Original Research Article

SESAMOIDS OF THE FEET: A CADAVERIC STUDY ON THE INCIDENCE AND MORPHOLOGY IN SOUTH INDIAN POPULATION

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ABSTRACT

Background: Sesamoid bones are tiny seed like bones embedded in the tendons or joint capsule. They prevent friction and protect the tendons from direct injuries. The largest sesamoid bone, the patella is given much importance when compared to the sesamoids of the feet. The sesamoids of the feet are classified into hallucal sesamoids, lesser toe sesamoids of the metatarsophalangeal joints of 2nd through 5th toe and lesser toe sesamoids of the interphalangeal joints of 2nd through 5th toe. The sesamoids show bipartism which can often be mistaken for fractures in radiographs. The incidence and morphology of the sesamoid bones in South Indian population is hitherto unreported. The present study aims to assess the incidence of sesamoid bone and their morphological features in South Indian population by dissection method.

Materials and Methods: 46 lower limbs were utilized for the present study. Of which 23 belonged to right and 23 belonged to left. By standard dissection methods the sesamoids of the feet were exposed. Their occurrence, shape, partition, fragmentation and size were macroscopically noted.

Results: The incidence of hallucal sesamoids was 100%. Bipartism in hallucal sesamoids was noted to be 4.3%. Hallucal sesamoids of the interphalangeal joint was 15.2 %. Sesamoid of the fifth toe (metatarsophalangeal) was 6.5%. The average diameter of the hallucal sesamoids, interphalangeal sesamoid of the hallux, metatarsophalangeal sesamoid of the 5th toe was 9mm, 5mm and 2mm respectively. All the sesamoids were semi-oval in shape

Conclusion: The importance of sesamoid in clinical practice is often underestimated. Bipartite sesamoids are often mistaken for fractures. Chronic sesamoiditis and osteonecrosis are common differential diagnoses in chronic foot pain involving the ball of the toes. The present study discusses the clinical importance, incidence and morphology of the sesamoids of the feet.

KEY WORD: Sesamoids, Hallucal, Metatarsophalangeal, Fractures, Osteonecrosis.

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these sesamoid bones were indestructible and housed the soul after death [2].

Sesamoid bones are partially or completely ossified and are embedded in tendons. Unlike the major bones they are not connected to one another. These bones reduce the friction of the tendons acting over the joints and also protect the tendon from direct injuries [3]. The incidence and clinical significance of sesamoids has been reported variably in the literature [4, 5]. The sesamoids noted in the feet include the halluclal (great toe), lesser toes metatarsophalangeal joint sesamoids and interphalangeal joint sesamoids of great toe. The Hallucal sesamoids are said to be physiologic in nature and is very rarely absent. They are embedded in the tendon of Flexor hallucis brevis and are always present on the plantar aspect of the 1st metatarsophalangeal joint. They are usually two in number namely medial and lateral. The medial one commonly shows bipartism [6, 7]. An inconstant sesamoid is often reported in the interphalangeal joint of the great toe. The sesamoids in the 2nd through 5th toe are rarely encountered and if found are usually embedded in the plantar aspect of the joint capsule [3, 8].

Sesamoids appear in the 12th week of fetal life and get ossified at an earlier age in females [9, 10]. However, a controversy exists regarding the age of completion of ossification between males and females [9, 11]. Associated pathology related to sesamoids are not uncommon. The array of clinical conditions related to these little bones includes fractures, infection, arthritis, osteonecrosis, absence, hypoplasia and fragmentation.

However, in day-to-day clinical practice not much importance is given to sesamoid bones. Studies on the incidence of sesamoid bones in various population including Turkish, Malavian, Sudanese, Japanese, Nigerians and Bahrainis are available. To our knowledge the incidence and morphology of sesamoid bones in South Indian population is hitherto not reported. Therefore, the aim of the present study is to find out the incidence and variations of sesamoid bones in the local population.

MATERIALS AND METHODS

46 lower limbs (right side 23 & left side 23) available in the department of Anatomy, KFMSR were utilized for the proposed study. Age and gender of the cadavers were not considered. Sole was dissected as per standard guidelines [12]. The presence or absence of the sesamoid bones in the usual sites such as metatarsophalangeal and interphalangeal joints of 1st-5th toe were noted. Using the magnifying lens, the gross features including shape, average diameter, fragmentation, hypoplasia and partition were noted. The results were analyzed statistically.

OBSERVATIONS AND RESULTS

Table 1: The results and observation are tabulated as follows.

