

The influence of palato-cranial base (basomaxillary) angle on the length of the caudal process of the nasal septum in man

Ranko Mladina and Zvonimir Krajina

Dept. of O.R.L., School of Medicine, University of Zagreb, Yugoslavia

SUMMARY

The authors investigated and defined the relationship between the length of the caudal process of the quadrangular lamina and the palato-cranial base (basomaxillary) angle.

The length of the caudal process was measured by an indirect method during surgical exposure in 71 patients with nasal septum deformity. The usual cephalometric reference points were used to form the angle reference lines; the points were marked over X-rays and traced on transparent paper using the "against the light" technique. It was found that the caudal process was longer than 3 cm (range 3.1-4.2 cm, mean value 3.45, standard deviation 0.34) when there existed a palato-cranial base angle; contrary, it was always shorter than 3 cm (range 1.9-3.0 cm, mean value 2.40, standard deviation 0.33) when the reference lines were parallel. That means that the angulation between the reference lines assigning the angle predisposes a longer caudal process, making possible a backward growth of this cartilaginous baton, and therefore the occurrence of some particular types of septal deformities.

Finally, the authors suggest another name for the palato-cranial base angle, i.e. the basomaxillary angle, because it is simpler, shorter and still clear enough.

INTRODUCTION

Recently it was confirmed that the length of the caudal process is not always in a direct relationship with the septal deformity degree, but is commonly associated with particular types of deformities (Mladina, 1989).

Takahashi (1988) states that the development of horizontal septal deformity, appearing like a longitudinal, sharp, unilateral and basal ridge (type 5 after Mladina's classification of pathological septal deformities) and following the site of direct connection between the vomer and perpendicular lamina, is strictly caused by the pressure between these two septal parts. Moreover, he confirms

that the caudal process is in fact a vomerine process as this cartilaginous baton is embedded within the vomer itself and the superior edges of the vomerine sulcus are fused together.

The importance of the reduction of the splanchnocranium and the parallel diminishing of the basocranial angle during human evolution was stressed firstly by Šercer (1936), and recently explained in more detail by Takahashi (1988). Some types of pathological septal deformities, especially those of horizontal position, are probably connected with the entire skull development, particularly with some essential skull angles, such as the basocranial angle and presumably also the palato-cranial base angle described by Scott (1967).

This angle is situated between the backward extension of the anterior cranial plane (sella-nasion) and the palatal plane. Therefore, it is defined by two reference lines observed in the lateral cranial X-rays (Figure 1). The first line is

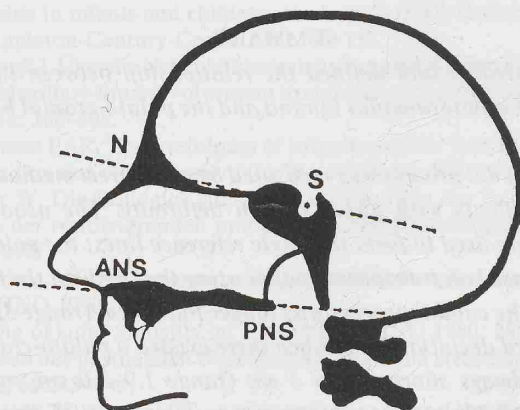


Fig. 1. The definition of the two reference lines assigning the palatocranial base (basomaxillary) angle.

marked by the letters N and S. The letter N means nasion, i.e. the cephalometric parameter marking the highest point on the nasofrontal suture, which means the surface termination of the frontonasal suture in the middle line. This requires a good X-ray as the nasal bone often produces a very light shadow. Letter S means sella, i.e. the cephalometric parameter representing the middle point of the pituitary body fossa.

The second reference line is defined by the point covering the top of the anterior nasal spina (ANS) and the point covering the top of the posterior nasal spina (PNS), i.e. the cephalometric point Pterygomaxillare (the intersection between the nasal floor and the posterior contour of the maxilla). This line in fact passes through the outline of the bottom of the nasal cavities (i.e. hard palate). These two lines form the palato-cranial base angle, as it was named by Scott. We suggest

another, simpler name: the basomaxillary angle. This term is composed of two parts: "baso" meaning that the first direction belongs to the elements of the skull base (to its anterior parts) and "maxillary", referring to the obvious passage of the other line through the upper jaw. Scott named this line "palatal plane", and described it as a line touching the upper surface of the hard palate. Lyberg (1989) named it "nasal line-NL".

We presume that there must be a relationship between this angle and the length of the caudal process. Therefore, this angle could be connected with the development and appearance of some certain types of pathological septal deformities as has been confirmed by recent investigations (Mladina, 1989). The aim of this paper is to find out the possible relationship between the length of the caudal process and the value of the palato-cranial base (basomaxillary) angle.

