The Role of the Pubic Bone in Dinosaurs and Birds

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1. Introduction

The shape of the pubic bone of dinosaurs (in this study, dinosaurs refer to non-avian dinosaurs) differ greatly depending on the species, which has resulted in its frequent use in the classification of the species (Fastovsky et al., 2015). However, the function of the pubic bone in dinosaurs has not been clarified yet. As theropod dinosaurs evolved into birds, their pubic bone became thinner and its direction has changed from downward to backward (Gregory et al., 2020). This study focuses on this change in the shape of the pubic bone and aims to reveal its function from a morphological perspective.

2. Method

In this study, the skeletons of dinosaurs and birds, and dissected hen*(Gallus gallus domesticus*)' s muscles are observed. The observed skeletons are possessed in National Museum of Nature and Science, Tokyo, Gunma Museum of Natural History, Misato Ostrich Farm, and Abiko City Museum of Birds.

3. Results and Discussion

Therizinosaurus(*Therizinosaurus cheloniformis*) and tyrannosaurus(*Tyrannosaurus rex*), are bipedal theropods of the same time period. Although they share similar physical features, their pubic bones differ largely in width. Also ostriches(*Struthio camelus*), which are ratite birds closely related to dinosaurs, have an independent pubic bone that is connected at the tip, similar to dinosaurs, which is a structure that could carry something steadily. From these facts, we considered that the function of dinosaurs' pubic bone is to support internal organs.

Initially, bones have the function to support the body and protect the internal organs (Hashinuma et al. ,2005). In flying birds, the pubic bone is generally apical, pointing backwards and fused with the ilium. But since ostriches have extraordinarily long and heavy internal organ (intestine), the pubic bone is likely used to support the weight. The difference between therizinosaurus and tyrannosaurus is their dietary habits. We assumed that this is the reason of the large difference of the pubic bone.Herbivores tend to have longer intestines due to its long digestion time (Hosoya et al., 2017), which might also be the case with dinosaurs.

Herbivorous Therizinosaurus would have had a wide pubic bone to accommodate their long intestine, while carnivorous Tyrannosaurus would have had a narrow pubic bone for their relatively short intestine. As theropod dinosaurs evolved into birds, their body weight was reduced in order to fly. We hypothesized that during this process, their digestive organs became dwarfed, and the pubic bone lost its supporting role and became thinner. To examine the hypothesis, pubic bones of theropods are compared to each other in accordance with a phylogenetic tree, and it is found that their pubic bones gradually turn backwards as theropods evolved into bird and become lighter.

On the other hand, fast-running theropods such as Ornithomimus(*Ornithomimus edmontonicus*) had forward-facing pubic bones, even though they would have been sufficiently light in weight. To explain this fact, we are conducting further study regarding their running ability, the need for incubation and more. More details will be presented in the poster presentation.

Keywords: Theropoda, pubis, macroscopic view

