Bull. Group. Int. Rech. Sci. Stomatol. Odontol. 44, 52-56, 2002

CONDYLAR– MANDIBULAR ASYMMETRY, A REALITY

R. BORATTO, U. GAMBARDELLA, P. MICHELETTI, L. PAGLIANI, L. PREDA, T.L HANSSON

Dipartimento di Medicina Sperimentale, Sezione di Anatomia Umana Normale, Università degli Studi di Pavia - Italia

KEY WORDS: Asymmetry, condyle jaw, ramus, OPG
MOTS CLES: Asymétrie, condyle, branche, maxillaire inférieur, OPG

RESUME

Dans ce travail on va évalué la possibilité de reconnaitre une asymétrie condyle-maxillaire inferieur au moyen d'une OPG.

Les résultats d'un précédent travail dans le quel on a étudié et mesuré 100 crânes appartenants au Musée d'Anatomie de Pavie, ont montré l'éxistence d'une asymétrie. Avec les mêmes crânes on a étudié si les resultats des études morphologiques était comparables a ceux de l'OPG. On n'a pas vérifier l'éxistence de corrélations entre l'asymétrie anatomique et l'asymétrie montré par l'OPG. L'ésplication est donné par la différente position du maxillaire inferieur pendant les mésurages. Les résultats confirment toutefois l'expérience quotidienne de l'odontoïatre, c'est à – dire que l'asymétrie du condyle peut être une des pricipales causes de l'asymétrie de l'apparat en question.

ABSTRACT

The aim of this study is to evaluate the possibility to recognize a condylar-mandibular asymmetry through a panoramic radiograph.

Results from a previous work, in which 100 skulls from the Museum of the Institute of Anatomy of the University of Pavia were studied and measured, showed the presence of asymmetry. Using the same skulls we examined the possible correlation between morphological and radiological data.

We did not find out correlation's between the condylar asymmetry evaluated at the anatomical level and the radiological asymmetry which was indeed found. This is probably due to the different positioning of the jaws during the two different measuring processes.

Nevertheless our results confirm the daily experience of dentistry: asymmetry of mandibular condyle can be one of the mayor causes for the asymmetry of the stomatognatic apparatus.

INTRODUCTION

Little attention has been paid to the condylar asymmetry of the bilateral stomatognathic system. Neither in the scientific literature nor in clinical reports it is discussed despite its introduction by habets at al. already in 1988. An asymmetry >3% calculated from the measurements of the condylar heights on the ramus tangentori the panoramic radiograph according to the formula (R-L): (R+L) x 100, was suggested as a morphological asymmetry. Since then, only a few studies have incorporated the condylar asymmetry as a variable of interest of examination in the search for the cause for functional facial pain (Habets L.L.M.H. et al. 1987, 1988,1999; Ferrario V.F. 1997). However, they have all concluded that patients with diagnosed functional craniomandibular pain are more asymmetrical regarding the two temporomandibular joint condyles than general dental patients. Lachmann (Lachmann S. 1999) also showed in his thesis that there is a relationship between condylar asymmetry through specific movement patterns of the mandible, and adjacent joint pathology.

It is common knowledge and it should also be common practice to always have at hands a panoramic radiograph of every patient. Every dental student has been told the need of such a radiograph for the screening and an early detection of undiagnosed hard tissue changes of maxilla and of the mandible (neoplasm, tumors, strange lesions etc.). Most dental students have also been told the questionable value of the panoramic radiograph because of

the superimposition of structures due to the construction of the x-ray machine with two different axes of rotation (focus in one direction and the film in the opposite direction) (Welander U. 1978). On the other hand, the panoramic radiograph is the only routinely used radiograph in the dental practice in which comparisons between the right and the left sides of the jaws can be made. Both the sides are projected in the same film without any change of position of the patient's head.

However, comparisons of horizontal dimensions are not possible due to the superimposition of structures. Vertical dimension can be compared as the focus of the x-ray machine is long and narrow (Tronje G. 1982, Habets L. et al. 1987). From this point of view the panoramic radiograph shows its strength and its unquestionable value in assisting the dentist in finding the correct vertical and frontal relations between the two jaws. In other words, in the clinical evaluation of occlusion from a functional point of view the panoramic radiograph seems to offer outmost valuable information.

