

Anatomical Studies on the Tarsal Joint of Buffalo Calves (*Bubalus bubalis*)

Supriya .B^{*1}, T. S. Chandrasekhara Rao²

¹Assistant Professor, Department of Veterinary Anatomy,
College of Veterinary Science,
Sri Venkateswara Veterinary University, Tirupati- 517502, A.P, India

²Dean, Faculty of Veterinary Science,
Sri Venkateswara Veterinary University, Tirupati- 517502, A.P, India

Abstract: *The study was conducted to through light on special morphological features of buffalo tarsus compared to that of cattle. It was conducted on 15 apparently healthy buffalo calf limbs of 1- 1½ year age buffaloes collected from the local slaughter house in the Department of Veterinary Anatomy, College Of Veterinary Science, Tirupati. The tarsal joint of buffalo comprised of the bones and ligaments nearly similar to those of ox. The individual tarsal bones had well developed articular facets. The present paper describes the detailed anatomical description of ligaments of tarsus of buffalo calf and how they differ from that of white cattle.*

Keywords: Tarsal articulation, Buffalo calf, ligament, tarsal joint, synovial sac

1. Introduction

The disease conditions of the joints of the limbs drastically reduce the productive and reproductive capabilities of animals. Extensive information was available on the anatomy of the joints of horse, dogs, pig and the cattle in standard text books dealing with anatomy and clinical anatomy [1], [3], [4], [6], and [7]. Several anatomical aspects of joints which were specific to buffaloes and vary with those of ox were not well documented. Hence, the present study was undertaken to through light on special morphological features of buffalo tarsus. Nomina Anatomica Veterinaria [5] followed for nomenclature.

2. Materials and Methods

The study was conducted on fifteen apparently healthy 1-1½ year old buffalo calf limbs procured from the local slaughter house irrespective of breed, sex and nutritional status. The limbs of the animals were preserved in 10% formalin and the gross morphology of joints and relations were studied by careful dissection. The dissection was also carried out in some unpreserved fresh specimens to study the movements of the joints. The ligaments of the joints were painted with acrylic paints for better visualization.

3. Results and discussion

The tarsal joint of buffalo calf was a composite joint comprised of tarsocrural joint, proximal intertarsal joint, distal intertarsal joint and the tarsometatarsal joint. The capsula articularis was attached around the tibial articular surface above and fused third and fourth large metatarsal below. The joint showed tibiotarsal, proximal tarsal, distal tarsal and tarsometatarsal synovial sacs. The tibiotarsal sac was larger. The plantar annular ligament completely covered the tarsal groove.

The lateral collateral ligament showed two parts, the long lateral collateral ligament and the short lateral collateral

ligament. The former extended from lateral aspect of the lateral malleolus to proximal end of fused third and fourth large metatarsal and also attached to the lateral aspect of bones in its course. The latter was deep to former and extended from the anterior aspect of lateral malleolus and ended on lateral aspect of body of fibular tarsal just below articular surface of lateral malleolus. The calcaneometatarsal ligament originated proximally from distal end of fibular tarsal and ended on the fused third and fourth large metatarsal dorsal to long lateral collateral ligament (fig. 1).

The long medial collateral ligament extended from distal end of tibia to the proximal end of fused third and fourth large metatarsal attached to the medial aspect of tarsal along its course. The short medial collateral ligament was divided into three parts out of which two parts, pars tibiotalaris were attached to the tibial tarsal and one part pars tibio calcanea was attached to fibular tarsal (fig.2) the latter in white cattle divided into only two parts [4]. The lig. talocentrodisto-metatarsium was a flat ligament extending from the medial surface of tibial tarsal and end on fused third and fourth large metatarsal attaching to medial aspect of the tarsals along its course (fig.2).