METHODS AND MATERIAL

The length of the caudal process was measured in 71 patients during operation, and was compared with the value of the palato-cranial base (basomaxillary) angle in each patient as measured from lateral cranial X-rays.

The length of the caudal process was measured with an indirect method: the distance between the lower anterior rim of the pyriform aperture and the most posterior point of the caudal process which was still surgically feasible was taken as a function of this length (the so called X-value). The distance was marked on an instrument during operation, transferred to a ruler scale and measured in centimetres.

The cephalometric orientation points were drawn on the X-rays and were later traced onto transparent paper, using the well-known "against the light" technique. Connecting the proper points, the two reference lines were formed: one connecting the points N and S (nasion and sella), and the other connecting the points ANS (anterior nasal spina) and PNS (posterior nasal spina or pterygo-maxillare point) (Figure 1).

Only good quality X-rays were taken into consideration as the nasal bones often produce a very light shadow, which makes determination of cephalometric point N practically impossible in poor quality X-rays.

Using the standard geometrical methods, the two reference lines were drawn near each other so that it was possible to observe their relationship in more detail. The lines were either parallel or angulated. The security factor of 2° was used as a criterion to confirm if the angle really existed. We considered that possible variations and failures in tracing the points and lines from the X-rays onto the paper could influence the analysis of the intermediate examples (those standing on the borderline between parallel relationship and angulation) and make them useless for further analysis. Therefore, only angles with more than 2° were taken as angulations. In the case of lower values, all X-rays were designated as a "parallel relationship", i.e. with no palato-cranial base (basomaxillary) angle.

Each X-ray was traced over twice. If the difference exceeded 1° , a third measurement was taken according to Slagvold (1969) and the middle value of the two nearest measurements was used.

RESULTS

The parallel relationship between the two reference lines which define the possible palato-cranial base (basomaxillary) angle was found in 45 cases and angulation in 26 cases (the range of the palato-cranial base or basomaxillary angle values varied from 2.7° to 10° ; the mean value was 5.55° and standard deviation 2.31). The angle values showed no significant difference in comparison with the results of other authors (Lyberg, 1989).

The average length of the caudal process (X-value) was about 3 cm. When the relationship between the two reference lines was parallel, the X-value was always less than 3 cm (range: 1.9–3.0 cm, mean value 2.40, standard deviation 0.33); however, in cases with an angulation, X-values were more than 3 cm (range 3.1–4.2 cm, mean value 3.45, standard deviation 0.34).

DISCUSSION

The caudal process is undoubtedly significant for septum stability (Takahashi, 1977, 1988). According to the results of recent investigations, it is obvious that the length of the caudal process is closely related to the occurrence of certain types of septal deformities (Mladina, 1989). We found the relationship between the length of the caudal process and the palato-cranial base (basomaxillary) angle: angulation between the reference lines assigning the angle predisposes a longer caudal process, making possible a backward growth of this cartilaginous baton (Figure 2), and therefore the occurrence of some particular types of septal deformities.

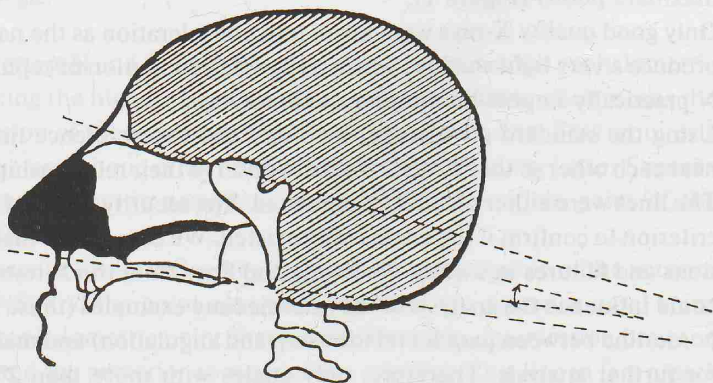


Fig. 2. The angulation between the two reference lines means a space surplus which makes possible an excessive backward growth of the caudal process.

CONCLUSION

An angulation between the reference line marked by the points N and S (nasion and sella) and the reference line assigning the plane of the hard palate, i.e. the bottom of the nose cavities is found in some people. There is a close relationship between the length of the caudal process and the angulation: if the angle exists, the length is greater and thus predisposes the occurrence of some particular types of septal deformities.

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R. Mladina, M.D.
ENT Department
School of Medicine
University of Zagreb
Salata 4
41000 Zagreb
Yugoslavia