A standardized way of clinically examining the patients with "orofacial" pain is lacking in the studies denying the importance of occlusion as a cause for functional facial pain. Patients examined were never put into specific diagnostic categories regarding the origin of facial pain before the statistical analyses were performed (Solberg W.K. et al. 1979, Carlsson G. E. et al. 1995). A standardized way of radiographically examining the patients with orofacial pain is also lacking. Aesthetic problems today occupy the minds of many dentists and their patients, little attention is paid to facial asymmetry or to condylar-mandibular asymmetry.

The aim of this study was therefore to examine whether is possible to recognize a morphological condylar asymmetry in a panoramic radiograph.

MATERIAL AND METHODS

100 skulls from the Museum of Institute of Anatomy of the University of Pavia (Italy), were randomly selected for this study. Information regarding age at the death, possible cause of death and gender is available but out of scope of this study. Each mandible was placed on the anatomical measuring table with its base (corpus mandibulae) on the horizontal plane (Fig.1). The condyle and ramus heights were measured by one examiner. The values where then put into the formula, earlier described by Habets at al. (1988) (R-L) : (R+L) x 100 and the asymmetry was expressed in percentage. (Habets L.L.M.H. et al. 1987, 1988,1999; Boratto R. et al. 2002)

R= height in mm. of the right condyle or the right ramus

L= height in mm. of the left condyle or the left ramus.

Thereafter each skull was placed in the panoramic x-ray machine (Panelipse II-Gendex) with its mandible

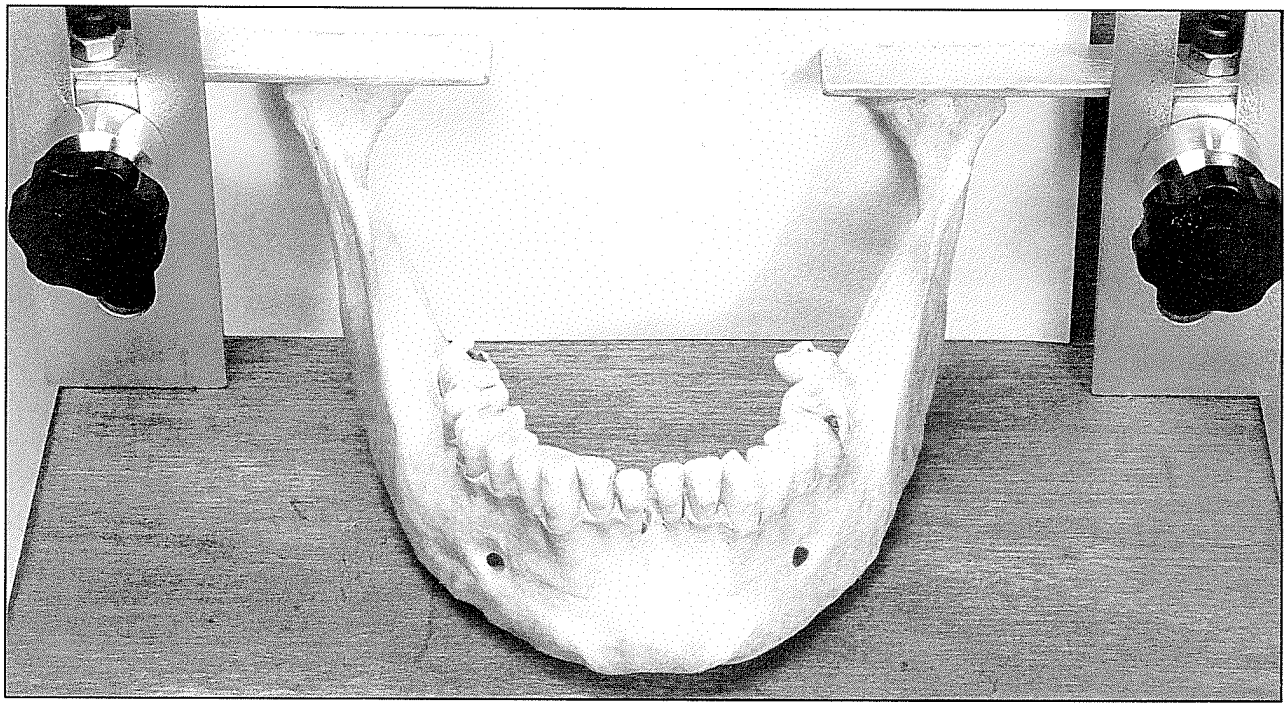

Fig. 1a: Example of jaw placed on the anatomical measurement table.

