalation decreases serum osteocalcin concentrations. BMJ 1991; 302: 627–8.