COMPARATIVE MORPHOLOGICAL PECULIARITIES OF THE HINDLIMB TO SOME RODENTS (RABBIT, NUTRIA, GUINEA PIG AND SQUIRREL)

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Abstract
Although all the species proposed to study are rodents, that four mammal live in different environments (terrestrial, semi-aquatic or semiarboricol) and develop survival strategy involves in locomotor adaptation to the needs imposed by the environment. Thus, the rabbit develops a terrestrial moving by leaps and bounce, the length of the hind limb is double compared to the frontlimbs, muscles propellant are highly developed, through action on ischial insertion lead to appear a three massive ischial tubers in other rodent species instead marked by a ridge or a rounded small tuber. On the other hand, a strong flexors of the hip (mainly muscles as superficial, middle and accessory gluteus) lead to lengthening the iliac blade to nutria, squirrel and guinea pigs and the emergence of deep gluteal pits separated by a high ridge. At nutria and squirrel, the femur is seconded by a long neck and has ¾ articular surface of a sphere and to rabbit and squirrel, very short in guinea pig , is observed the presence of the third trochanter.
Key words*: squirrel, bone, rabbit, hindlimb, rodent*

Introduction

Although the studied species belong to the group of rodents, the diversity of life aspects where they live, leads to peculiarities of bone conformation of the hindlimb posed by developping long bone or growing a sharp crests separating deep pits or some protruding tubers giving information about action, strength, speed and importance of muscle for mobilizing a joint or in the entire body movement in the context when the rabbit and guinea pig are terrestrial, semi-aquatic being nutria and squirrel, semiarboricol (Feider, Z. et al, 1976).

Material and method

To identifying the conformational features, each 5 skeletons from the studied rodents were processed (rabbits, nutria, guinea pig and squirrel). After boiling and scraping off the adherent tissues, the bones were treated with hydrogen peroxide for about one hour. Description, identifying and highlighting the bones 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.

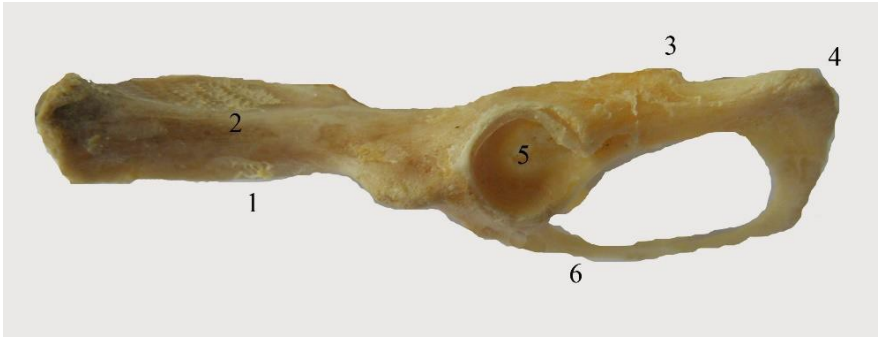
Results and discussion

In rabbits, the iliac blade is characterized by the appearance flattened and quadrilateral side surface being present gluteenă a low ridge. Ischial tuberosity, tricuspid, the lateral cusp is massive and very evident. Supraacetabular crest is marked by a sharp spina (Mclaughlin CA, 1990).

The pubis presents a stark aspect ventral ridge for abdominal dorsal muscles insertion (Figure 1, A).