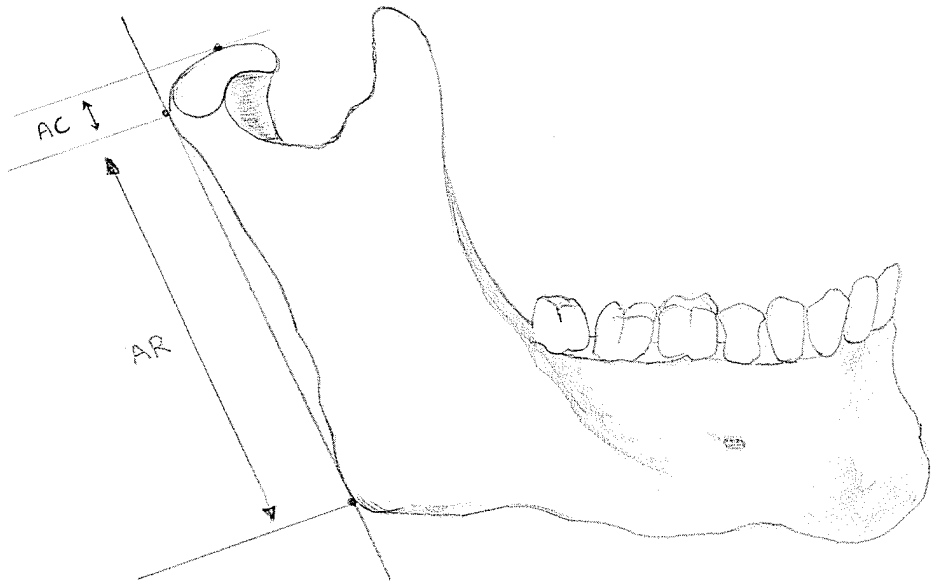

Fig. 1b: Schema of the measurement method: AR ramus height, AC condyle height

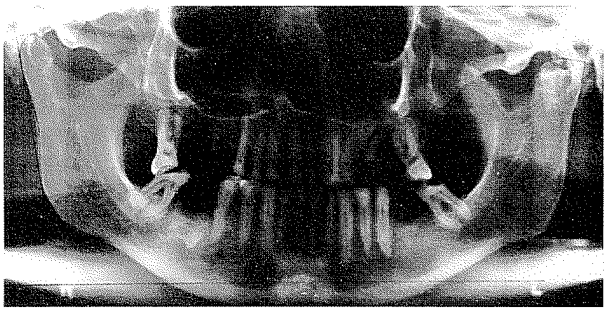

Fig. 2a

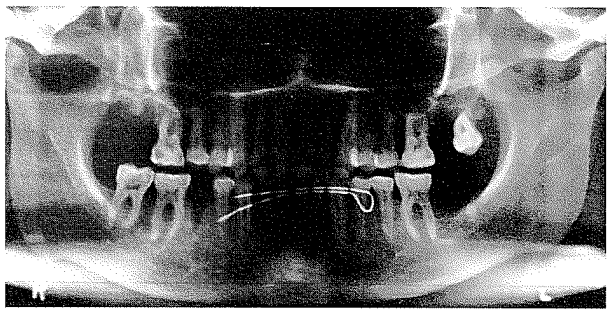

Fig. 2b

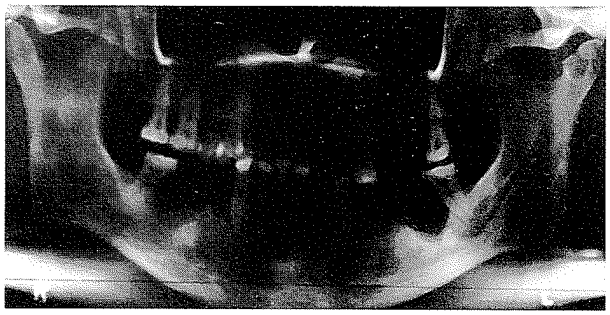

Fig. 2c

Fig. 2: Panoramic radiograph of the condyle ramus-complexe

2a : Asymmetry. The left condyle is distinctly shorter than the right one. (46,8 dx – 59 sx)

2b: Asymmetry with prevalence of the right complexe over the leftone. Note the flattering of the left condyle.

2c: Substantial symmetry

oriented according to the "frankfurter horizontal".

A radiograph was taken. The condylar and ramus heights were measured on the image (Fig.2) by three examiners who had no information about the anatomical measurements and the calculation of the asymmetry index. The examiners were differently experienced in analyzing panoramic radiograph. The asymmetry was calculated and expressed in percentage according to the earlier mentioned

formula.

