COMPARATIVE MORPHOLOGICAL PECULIARITIES OF THE SKULLS AT SOME RODENTS (RABBIT, NUTRIA, GUINEAPIG AND SQUIRREL)

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Abstract
Generally, the rodent skulls have a rectangular shape, viscerocranium being about 2/3 of its length, representing the dominant portion of the skull. As a result of studies performed on the skulls from rabbit, guinea pigs, squirrels and nutria, several differences are observed in the matter of skulls morphology which is determined primarily by grasping and trituration of the food, even though these animals are rodents. At all rodents, the incisive bones are dominant, having a strongly rostral curved aspect. The convexity continues with the incisors, in their turn highly curved and strong. In rabbits, the jointing condyle is highly exalted above the mandible molar level which reduces the sectioning force through vertical action and its jointing surface is transversally orientated, allowing the flexion, extension or the propulsion and the caudal movements, like all herbivores. Articular condyle in nutria exceeds about 1 cm the surface of the mandible molars plane, this species requires an increased force for severing food, both in the terrestrial or aquatic environment. In guinea pigs, a terrestrial species, the condyle jointing surface is located near the molar level easing the food trituration by vertical and lateral movement. At squirrel, the condyle is placed nearly in the mandible molars plane but the ascension of the coronoid process above the molars plan eases the antero-caudal movements more than the vertical sectioning.
***Keywords**: incisor, guinea pig, mandible, mastication, rodent.*

Introduction

Regarding of the appearance of skulls and jaw in rodents, there is a wide variety of conformational structures involved in food trituration. In rodents, the incisive bones are highly developed, the bones having a curved shape and sustaining a small alveolar pouch for incisive (rabbit having two of this kind) where a powerful incisive can be found (Hautier L et al. 2010). Alveolar processes of incisive bones are deep, being able to reach the alveolar processes of the maxillary bones, this causing the incisive to develop a resistance growth. The incisors are as chisel shaped, are shorter, and in transverse section they show a triangular shape and they are also ventrally curved reaching the plan of molars root (Feider Z, 1967)

Material and method

To identify the conformational features, 5 skulls from the studied rodents were processed (rabbits, nutria, guinea pig and squirrel). After boiling and scraping off the adherent tissues, the skulls and the mandibles were treated with hydrogen peroxide for one hour. Description, identifying and highlighting the skull in those studied species were done by measuring and comparing the results with reference to our own existing findings. In order to highlight these results pictures were taken, using an OLYMPUS, 8 megapixels and Photoshop.

Results and discussion

In rabbits, the jawbone presents incomplete ossification, which is a normal occurance. Upper incisors are seated in two rows: the preceding incisors are more developed, longer and curved, are specialized, together with the mandibular incisors when sectioning the herbal similar to the peaks of a plier (Figure 1). The secundary incisors are smaller having cylindrical shaped, those being used in grinding. At the other rodents there are two incisors on each archway with a lophodont shape. Also, the maxilar bones are highly developed. On the sides, on every bone a zygomathic process is detaching. This zygomatic process is triangular, blade shaped and it is an insertion point for masseter muscle (Figure 1).

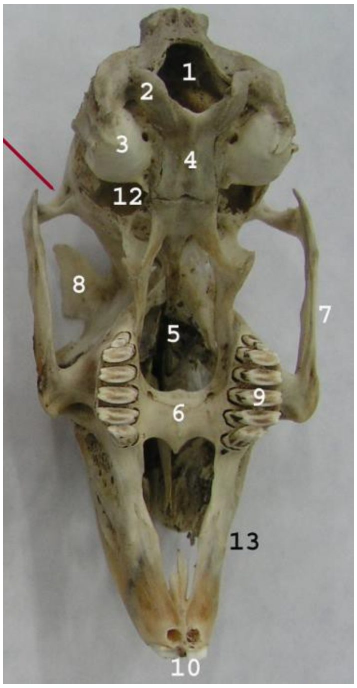

Figure. 1.The skull in rabitt, ventral view
1- foramen occipitale, 2-condilus occipitalis, 3- bulla timpanica, 4- bazioccipitalis, 5- choanae, 6- bolta palatina, 7- arcada zigomathica, 8- processus orbitalis, 9- molar, 10- principal incisors and its alveolar pouch, 11- secundar incisors, 12- foramen jugale, 13- maxilaris

