

ORIGINAL PAPER

Former and present aspects in upper level of visceroskull architecture

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Abstract

The classical reference material describes two resistance arcs, the maxillary arc and the mandibular arc, from which the masticatory forces direct themselves towards the functional resistance structures of the visceroskull. From the maxillary arc, three pairs of vertical pillars ascend (that is fronto-nasal, zygomatic and pterygoid). Certain authors add to these a median arc – the bony part of the nasal septum. From the mandibular arc, the lines of force make for the condyle and the coronoid process of the mandible. In terms of the new outlook, at the upper level of the visceroskull, there are five vertical blades described: one median, two medial and two lateral, those last including the pillars from the classical descriptions. These vertical blades are joined by three horizontal laminae: the upper one, the middle one - interrupted by the median line and the lower one – included in the concavity of the maxillary arc. These structures of laminae induce the formation of some resistance cylinders and cones. Within the lower level of the visceroskull there are three mandibular arcs described: the upper one (the classic mandibular arc), the middle one (with an oblique direction) and the lower one.

Keywords: maxillary arc, vertical pillars, lines of force, structures of laminae, resistance cylinders and cones.

Introduction

The visceroskull's architecture presents a series of resistance functional structures, which are closely related to the resistance structures of neuroskull.

As part of visceroskull's architecture, we can distinguish resistance structures belonging to the upper level of the visceroskull and also to the lower level.

On the whole, these structures of visceroskull have an essential role to king over the masticatory forces and leading them towards the resistance structures of neuroskull. The classical reference material (Braus H, Bennighoff A) describes two resistance arcs, both disposed in the transversal level and posterior concavity: the maxillary arc and the mandibular arc, the first one appertaining to the upper level of visceroskull and the second one to the lower level [1].

The resistance functional structures of visceroskull's upper level

At the upper level of visceroskull is described a maxillary arc, represented by a condensation at the roots of the teeth implanted in maxilla. From the maxillary arc, three pairs of vertical pillars ascend to the neuroskull's functional resistance structures: fronto-nasal, zygomatic and pterygoid or pterigopalatine [2].

Fronto-nasal pillar or the anterior pillar has his origin in the part of the maxillary arc corresponding to the skull and to the two superior incisor teeth. From the origin ascends and then split into three: the middle branch ends up to the frontal resistance knot and the lateral branches, the upper and the lower one are found through the supraorbital and infraorbital border.

Zygomatic pillar or the middle one has his origin in the maxillary arc, corresponding to the premolars and to the first superior molar. This pillar ascends and then split into three: the lateral branch is dedicated to the zygomatic resistance knot and the medial branches, the upper and the lower one are disposed to the supraorbital and infraorbital borders, where these borders meet the similar ones arises from the fronto-nasal pillar. Therefore, we can say that at the base of each orbit is a real resistance ring formed by frontal, maxilla, zygomatic bone and also by the frontal process of maxilla [3].

Pterigoidian or pterigopalatine pillar, the posterior one, starts from the maxillary arc corresponding to the last two superior molars, ascends and ends up to the pterigoidian resistance knot.

Afterwards, a vertical median pillar represented by the bony part of the nasal septum and also by the perpendicular laminae of ethmoid and vomer, is added to the last three pillars already described.

The median pillar holds from the palatine arch to the ethmoido-frontal rafter and the body of the sphenoid, which are pieces of resistance structures of the skull basis. The concavity of maxillary arc is filled with the palatine arch, which join together the arms of the maxillary arc. Inside the palatine arch are described a series of forces lines, one of them transversal and the other ones arc shaped, parallel with maxillary arc.

Recent researches (Niculescu M *et al.*) based on bony sections, radiographic images and CT, and also anatomical sections, show up a new concept related to the functional resistance structures of the upper level of visceroskull [4].

In the light of this new concept, the functional architecture of upper level of viscerocranium is represented by eighth blades: five vertical and three horizontal, the last ones being mentioned in a certain way in classical descriptions.

The vertical blades are: one median and two paramedian median and lateral. The median blade is represented by the bony part of the nasal septum. The medial blade is formed by the bony structures which are making up the lateral wall of nasal cavities. The lateral blade is represented by the bony wall of maxilla's anterior face.

In lateral blade we can include the vertical pillars (fronto-nasal, zygomatic and pterygoid) from the classical descriptions.

The masticatory forces take over by the maxillary arc follow in fact three directions: the first one ascends through the lateral blade, the second one through the medial blade and the third one goes in a transversal level through the palatine arch to meet the one of the opposite side and than to ascend together through the median blade [5].

The meeting of the forces with transversal orientation through palatine arch on the median direction with the resistance took by the vertical pillar causes the appearance of palatine torso.

The three horizontal laminae: the upper one, the middle one and the lower one, join together the vertical resistance blades. The upper lamina is represented by the orbital parts of frontal, the roof of the orbital cavities and the horizontal blade of ethmoid (part of nasal cavities roof). The middle lamina, interrupted on the median direction by the presence of the nasal cavities is represented by the bony wall which makes the upper face, the orbital face of maxilla (the floor of the orbital cavities). The lower lamina is made by the palatine arch represented in the 2/3 anterior by the palatine process of maxilla and in the 1/3 posterior by the horizontal blade of palatine.

The lamellar structures from the viscerocranium's architecture realize with minimum material maximum resistance, pneumatization of the bones which constitute the upper level of viscerocranium is the result of the action of filogenetical factors of cephalisation. New researches (Niculescu V *et al.*) lead to the description of resistance functional structures made by the lamellar structures.

In these resistance structures of upper level of viscerocranium architecture we can describe some resistance cylinders and cones [6].

Resistance cylinders, situated antero-posterior and transversal flattened are represented by the nasal cavities walls [7].

Resistance cones flank the resistance cylinders, each part finding two resistance cones, one superior and the other inferior.

The superior resistance cone corresponding to the orbital cavities walls has the axle oblique oriented from anterior and lateral to posterior and medial, the base being anterior disposed.

The inferior resistance cone corresponding to the walls of the maxillary sinus, has the axle oblique oriented from posterior and lateral to anterior and medial, the base being posterior disposed.

We can consider that both the resistance cylinders and cones are not only structural elements of resistance but also elements of elasticity, a real functional ensemble of elastic resistance.

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Received: November 19th, 2005

Accepted: January 20th, 2007