+%values means that the right side is higher; -% value means that the left side is higher.

The values were statistically analyzed with the conduction coefficient of Pearson.

RESULTS

No correlation between the anatomically condylar asymmetry and the radiographical condylar asymmetry was found. When the total mandibular height (condylar + ramus height) value is used in evaluating the mandibular asymmetry the correlation index between the anatomical asymmetry is 0.93 (formula of statistical calculation). The radiological asymmetries were confirmed with the anatomical asymmetries at high significant level ($P<0,001$).

As technical errors like mounting of the skull in the x-ray machine, thick lines of drawing etc. influence the results, all calculated asymmetries, anatomical or radiological, between +3% and 3% were not classified as true asymmetries, although asymmetries may exist. The overall results are shown in Fig. 3 (diagram R/L index cutoff 3%) regarding the total mandibular asymmetry. Eight skulls (8/100) showed in the anatomical measurements complete symmetry. Eleven radiographs (11/100) showed after calculation of measurements complete symmetry. Ten out of these 11 radiological symmetries were within the + 3% -3% cut off level in the anatomical measurements asymmetry calculation.

DISCUSSION

The lack of correlation between the anatomically measured condylar asymmetry and the radiological measured condylar asymmetry is due to the mandibular position during the anatomical measurement. The mandible was than resting on its base (corpus mandibulae) while in the radiological analysis the mandible was oriented parallel to the Frankfurter horizontal.

Thereby the most posterior point of the condylar neck changed position in its vertical dimension. Due to this error the total vertical mandibular height was used in the calculations of asymmetry.

The results confirm the daily clinical experience of many years that (condylar) mandibular asymmetry may be major reason for an asymmetrycal stomatognathic system. Its consequent asymmetrical function may also result in bruxism with orofacial pain of either mainly arthrogenous origin of mainly myogenus origin. To