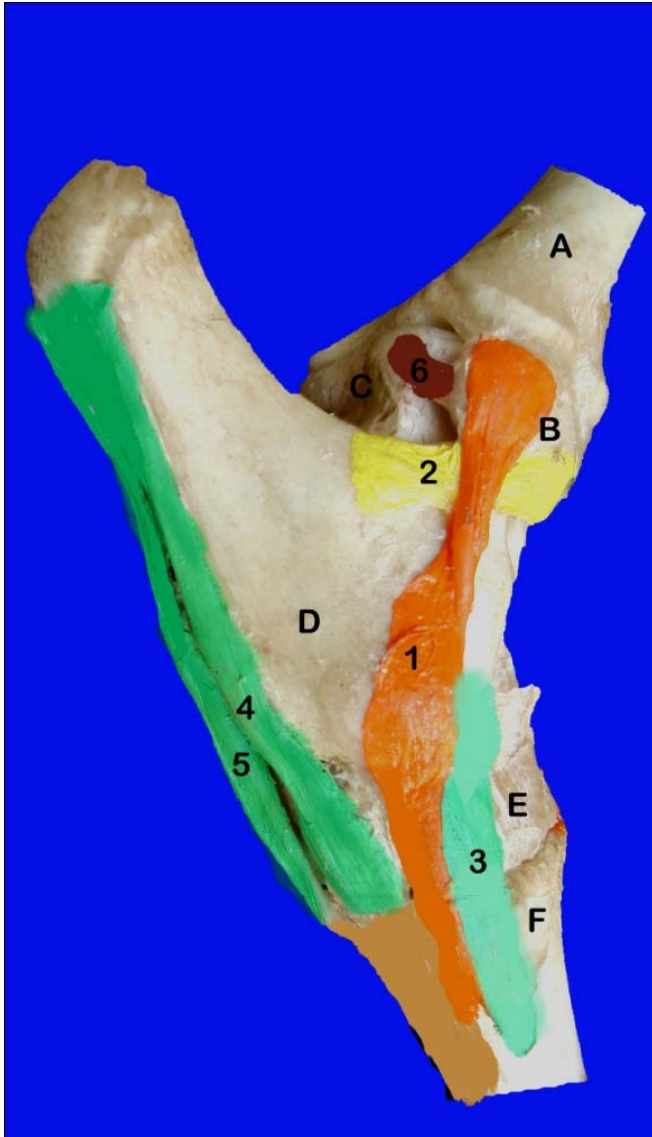


Figure 1: Photograph showing lateral aspect of tarsus with the capsula articularis removed

1-2. Lateral collateral ligament, 1. Long lateral collateral ligament, 2. Short lateral collateral ligament, 3. calcaneo metatarsal ligament, 4, 5. Lig. plantare longum, 4- Lateral limb, 5- Medial limb, 6. Lig. connecting Lateral malleolus and tibial tarsal, A. Tibia, B. Olaternalmalleolus C. Tibial tarsal, D. Fibular tarsal, E. Fused central and fourth tarsal, F. Fused third and fourth large metatarsal

The lig. plantare longum extended from the plantar aspect of tuber calcis to fused third and fourth large metatarsal and along its course attached to plantar surface of tarsus and metatarsus. It comprised of the medial and lateral limbs as reported by Nickel et al. [4] in cattle. The lateral limb ended along the caudal margin of proximal articular surface of fused third and fourth large metatarsal. The medial limbs extended a little longer along posterior aspect of fused third and fourth large metatarsal (fig.2). Raghavan [6] and Gupta and Sharma [2] described only a single strong flat band extending from the posterior border of the tubercalcis along fused central and fourth tarsal and fused third and fourth large metatarsal in ox and yak respectively.

3.1. Tarsocrural joint

Tarsocrural joint was a composite hinge joint formed by the cochlea of tibia, trochlea of the tibial tarsal, fibular tarsal and lateral malleolus. The tibial tarsal articulated with the tibia and lateral malleolus and the fibular tarsal articulated with the lateral malleolus only. The joint capsule was spacious and communicated with the proximal inter tarsal joint. A strong transverse ligament attached the lateral malleolus to the plantarolateral aspect of proximal end of tibial tarsal (fig.1) and a narrow, thin dorsal ligament connected lateral malleolus and tibial tarsal. This joint was greatly involved in the movement of the hock and showed flexion and extension.