A

B



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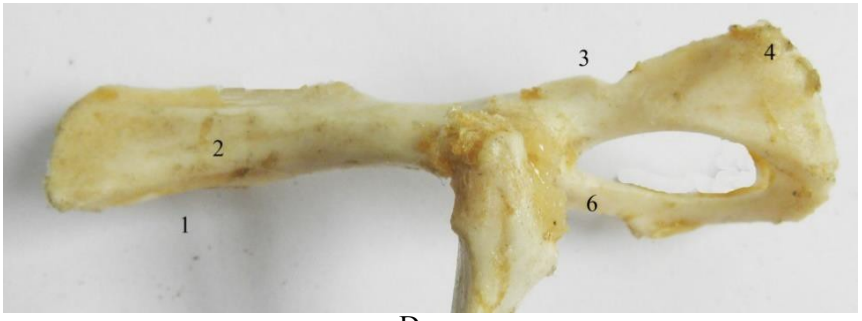


D

Figure 1. The coxal to : A- rabitt, B-nutria C- guinea pig, D- squirrel
1-iliac palett, 2- gluteea crest, 3- iliac spina, 4- ischiatic tuberosity,
5- hip jointing cavity, 6- pubis

In nutria, the coxal is longer than the similar to rabbit, having a slender prismatic iliac palette by detaching a massive gluteal crest that offer a larfe place for part of gluteal muscles insertion ((Dinç G, 1999). Ischiatic tuberosity is simple and rounded, and supraacetabular crest appears as a low tuber (Figure 1, B).

At guinea pigs, the iliac palette looks iliac triangular gluteal crest being straight and low. Ischial tuberosity is simple massive, tuberous in appearance (Figure 1, C).

To squirrel,the iliac blade is narrow and looks quadrilateral, the gluteal crest looks straight and detached in the middle third of it. Ischial tuberosity is simple and rounded (Figure 1, C).

Among the four species of rodents studied is observed significant differences in conformation of the femur which are the consequence of each species propulsion mode.
In rabbits, the length of the bone is higher than the other species in the study because it is moving by leaps and choppy (*Cende A,* 2014).

The propelling muscles which inserts on femur print on it a slightly curved appearance and massivity of the proximal part of it. Hemispheric articular surface of head is sustained by a short and thick neck. It is noted the development of a uniquely blade bone of the three trochanter, third trochanter does not exceed the proximal quarter of femour (Figure 2, A).

At the distal, the femoral trochlea is a long and the jointing condyle surface extends caudal, rounding on them.

Figure 2. The femour to: A- rabbit, B- nutria, C- squirrel,
D- guinea pig, cranial aspect
1- femural head, 2- greater trochanter, 3- second trochanter, 4- third trochanter,
5- femoral trohleea

To the nutria, the femor appears straight, the femural head is more detached medially, has a long and powerful neck and the articular surface aprozimatively reaches ¾ spherical surface (Figure 2, B).

Greater trochanter is massive and looking crest. The second trochanter looks tuberous and third of them missing.

At squirrel, the femour looks straight, the proximal extremity being masive by detaching a hemispherical femoral head which is supported by a long neck ((Spataru M, 2005). Greater trochanter looks tuberous being continued with a bony crest that ends abruptly with a low tuber, representing the third trochanter(Figure 2, C) .

To guinea pig, the femur is strait, the articular head is massive, hemispherical and supported by a long neck. Greater trochanter is massive, tall, looking quadrangle. The second trochanter has tuberous aspect and third of it is represented by a straight muscular ridge which ends in the middle of femour through a small tuber (Figure 2, D).

In rabbit, tibia is massive and fibula has the only its proximal half, the two bones are fully welded to the distal end ((*Cende A,* 2014). The tibial crest is short and sharp and the articular condyles have a plan-concave surface (Figure 3, A).

