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Case Report

PRESENCE OF ENTHESOPHYTES IN BOTH APPENDICULAR AND AXIAL SKELETON OF A CADAVER: A CASE REPORT

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ABSTRACT

During the routine anatomy dissection for the undergraduate students, an uncommon variation in relation to bones was observed. The muscle attachments of the axial and appendicular skeleton were associated with the formation of extensive enthesophytes. The bones mainly responsible for the weight transmission especially in the lower limbs were observed to have an abundant new bone formation in the area for muscle and ligament attachments. This information may be of importance to radiologist, surgeons who are seeking to reduce the morbidity associated with dissections in this region, particularly related to paresthesias and nerve compressions.

KEY WORDS: skeleton, enthesophytes, Paresthesias, Nerve compressions.

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INTRODUCTION

Entheses are the insertion sites of ligaments, tendons or articular capsule onto the surface of the bone [1]. The outward bony projections from the articular surface of synovial joints are called “osteophyte” whereas the bony spur produced at the site of attachment of ligament or tendon is called “enthesophyte” The formation of enthesophyte can be considered as a part of stress-induced response from the bones which are usually associated with any one of the inflammatory, degenerative, endocrine or metabolic disorders [2].

This article presents an uncommon variant of enthesophyte formation in both axial and appendicular bones obtained from a male cadaver.

CASE REPORT

During the routine dissection classes for the undergraduate students, a rare uncommon variation in relation to muscles of the lower limbs was identified in a 60-year-old male cadaver in the Department of Anatomy, JIPMER, Karaikal. On external examination, there were no identifiable signs of trauma, pathological lesions, post-operative scars in the limbs and the posterior thoracic wall. As per Cunningham’s manual, the lower limbs and the vertebral column were dissected carefully to identify the proximal and

distal attachments of related muscles. After identification, it was observed that the belly of muscles had normal structure and arrangement whereas the enthesis was abnormal. These sites of attachments were found to be harder on palpation. On further trying to dissect with the scalpel, a gritty sound was heard, as if trying to cut the bone. After complete dissection of the body, the cadaver was year-marked and buried. Finally, bones were extracted by the routine procedure in the department and examined. The medical history of the subject was unknown. On inspection bony spurs (enthesophytes) were visualized at the sites of insertion of the tendons of the muscles in both axial and appendicular skeleton. The lower lumbar vertebra had two enthesophytes - projecting from the superior border of the anterior surface of its body on its lateral aspect of size 3x2 cm and 2x1 cm. In general, the body of vertebra appeared to be thick and the spinous process was stout. (Figure. 1) The other parts of the axial skeleton were found to be normal. In the appendicular skeleton, only lower limb bones possessed this uncommon variant. The following findings were revealed on inspection of the bilateral femur bones – a) prominent muscular impressions, b) Marked enthesophyte of length 5 cm and breadth 1 cm present on both the lips of linea aspera. The position of the enthesophyte on femur represented the attachment of vastus group of muscles. (Fig. 1)

Examination of the both-sided upper end of tibia showed prominent bony spurs at the following sites:

1. Upper end of tibia at the insertion of quadriceps tendon and guy rope muscles of size 4 x2 cm

2. The shaft of the tibia at the distal attachment of soleus muscle. The growth of enthesophyte at this region is florid and it measures about 7 cm in length and 3 cm in breadth. (Fig. 2) Both fibula revealed increase in thickness and marked bony spur projections on its shaft at the insertion of fibularis longus and fibularis brevis muscles.. (Fig. 2) Calcaneus of both sides presented a bony spur of size 3x2 cm at the distal attachment of Calcaneal Tendon. (Fig. 3) No evidence of fracture was found on the surface of lower limb bones. The upper limb bones were found to be normal.

Fig. 1: Photograph showing the areas of enthesophytes in the femur and the vertebras.

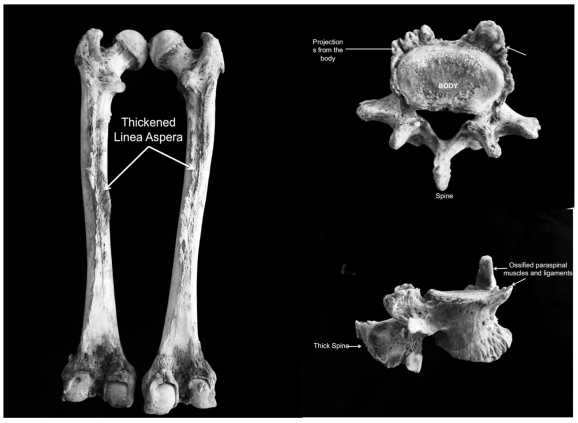


Fig. 2: Photograph showing the presence of bony spur on the upper end and shaft of tibia and fibula.

