

Original communication**COMPARATIVE ANATOMICAL STUDY AND INCIDENCE OF OS PERONEUM IN PERONEUS LONGUS TENDON AND ITS CLINICAL SIGNIFICANCE****Poonam Verma*, Anterpreet K Arora***Department of Anatomy, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, India***RESUMEN**

Introducción: El objetivo de nuestro estudio fue evaluar la tasa de incidencia del os peroneo (OP) en el tendón del peroneo lateral largo (PLT) y su importancia clínica. Métodos: La disección de 60 cadáveres embalsamados (56 hombres y 4 mujeres) del grupo de mediana edad se hizo para tener acceso a la tasa de incidencia del os peroneo en PLT. Resultados: En nuestro estudio se observó que la tasa de incidencia del os peroneo fue de 86,6% (52 extremidades). La ubicación del os peroneo es también un tema de controversia. La mayoría de los autores afirman que se relaciona con el hueso cuboide y de vez en cuando se ve inferior al calcáneo distal a la articulación calcáneo-cuboidea. Pero en el presente estudio el os- peroneo estuvo en relación al hueso cuboide en 40 extremidades (76.9%) y distal a articulación calcaneocuboidea en el resto de las 12 extremidades (23.1%). Conclusión: Este estudio sugiere que existe una alta tasa de incidencia de un OP en cadáveres. Esto puede ser como consecuencia de la técnica utilizada para localizar el mismo. La importancia clínica ha sido mencionada en relación con la ubicación del os peroneo, que puede ser confundido con fracturas estiloides y de Jones.

Palabras clave: *Os peroneum; Huesos sesamoideos; Fractura de Jones; Estiloides.*

ABSTRACT

Introduction: The aim of our study was to assess the incidence rate of the os peroneum (OP) in the peroneus longus tendon (PLT) and its clinical significance. Methods: Dissection of 60 embalmed cadavers (56 male and 4 female) of middle age group was done to access the incidence rate of os peroneum in peroneus longus tendon. Results: In our study the

incidence rate of os peroneum was 86.6% (52 limbs). The location of os peroneum is also a subject of dispute. Most authors stated that it is related to the cuboid bone and occasionally it is seen inferior to the calcaneum distal to the calcaneocuboid joint. But in the present study os peroneum was in relation to cuboid bone in 40 limbs (76.9%) and distal to calcaneocuboid joint in 12 limbs (23.1%). Conclusion: This study suggests that there is a high incidence rate of the os peroneum in the peroneus longus tendon in cadavers. This may be a consequence of the technique used to locate it. The os peroneum can be mistaken for a styloid or Jones fractures.

Key words: *Os peroneum, sesamoid bone, Jones fracture, styloid.*

INTRODUCTION

Sesamoid bones are minute osseous prominences present in the tendon of some muscle. As many as 42 sesamoid bones could be present in individuals. Mechanically sesamoid bones serve to protect the tendon from damage and, in some cases, increase the efficiency or mechanical advantage of their associated muscles (Sarin et al, 1999).

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The os peroneum is found in only a few primate families and seems to be completely absent in the non-primate pentadactyl mammals, in the Prosimii and in the Platyrrhini (New World monkeys). In the Cercopithecidae (Catarrhini, Old World monkeys) and the Hylobatidae, the os peroneum is a coffee bean-shaped constant, large and regular bone (Le Minor, 1987).

Sesamoid bones developed within tendons in those areas which wrap around the bony prominences. They are common in humans but are variable in number and their position. Sesamoid development is mediated by local mechanical forces associated with skeletal geometry, posture and muscular activity. Evolutionary character analysis reveals that the formation of these sesamoid bones in humans may be a consequence of phylogeny. These observations indicate that variations of intrinsic factors may interact with extrinsic mechano-biological factors to influence sesamoid development and evolution (Sarin et al, 1999).

Sesamoid bones are generally thought to arise from an interaction between mechanical and biological factors (Bizarro, 1921; Goldberg and Nathan, 1987; Jones, 1942; LeMinor, 1987).

In humans, most sesamoids begin as cartilaginous nodules that undergo endochondral ossification during early to late childhood between the ages of 3 and 12 (Ogden, 1984; Pancoast, 1909). Plantar, lateral foot pain is a common presenting symptom to foot and ankle clinics, and while there are many causes of lateral foot pain, including peroneal tendinopathy, arthritis and anterolateral ankle impingement.