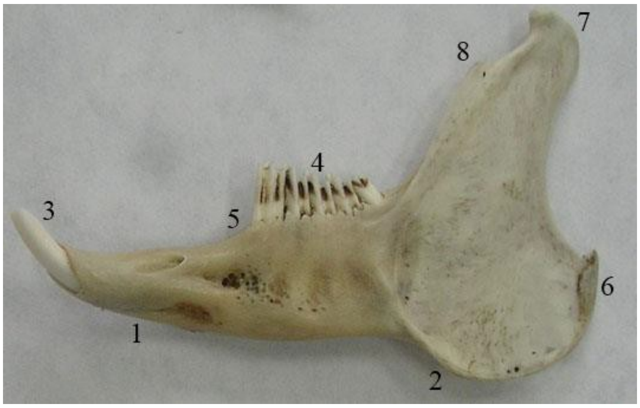

Figure. 2. Mandible in rabitt, lateral view
1-horizontal branch of the mandible, 2- recurved branch of the mandible, 3- incisors, 4- molars, 5- alveolar processes of mandible, 6- processus angularis, 7- condyle of mandible, 8- processus corono-condylaris

The lower jaw is the active element of the skull having different features in rodents. In rabbits, the coronoid process is reduced and the rounding of the angular processes can be seen (Becht G, 1953). Articular condyle is much higher above the dental plate which demonstrates the reduced trituration force and its articular surface being transversal, this enabling the flexion and extension; propulsion and retropulsion (Figure 2).

The mandible is that active element of the skull, having different features in rodents.

In rabbits, the reducing the angular coronoid process and the rounding aspect of the angular process represent the principal characteristics of it. The articular condyle is much higher above the dental plate which demonstrates a reduced force in trituration and its articular surface is transversal, flexion, extension, propulsion and retropulsion being possible, too (Coţofan V. et al, 1982).

In nutria, the palate region is bounded in majority by incisive bones, the palate processes are reduced, the incissura palatina looking bounding oval, short and deep (Figure 3).

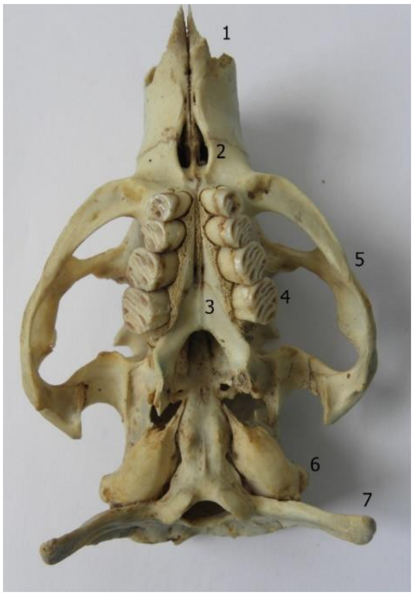

Figure 3. The skull in nutria, ventral view
1- os incisive, 2- fissura palatina, 3-palate, 4- molars, 5- zygomathic arch,
6- bulla timpanica, 7-paracondilar process

Figure 4. The skull in nutria, lateral view
1-Occipital, 2- external occipital protuberance, 3- zygomathic arch, 4- maxillar,
5- nazalis, 6-incisors, 7- molars

Maxillary alveolar processes are diverget, first molars become detached and the last three are paramedian located widening the palate, surface abrasion no having transverse ridges which are specific for rodents, they are smooth and oblique placed. Upper incisors are long, looking lophodont, cementum gives filed permanent brown appearance to the labial face of them (Figure 3).