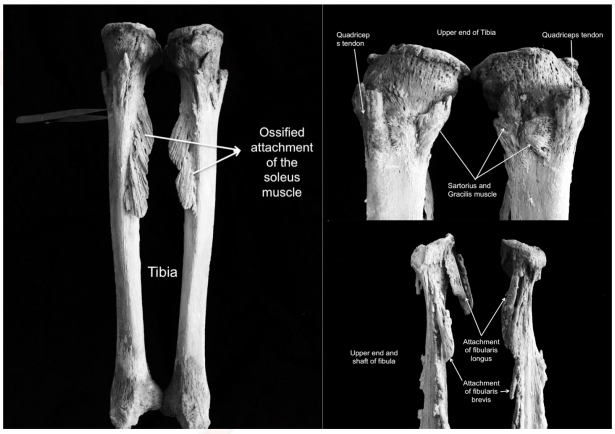
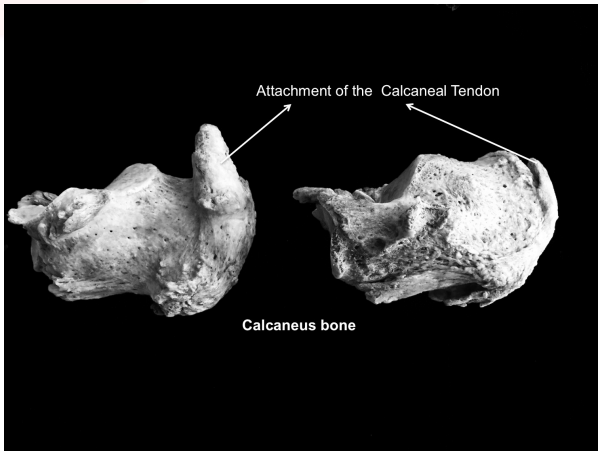


Fig. 3: Photograph showing the enthesophyte at the insertion of bilateral calcaneal tendon.



DISCUSSION

Entheses may be osteotendinous or osteoligamentous junctions located at any part of the bone. Various classifications of entheses have been illustrated according to its structure and its location. The presence of periosteum categorizes entheses into two types – Fibrous which consists of periosteum (Indirect) and Fibrocartilaginous where the periosteum is absent and

the tendon or ligament directly gets inserted into the bone (Direct). Based on the location, the types are chondro-apophyseal situated at the extremities of long bones and periosteal-diaphyseal [3]. The functions of entheses are as follows:

(i) Provides anchorage of the tendon or ligament

(ii) Helps in dissipation of stress

(iii) Act as "mini" growth plates

The dissipation of stress at the surface of the bones is performed by a group of tissues, which are located very close to the entheses. Such a collection of physiologically uniform tissues is referred to as "Enthesis Organ". The histologically multi-layered enthesis organ consists of four zones of tissues namely pure dense fibrous connective tissue, noncalcified fibrocartilage, calcified fibrocartilage and bone respectively [4].

Enthesopathies are defined as any abnormal change in the healthy structure or function of the entheses. These injuries usually result from over-usage of the corresponding muscles. Most common diseases in clinical practice which are associated with enthesopathies are Spondyloarthropathy, rheumatoid arthritis, Diffuse Idiopathic Skeletal Hyperostosis (DISH) and Calcium Pyrophosphate Deposit Diseases (CPPD) [2].

Most common manifestation of enthesopathies is the formation of enthesophyte. The growth of an enthesophyte tends to follow the direction of natural pull of the involved ligament or tendon. A number of theories have been proposed to the pathogenesis of enthesophytes. Inflmmatory theory suggested that the presence of TGF- beta and BMPs induces the formation of enthesophyte [5]. Mesenchymal stem cells act as progenitor for enthesophytes according to molecular theory [6]. Mechanical theory proposed that the irritation causes damage to periosteum, which further induces the differentiation of osteoblasts into enthesophytes [7].

Enthesophyte formation is closely associated with male sex and proportionally increases with age [1]. Our case report also supports this finding as the bones are obtained from an elderly male cadaver. The probable reason, which could be attributed, is the increased skeletal/ muscle mass in male causing an increased bone-forming phenotype in addition to environmental and hormonal factors. A positive correlation has been proved between the occurrence of osteophyte and enthesophyte where the joint mechanics gets altered in chronic strain [8].

Enthesophytes in the living are visualized by X-ray images of the affected region. Sarah et al. constructed an enthesophyte atlas based using roentgenographic images of the pelvis in which three grades had been illustrated as –Grade I – Mild (Subtle new bone formation), Grade II – Moderate, Grade III – Florid (Marked new bone formation) [9]. In spite of various scoring systems [10,11] available for enthesophyte, there still lies an ambiguity for the grading of enthesophytes in our present case report, which mainly involved the lower limb bones.

In the present case report, the florid new bone formation is observed in the lower limb bones and lower lumbar vertebrae. The proposed mechanism is repetitive trauma to the weight bearing areas for the attachment of the muscles, which remained to be unnoticed for the long duration, resulting in the formation of enthesophytes. However, the aetiology remains inconclusive, as the medical history of the subject is not known.

CONCLUSION

In the present case report, the presence of bony spurs in both axial and appendicular skeleton provides an additional knowledge about enthesopathy and enthesitis. This is of utmost important for the rheumatologists, orthopaedic surgeons, radiologists, and anatomists.

Conflicts of Interests: **None**

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