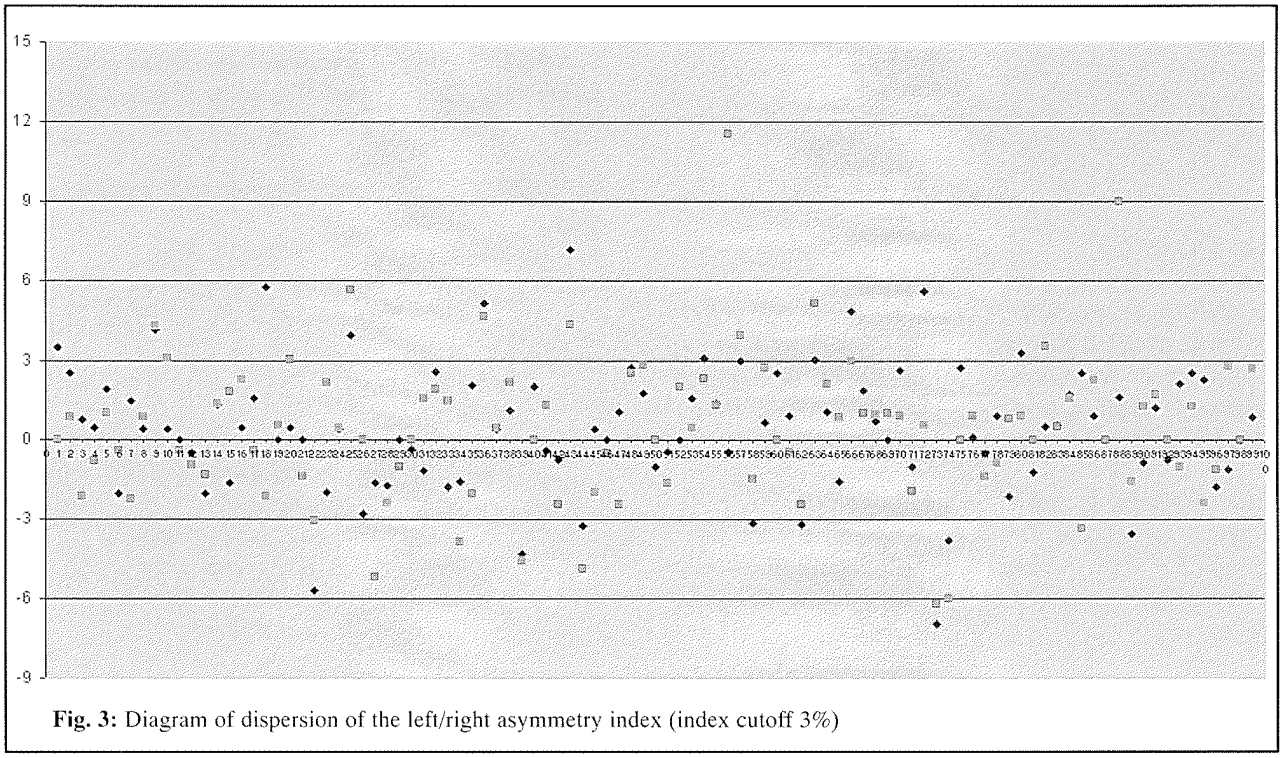

Fig. 3: Diagram of dispersion of the left/right asymmetry index (index cutoff 3%)

recognise a condylar/mandibular asymmetry, when present, is therefore of outmost importance for the registration of the mandibular position used in diagnostics and in treatment. The conventional axis of mandibular rotation should never penetrate the centers of the two condyles in a condylar/mandibular asymmetry. One side, the higher one, must determine the axis of rotation. If not, the axis of rotation definitely could not be parallel to the horizontal plan, used for reference at general rehabilitation. The definition and the application of the retruded position of the mandible therefore needs to be changed. As suggested by Hansson and coworkers the retruded position of the mandible is to be guided and determined by the higher and normally developed and functioning temporomandibular joint condyle. Although the ramus portion of the mandible, according to orthodontic expertise, is a very stable portion of the mandible an asymmetry of the two ramii mandibulae may occur which, in exception, may influence the total mandibular vertical asymmetry. In this perpspective the conclusion of this study is that the total mandibular vertical asymmetry (TMVA) needs to be recognised before the clinical application of the retruded position of the mandible that is generally determined by the higher and normally developed temporomandibular joint condyle.

REFERENCES

BORATTO R., GAMBARDELLA U., MICHELETTI P., CUSELLA DE ANGELIS M.G., HANSSON T.L. – Articolazione temporo mandibolare: ricerca di eventuali asimmetrie condilari. Società Medico Chirurgica di Pavia, 115, 1-7, 2002

CARLSSON G.E., LERESCHE L. - Epidemiology of temporo mandibular disorders, in sessle. Bryant B.J., Dionne P.S. R.A. – Temporomandibular disorders and related pain conditions, Seattle: IASP PRESS. 211-226, 1995.

FERRARIO V.F., SFORZA C., MIANI A. JR, SIGURTA D. - Asymmetry of normal mandibular condylar shape. *Acta Anat* 158, 266 – 273, 1997.

HABETS L., BEZUUR J.N., VANOOIJ C.P., HANSSON T.L. - The orthopantomogram, an aid in diagnosis of temporomandibular joint problems. I. The factor of vertical magnification.
J Oral Rehabil 14, 475-480, 1987.

HABETS L.L.M.H., BEZUUR J.N., NAEIJI M. HANSSON T.L. – The orthopantomogram, an aid in diagnosis of temporomandibular joint problems. II. The vertical symmetry.
J Oral Rehabil 15, 465 – 471, 1988.

HABETS L.L.M.H., BEZUUR J.N., JIMENEZ LOPEZ V., HANSSON T.L. – The OPG: an aid in TMJ diagnostic. III A comparison between lateral tomography and dental rotation panoramic radiography (Orthopantomography) *J Oral Rehabil* 16, 401–406, 1989.

HANSSON T.L. LACHMANN C. - Diagnose or quit: definition of RPM, Neue Gruppe, 13- Germany, 10:98.

LACHMANN S. - Ph. D. Thesis University of Hamburg (D) 1999.

SOLBERG W.K., WOO M.W., HOUSTON J.B. – Prevalence of mandibular dysfunction in young adults.
J Am Dent Assoc 98, 25, 1979.

TRONJE G. – In age distortion in rotational panoramic radiography. Ph D. Thesis University of Umea Sweden. 1982.

WELANDER U. - Layer formation in narrow beam rotation radiography.
Acta Radiol Diagnosis, 16, 529- 531 1978.

Corresponding Author:
Boratto Renata
Università degli Studi di Pavia
Dip. di Medicina Sperimentale
Sezione di Anatomia Umana Normale
Via Forlanini 8 27100
I - Pavia
fax 0382 422117
tel 0382 507648
e-mail: renata.boratto@unipv.it