Figure 5. Mandible at nutria, lateral view
1-Processus alveolaris ossi incisive, 2- molari, 3- processus articularis, 4- procesus angularis

The two mandibles from nutria are never welded. At nutria, the corono-condylar process is displaced, in comparison with other rodents to the base of the last molar. The articular process has a triangular articular surface, being continued with a massive neck, bordered caudally by a ridge sharp. At nutria, the articular condyle exceeds about 1 cm plan dulling surface of molars. Also, laterally from the molar portion is detached a strong bony crest which continues on the angular process, too. The angular process has the stillet appearance removable much caudally. The peculiarities of mandible at nutria by comparing the morphological characters that appear in the process of sectioning and mastication demonstrate the increase pressure force between dental tables (Figure 4).

To Guinea pig, it is remarkable the obliquely position of the molars settlement, first of the molars alveolar processes are close to the median plane of the mouth cavity, separated only by median inter-maxillary suture (Figure 6,7). It also notes that the four molars dental crowns are short and uniform, while the same mandibular decrease from first to last (Byrd KE. 1981). On the other hand, the oblique position of the molars and the slight medio-lateral oblique position of the abrasion surface of teeth show that, for triturating the food, more frequently the antero-posterior movements, such propulsion and retropulsion of the mandible are used (Figure 7).

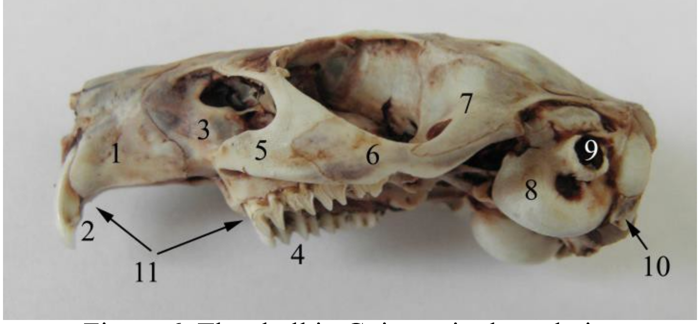

Figure 6. The skull in Guinea pig, lateral view
2- incisive bone, 2- upper incisors, 3- maxilaris bone, 4- upper molars, 5- zygomathic process of maxilar bone, 6- zigomathic bone, 7- zygomathic process of temporal bone, 8- bulla timpanica, 10- paracondylar process, 11- interdental space

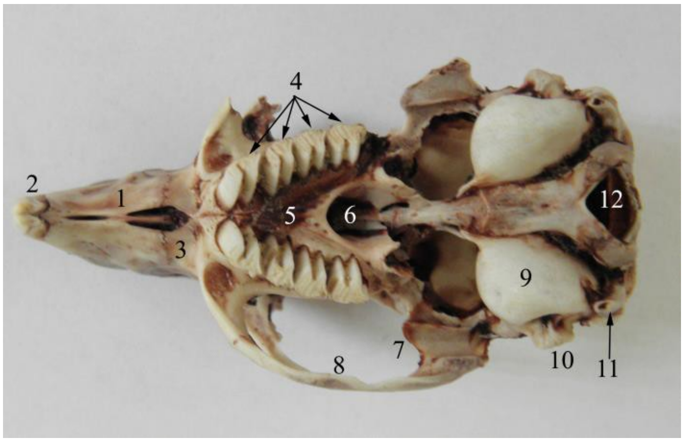

Figure 7 The skull in Guinea pig, ventral view
1- incisive bone, 2- upper incisors, 3- maxilar bone, 4- molars, 5- palate, 6- chonae,
7- temporal condyle, 8- zygomathic arch, 9- bulla thimpanica, 10- external ear oppening,
11- paracondylar process, 12- occipital

The mandible in Guinea pig is characterized by reduction in height of the coronoid process that occurs as a triangular bladed, about 2-3 mm high (Wible JR, 2007)(Figure 8).