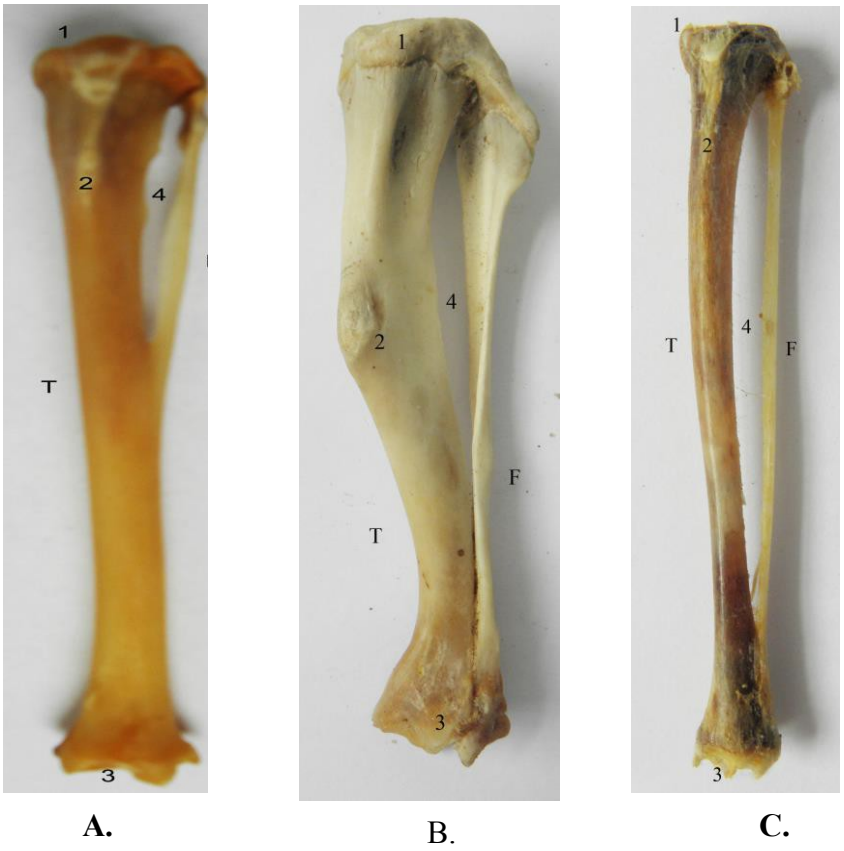


Figure 3. The shank bones in rabbit (A), nutria (B) şi squirrel (C)
T- tibia, F- fibula, 1- tibial condyl, 2- tibial crest, 3- distal jointing surface for heel joint
4- tibio-fibular space.

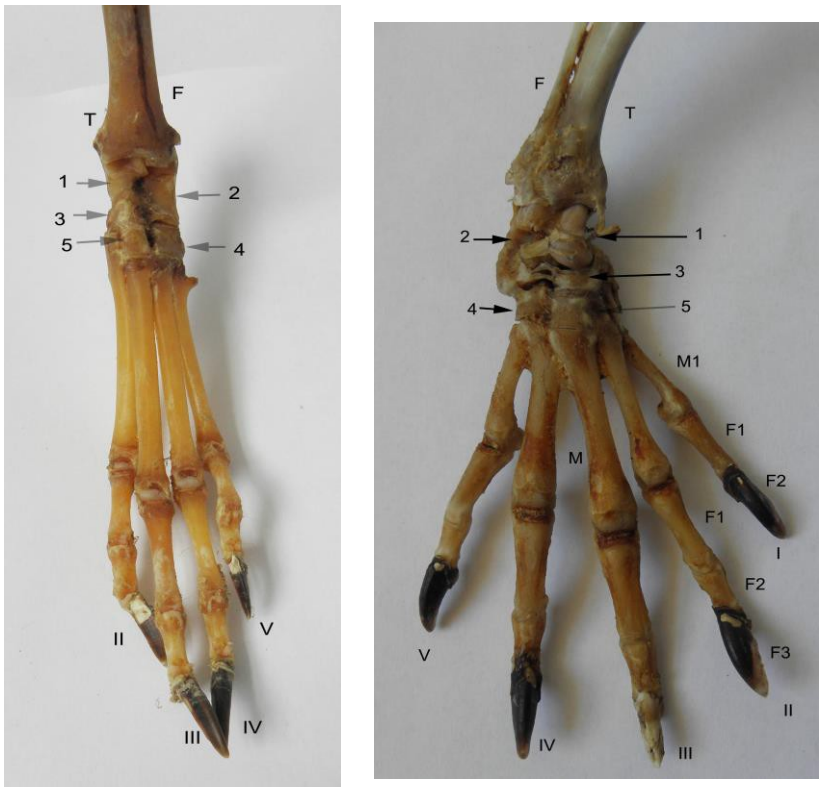
To nutria, the two shamp bones have entirely length, proximal being separated by a large interbones space, in the lower third fibula attaches to the tibia, and distally is in common (Dinç G, 1999).