The pathology related to the os peroneum is an often an overlooked reason of plantar lateral foot pain (Maurer and Lehman, 2011). Because sesamoid bones, when present, are formed by sesamoid cartilages that are derived from fetal or embryonic condensations of pre-cartilaginous tissue, many investigators have suggested that sesamoid formation were under genetic control (Merida-Velasco et al, 1997; Pearson and Davin, 1921). Recent biochemical studies support this interpretation. Analysis of joint patterning during early development indicates that vertebrate homeobox (Hox) genes and genes encoding members of the TGF- β family of signaling molecules also influence the formation and morphology of certain sesamoid bones in mice (Small and Potter, 1993; Storm and Kingsley, 1996). The os peroneum considered as a sesamoid in the tendon of peroneus longus has seldom been considered as a factor in the production of tarsalgias (Stropeni, 1920). Carter and colleagues have proposed that degenerative joint disease may represent a final stage in the process of endochondral ossification. A relationship between the presence of sesamoid bones and increased incidence of osteoarthritis suggests that sesamoid bone formation may arise from an increased tendency for endochondral ossification (Carter a, Carter b, 1987; Carter et al, 1991). The presence of an os peroneum may predispose the peroneus longus tendon to rupture at the cuboid level with or without concomitant fracture, or fracture through a partite os peroneum (Pancoast, 1909).

	Researcher	Rate of Sesamoid Variations
1961	Bhargava et al	Sesamoid cartilage found in 16(8%) cases in retromalleolar part and in 30 (15%) in calcaneal portion.
1991	Bloom	8%
1999	Sarin et al	14%
2003	Ruhli et al	14.9%
2004	Bergman et al	True sesamoid present in the tendon of Peroneus Longus
2006	Oydele et al	90%
2009	Muehleman et al	46%
2011	Benninger et al	88.6%
2013	Present study	86.6%

Table 1 - Comparison of incidence of sesamoid bones in the tendon of Peroneus Longus with the previous studies

MATERIAL AND METHODS

The material for this study comprised 60 lower limbs of 30 embalmed adult human cadavers obtained from the Department of Anatomy, Govt. Medical College, Amritsar. Muscles of lateral compartment of the leg were dissected and the peroneus longus was explored and studied. The origin of the muscle was separated from the bone. The tendon of this muscle was traced on the plantar aspect of foot till its insertion on the bone. The tendon of peroneus longus was traced near its curve from dorsum to sole for os peroneum and its relation to tarsal bones was observed with naked eyes. Its presence was felt by palpation method only as no histological and radiological techniques were used to confirm its finding. The observed sesamoid bones were photographed. Incidence rate of sesamoid bones in the tendon of peroneus longus in our research was compared with that of previous researcher's studies (Table 1).

RESULTS

In our study the incidence rate of os peroneum was 52 limbs or 86.6% of the cases (Figures 1a, 1b and Figures 2a, 2b). The position of the os

peroneum was also a subject of dispute. Most authors state that it is related to the cuboid bone and, occasionally, the ossicle is seen inferior to the calcaneus distal to the calcaneocuboid articulation. In the present study os peroneum was in relation to cuboid bone in 40 limbs or 83.3% of the cases (Fig 2a, 2b) and distal to calcaneocuboid in rest of the 12 limbs or 16.7% of the cases (Fig 1a, 1b). The results of the present study were compared with the previous literature as mentioned in Table 1.

DISCUSSION

In human beings, sesamoid bones are relatively infrequent and their shape is mostly irregular. Os peroneum appears as a regressive form of the typical bone observed in some families, which is in the process of disappearing (LeMinor, 1987). The OP is a sesamoid bone that is located within the PLT (Standing, 2005). The shape of the OP can be round, oval, triangular, irregular and may also be found as bipartite or multipartite (Mellado et al, 2003; Muehleman et al, 2009).

The etiology of the OP is unknown; however, it has been postulated that it arises from both mechanical and genetic factors (Muehleman et al, 2009).

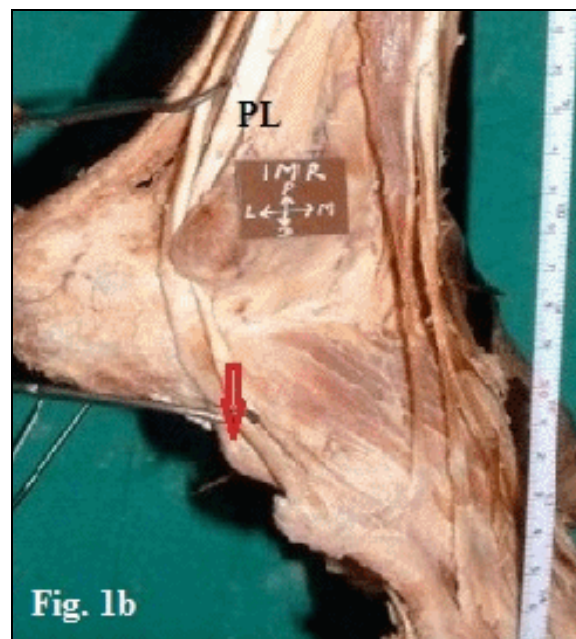


Figure 1a - Plantar view of left foot showing sesamoid bone in the tendon of Peroneus longus. **Figure 1b** - Lateral view of right foot showing sesamoid bone in the tendon of Peroneus longus