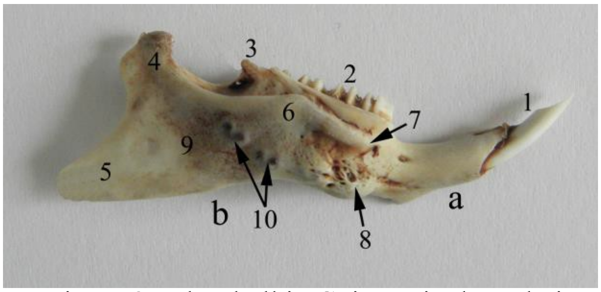

Figure 8 . The skull in Guinea pig, lateral view
a- Horizontal part of mandible, b- curved part of mandible, 1- incisors, 2- molars,
5- coronoid process, 4- condyle, 5- angular process, 6- mandible crest,
7- dorsal tubercle of mandible, 8- ventral tubercle of mandible, 9- masseteric fossa,
10- molars radix.

The reducing in height of the articular condyle increases the mandible's resistance and the position of the temporo-mandibular joint in the plane of the abrasion surface of the lower molars show bucking force in food trituration like the carnivores. The angular process with lamellar aspect exceeds the aboral plan of the skull, offers the place of insertion for extremely powerful chewing muscles in Guinea pig (Figure 8).

To squirrel, it is remarkable the strong development of the incisive bone which bound the lateral part and the half ceiling of the nasal cavity and mouth (Figure 9, 10).
The alveolar process of incisor is deep, reaches the base of mandible, the incisors having constant growth appearing as a chisel (Spătaru C.et al, 2011).

The mandible is customized by a massive mandibular angle. Mandibular condyle is placed nearly in the plane of the molars, causing a strong force when grinding. The ascending of the corono-condyle process much above of the mandibular molars level causes an increase the trituration force. Another mandible feature is the wide and quadruped angular process which much exceeds the caudal border of the mandible, being the insertion place for pterygoideus, occipito-mandibularis and the other muscles (Figure 11).

Figure 9. The skull in squirrel, lateral view
1-Occipital, 2- external occipital protuberance, 3- zigomathic arch, 4- maxillar, 5- nazal bone, 6-incisive bone, 7- molars

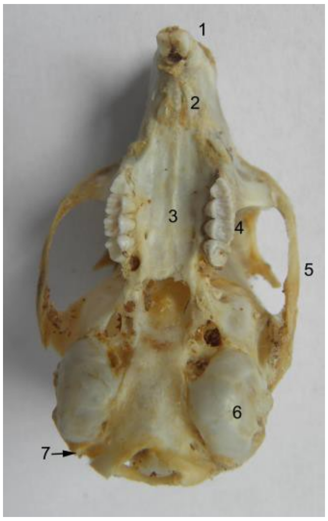

Figure10. The skull in squirrel, ventral view
1- incisiv bone, 2- fissura palatina, 3- palate, 4- molars, 5- zygomathic arch, 6- bulla thimpanică, 7- paracondylar process.

Figure 11. Mandible in squirrel, lateral view
1- incisors, 2- molars, 3- jointing process, 4- angular process

Conclusions

1. In rabbits, the jointing condyle is highly exalted above the mandible molar level which reduces the sectioning force through vertical action and its jointing surface is transversally orientated, allowing the flexion, extension or the propulsion and the caudal movements
2. The articular condyle is much higher above the dental plate which demonstrates a reduced force in trituration and its articular surface is transversal, flexion, extension, propulsion and retropulsion being possible, too.
3. In nutria, the maxillary alveolar processes are diverget, first molars become detached and the last three are paramedian located widening the palate, surface abrasion no having transverse ridges which are specific for rodents, they are smooth and oblique placed.
4. At nutria, the articular condyle exceeds about 1 cm plan dulling surface of molars.
5. To Guinea pig, it is remarkable the obliquely position of the molars settlement, first of the molars alveolar processes are close to the median plane of the mouth cavity, separated only by median inter-maxillary suture.
6. The mandible in Guinea pig is characterized by reduction in height of the coronoid process that occurs as a triangular bladed, about 2-3 mm.
7. To the squirrel, it is remarkable the strong development of the incisive bone which bound the lateral part and the half ceiling of the nasal cavity and mouth
8. In squirrel, the ascending of the corono-condyle process much above of the mandibular molars level causes an increase the trituration force.

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