Tibial spine is flattened and ends on the halfway through a masive tibial tubercle. Tibial condyles have plan-convex aspect, the lateral condyle has the proximal articular surface placed cranial comparatively with its medial, that allows the shank rotation in swimming (Figure 3, B).

To guinea pigs, the calves bones are represented by whole length but closely attached in the distal half. Tibial crest is sharp and straight and ends in the proximal third with an masive tuberosity.

To squirrel, the two bones are independent. Tibia is straight, it has a long tibial crest, smooth and rounded. Fibula is thin and is represented by more proximal and distal extremity that articulates with the tibia (Figure 3,C).

Tarsal bones of the species studied are: the calcaneus, the talus, scaphoid, cuboid, and into two (rabbits and guinea pigs) and four cuneiform bones (the otter and squirrel) (Figure 4, 5).
In rabbits, the medial cuneiform is welded to the proximal end of the metatarsus II, thus forming an extension for articulates with the scaphoid (Mclaughlin CA, 1990) (Figure 4, A).



A. **B.**

Figure 4. The shank bones, the metatarsaland phalanx in rabbit (A) and nutria (B)
T- tibia, F- fibulla, M- metatarsal bones, F1-F3- proximal, meddle and distal phalanx,
I-V- from the first to the fifth finger
1- astragal, 2- calcaneus, 3- scaphoideus, 4- lateral cuneiform bone, 5- medial cuneiform bone.

To the nutria and squirrel, the astragalus has a ventral obliquelly and medio-lateral trochlea that allows the foot rotation laterally (Spataru M, 2005, Spataru C, 2009). Also, foot movements are favored by artcular talar head that articulates with the scaphoid (Figure 4, B).

The calcaneus, solid in all studied species, in nutria looks trifaciat and calcaneal tuberosity is divided by a transverse groove. The scaphoid, dorsal-ventral flattened, has a glenoid cavity for astragalus and some plan articular surfaces for neighboring bones.

Metatarsal bones in rabbits are in number of four, to nutria and squirrel are five and only three in guinea pigs being continued with the same number of fingers (Figure 5). In rabbits and guinea pig, the metatarsal bones are joined by a tight intermetatarsal ligament, in nutria and squirrel, the metatarsal bones are removed to each other earning a functional independence required in swimming and climbing.

The phalanx of the hindlimb is longer than the frontlimb because the plantigrade locomotion in all the studied species.

Figure 5. The shank bones, the metatarsaland phalanx in guinea pig
T- tibia, F- fibula, Tars- tarsian bones, Mt- metatarsian bones, F1-F3- proximal, middle and distal phalanx, I-V- from first to the fifth finger

Conclusions

1. In nutria, the coxal is longer than the similar to rabbit, having a slender prismatic iliac palette by detaching a massive gluteal crest that offer a larfe place for part of gluteal muscles insertion. Ischiatic tuberosity is simple and rounded, and the supraacetabular crest appears as a low tuber.
2. To nutria, the greater trochanter is massive and looking crest, the second looks tuberous and third of them missing.
3. In rabbit, tibia is massive and fibula has the only its proximal half, the two bones are fully welded to the distal end.
4. To squirrel, the two shank bones are independent. Tibia is straight, it has a long tibial crest, smooth and rounded, fibula is thin and it is represented more by proximal and distal extremity that articulates with the tibia.

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