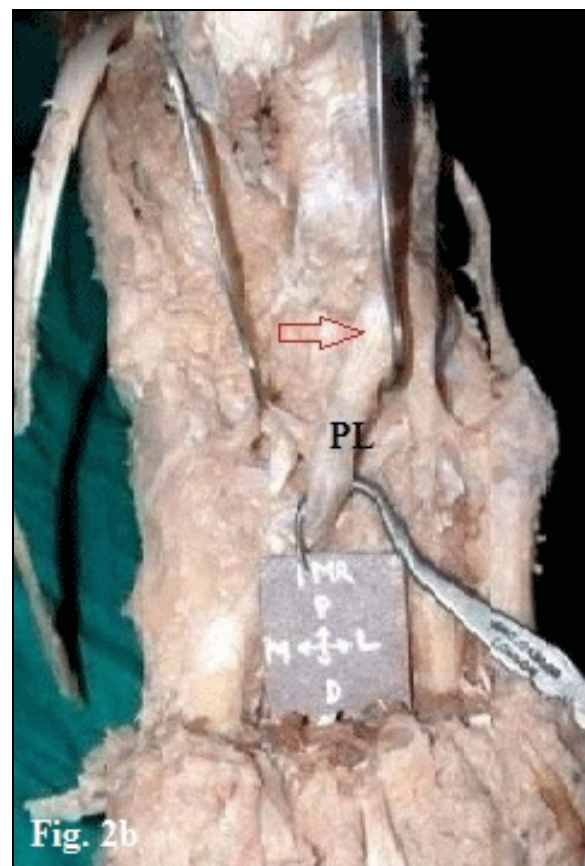
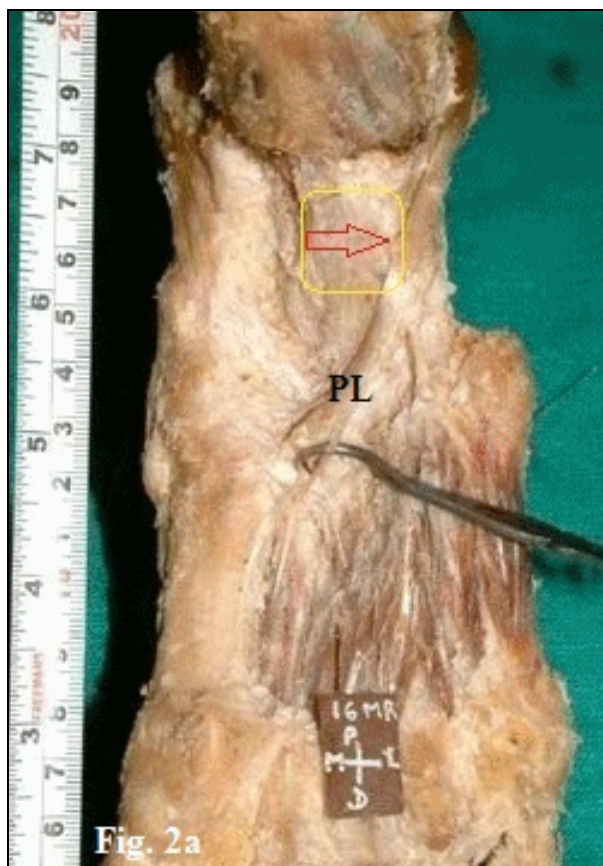


Figure 2a - Plantar view of right foot showing sesamoid bone in the tendon of Peroneus longus. **Figure 2b** - Plantar view of right foot showing sesamoid bone in the tendon of Peroneus longus

The IR of the OP within the PLT in the cadavers (86.66%) was consistent with cadaveric studies with incidence rates of 88.46% and 90% (Benninger and Kloenne, 2011; Oydele et al, 2006). This consistency may be related to similar methods of identification of the OP in the PLT. Bloom and Bhargava observed sesamoid bones in 8% and 23% (Bhargava, 1961; Bloom, 1991) Recent cadaveric studies have also reported incidence rates of 46% and 14.9% (Muehleman et al, 2009; Rühli et al, 2003). The method of identification may also contribute to the high incidence rate of the OP within the PLT because our study was based only on observation, palpation and dissection without taking in consideration histology and radiological techniques.

The clinical importance of the os peroneum is related to its presence that can be mistaken for styloid and Jones fractures. This suggests that teaching the OP in the PLT is clinically relevant because lower limb injuries are common. Presence of sesamoid bones may be related to increased incidence of osteoarthritis which

reveals that sesamoid bone formation may arise from an increased tendency for endochondral ossification.

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