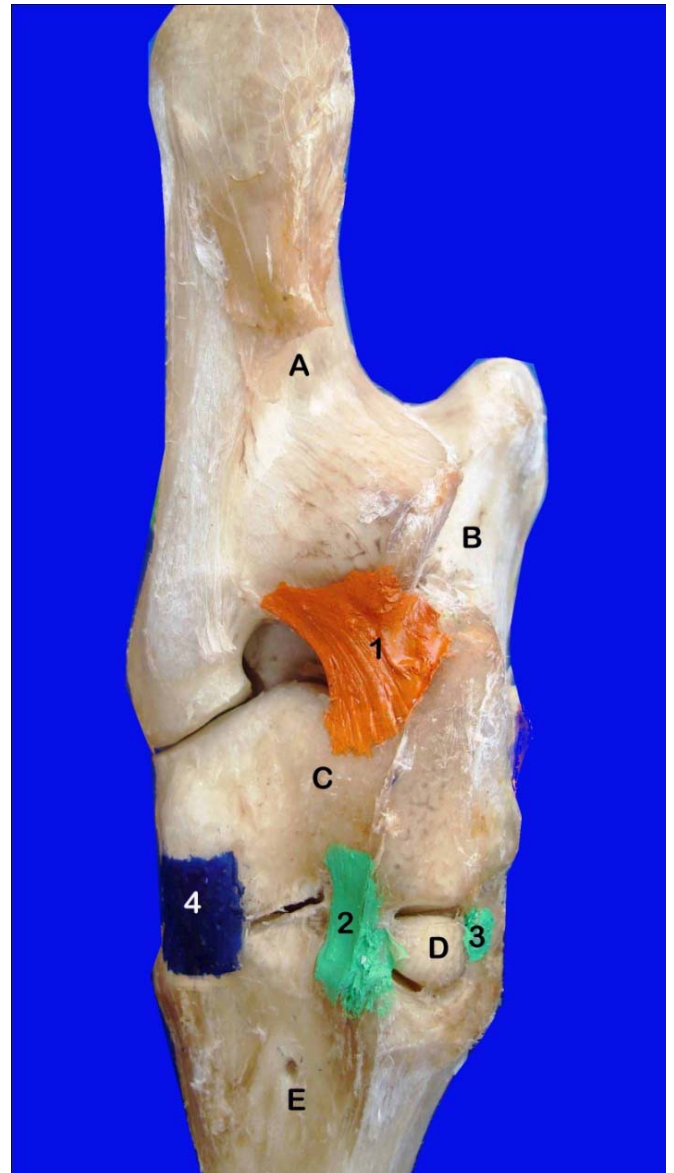


Figure 2: Photograph showing medial face of tarsus

1-3. Medial collateral ligament, 1. Long medial collateral ligament, 2,3. Short medial collateral ligament, 2-Pars tibio calcaneae, -Pars tibiotalaris, 4. Lig. talocentrodisto metatarsium, 5. Lig. plantare longum-medial limb, 6. Lig. talocalcaneum plantare, 7. Lig. tarsi dorsale, 8. Lig. tarsidorsale obliquum, A. Tibia, B. Tibial tarsal, C. Fibular tarsal, D. Fused central and fourth tarsal, E. Fused second and third tarsal, F. Fused third and fourth large metatarsal

3.2 Proximal inter tarsal joint

Proximal inter tarsal joint was an amphiarthrosis formed between the tibial tarsal and fibular tarsal proximally and fused central and fourth tarsal distally. It included art. talocalcaneocentralis and art. calcaneouquartalis. The articular sac was roomy. On the dorsal aspect flat oblique ligament extend between the two trochlear ridges connected the tibial tarsal and fused central and fourth tarsal (fig.2). Two collateral ligaments were present. On plantar aspect one thick ligament extended from the sustentaculum tali to the plantaromedial prolongation of fused central and fourth tarsal (fig 3).

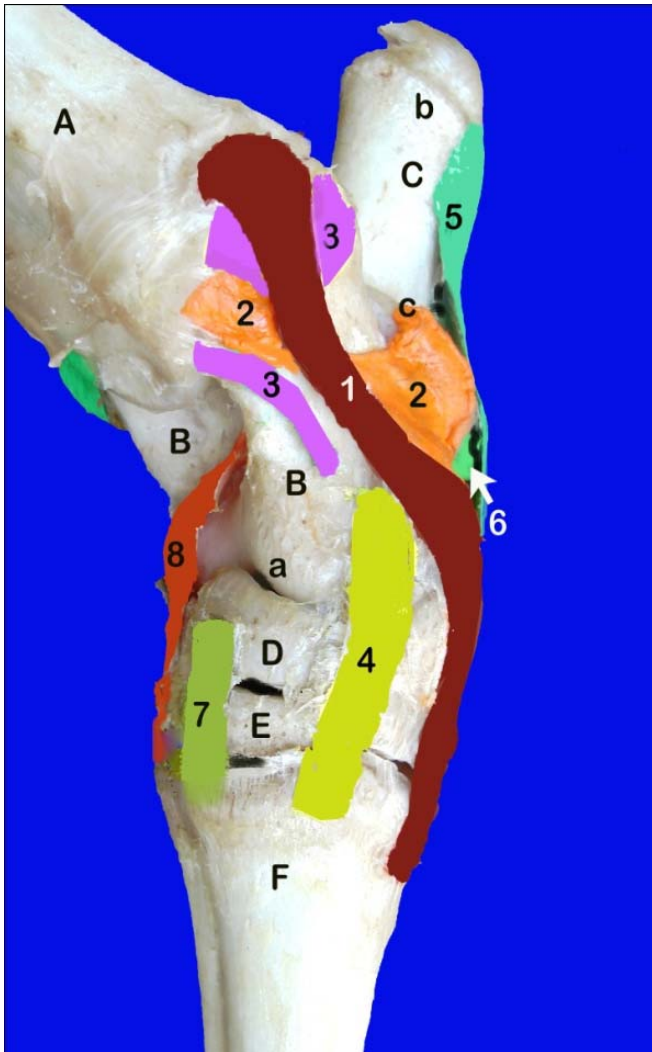


Figure 3: Photograph showing posterior aspect of tarsal joint (Lig. plantare longum removed)

A. Fibular tarsal, B. Tibial tarsal, C. Fused central and fourth tarsal, D. first tarsal, E. Fused third and fourth large metatarsal
1. lig. connecting sustentaculum tali and fused central and fourth tarsal, 2. plantar ligament between first tarsal and fused third and fourth large metatarsal, 3. Lig. connecting first tarsal and fused second and third tarsal, 4. plantar ligament connecting fused central and fourth tarsal and fused third and fourth large metatarsal.

The tibial tarsal and fibular tarsal were connected by one lateral ligament and two interosseous ligaments. The lateral ligament extended between anterior margin of body of

fibular tarsal and cranio-lateral margin of tibial tarsal just above the lateral condyle. One very thick interosseous ligament extended from lateral aspect of tibial tarsal to the medial aspect of the fibular tarsal (fig.4) while the second one extended from the depression on the posterior surface of tibial tarsal to fibular tarsal. No movements were observed in this joint.

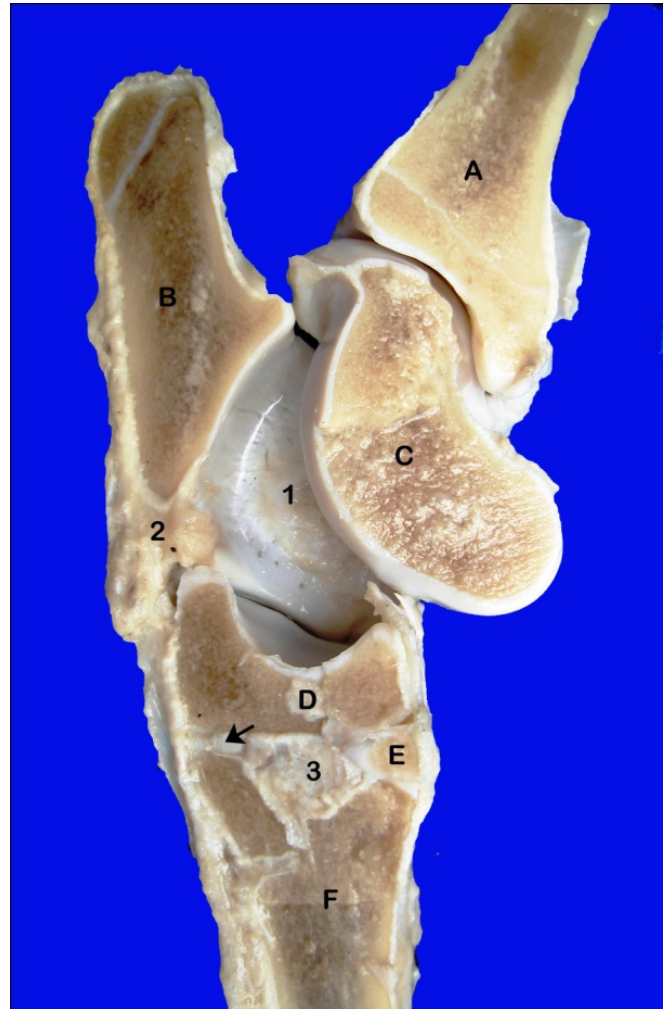


Figure 4: Photograph showing interosseous ligaments on a cut surface of tarsal articulation (arrow indicates tendon of M. peroneus longus)

A. Tibia, B. Fibular tarsal, C. Tibial tarsal, D. Fused central and fourth tarsal, E. Fused second and third tarsal, F. Fused third and fourth large metatarsal

1. Interosseous lig. between tibial tarsal and fibular tarsal, 2. Interosseous lig. connecting the fibular tarsal and fused central and fourth tarsal, 3. Interosseous lig. connecting fused central and fourth tarsal, fused second and third tarsal and synovial fossa of fused third and fourth large metatarsal.

3.3 Distal inter tarsal joint

Distal inter tarsal joint was an amphiarthrosis formed by fused central and fourth tarsal proximally and fused second and third tarsal and the first tarsal distally. On the dorsal aspect a ligament connected the fused central and fourth tarsal and fused second and third tarsal (lig. tarsi dorsale) (fig.2). The joint had two interosseous ligaments. The first one extended between the fused central and fourth tarsal to

fused second and third tarsal and the second one extended between anterior aspect of first tarsal to posterior aspect of fused second and third tarsal (fig.5). The joint was covered by distal tarsal sac.

3.4 Tarsometatarsal joint

Tarsometatarsal joint was an amphiarthrosis formed between flat articular surface on the distal row of tarsals and fused third and fourth large metatarsal. The joint capsule also covered the proximal inter metatarsal joint. It consisted of five ligaments, one dorsal ligament connected the fused second and third tarsal to the fused third and fourth large metatarsal, second one between fused central and fourth tarsal to the fused third and fourth large metatarsal, third one a plantar ligament from first tarsal to fused third and fourth large metatarsal, fourth one on plantar aspect of fused central and fourth tarsal and fused third and fourth large metatarsal (fig.3). A very strong interosseous ligament was present between fused central and fourth tarsal and synovial fossa on the fused third and fourth large metatarsal (fig. 4,5). These observations were in accordance with the findings of Gupta and Sharma [2] in yak, while Raghavan [6] reported three interosseous ligaments in distal inter tarsal joint of ox.

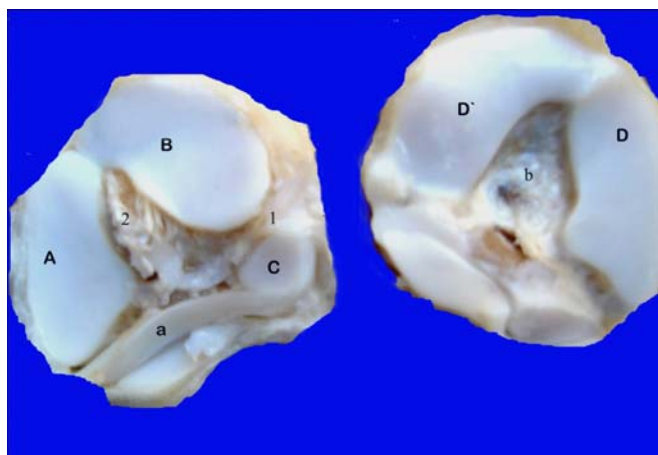


Figure 5: Photograph showing articular surface of the tarsometatarsal joint and interosseous ligaments

A. Distal articular surface of fused central and fourth tarsal, B. Distal articular surfaces of Fused second and third tarsals, C. Distal articular surface of first tarsal, D, D'. proximal articular surfaces of fused third and fourth large metatarsals, D- For Fused central and fourth tarsal, D'- For Fused second and third tarsal a. Tendon of M. peroneus longus, b. Synovial fossa of Fused third and fourth large metatarsals 1. Interosseous lig. connecting first tarsal and fused second and third tarsals, 2. Interosseous lig. connecting fused central and fourth tarsal, fused second and third tarsal and synovial fossa of fused third and fourth large metatarsal.

Conclusion

The tarsal joint of buffalo comprised of the bones and ligaments nearly similar to those of ox. The articular surfaces were better developed than cattle. In tarsal joint the lig. collaterale tarsi mediale breve was divided into three parts, while in white cattle it was reported to be divided into two parts. The lig. plantare longum comprised of the medial and

lateral limbs. In proximal inter tarsal joint on plantar aspect one thick ligament extended from the sustentaculum tali to the plantaromedial prolongation of fused central and fourth tarsal. This ligament was not reported earlier either in white cattle or buffalo.

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Author Profile

Dr. B. Supriya was the Assistant Professor in the Department of Veterinary Anatomy, College of Veterinary Science, Tirupati. A.P, India for the last two years. She received her B.V.Sc and M.V.Sc from Sri Venkateswara Veterinary University in 2008 and 2010 respectively. She worked as Veterinary Assistant Surgeon in Krishna district of Andhra for two years.

Dr. T. S. Chandrasekhara Rao was the Dean, Faculty of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati- 517502. A.P, India. he got his B.V.Sc&AH in 1984 from ANGRAU, M.V.Sc (Anatomy) in 1986 from ANGRAU and Ph.D (Anatomy) in 1994 from TANUVAS. He worked as Head of the department for twelve years; Associate Dean for four years. He was equally getting involved in different researches as a Research Guide and having publications in national and international journals.

*Corresponding author: Dr .B. Supriya, Assistant Professor, Department of Veterinary Anatomy, College of Veterinary Science, Tirupati-517502, Andhra Pradesh, India.

Email.id: supriyabotlagunta@gmail.com. Ph: +918179104577