<table>
<thead>
<tr>
<th>Sesamoid type</th>
<th>Location</th>
<th>Incidence</th>
<th>Side</th>
<th>Shape</th>
<th>Diameter</th>
<th>Partition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hallucal sesamoids: Flexor hallucis brevis tendon</td>
<td>Metatarsophalangeal joint</td>
<td>100%</td>
<td>Right</td>
<td>Semi-oval</td>
<td>9 mm</td>
<td>23-Right</td>
</tr>
<tr>
<td>Interphalangeal</td>
<td>Flexor hallucis brevis tendon</td>
<td>11.80%</td>
<td>Right</td>
<td>Semi-oval</td>
<td>5 mm</td>
<td>03-Right</td>
</tr>
<tr>
<td>Interphalangeal joint capsule</td>
<td>Interphalangeal joint capsule</td>
<td>11.80%</td>
<td>Left</td>
<td>Semi-oval</td>
<td>5 mm</td>
<td>02-Left</td>
</tr>
<tr>
<td>Lesser toe sesamoids</td>
<td>Metatarsophalangeal joint</td>
<td>6.50%</td>
<td>Right</td>
<td>Semi-oval</td>
<td>2 mm</td>
<td>01-Right</td>
</tr>
<tr>
<td>5th toe sesamoid</td>
<td>Metatarsophalangeal joint</td>
<td>6.50%</td>
<td>Left</td>
<td>Semi-oval</td>
<td>2 mm</td>
<td>01-Left</td>
</tr>
</tbody>
</table>

Fig. 1: Shows the halluclal sesamoid

Fig. 2: Shows bipartism in the halluclal sesamoid.
Vijaianand M, Ravichandran Doraiswamy. SESAMOIDS OF THE FEET: A CADAVERIC STUDY ON THE INCIDENCE AND MORPHOLOGY IN SOUTH INDIAN POPULATION.

DISCUSSION

Sesamoid bones are semi-oval shaped seed like bones or cartilages with an average diameter of about 10 mm. As many as 42 sesamoid bones have been noted in a single individual (13). Patella is the largest and the most common sesamoid present in the tendon of the quadriceps femoris muscle. In the feet, the hallucal sesamoids are the most common. The medial hallucal sesamoid is larger and elongated and the lateral hallucal sesamoid is smaller and ovoid. The medial hallucal sesamoid receives the insertion of flexor hallucis brevis (medial head) and abductor hallucis. The lateral receives the insertion of lateral head of flexor hallucis brevis and adductor hallucis. The medial and lateral hallucal sesamoids are attached to each other by a thick intersesamoid ligament [14].

The incidence of hallucal sesamoids have been reported as 99.9% by most of the authors (4,15-17). Cadaveric prevalence was found to be 99.9% (1355 feet were examined) and radiographic prevalence was found to be 99.6% (11,711 feet were examined). About 5 in 10,000 feet shows absence of hallucal sesamoids. In the present study, we have observed a 100% incidence (in all 46 limbs). Absence of hallucal sesamoid was not encountered in our study. The incidence of hallucal sesamoids in South Indian population is almost equal to the overall incidence reported by other authors (Fig. 1).

The medial hallucal sesamoids are more commonly injured than the lateral, as it receives most of the load than the lateral [18]. Hallucal bones are commonly injured in extension stresses of the great toe. Chronic pain in the ball of the great toe is commonly attributed to chronic sesamoiditis, painful bipartite sesamoids and chronic non unions. The studies by Scranton and Rutkowski [19] based on his dissection and radiographic studies, associates the anatomic variations of the first ray including rotational deformities of the first metatarsophalangeal joint, enlarged medial hallucal sesamoid and long first metatarsal bone as a cause for chronic sesamoiditis.

The concept of “sesamoid drift” was described in detail by Jared P. Frankel and Joan Harrington [20]. It describes mainly the abutment of the
medial sesamoid on the first metatarsal head and drift of the lateral sesamoid into the first interspaces in hallux abducto valgus deformity. In the present study the incidence of bipartism was 4.3%. Whereas, Mefert [21] reported an incidence of 7%. Medial hallucal sesamoid shows bipartism more commonly than the lateral. In our study we observed 2 limbs (01-Right and 01-Left) with bipartism. One showed bipartism in the medial hallucal sesamoid and other showed bipartism in the lateral hallucal sesamoid (Fig.2). In cases of hallux valgus deformity bipartism of the medial hallucal sesamoid is observed thrice more commonly than the lateral [22]. Partitions may be mistaken for fractures.

The hallucal sesamoids at interphalangeal joint are usually embedded within the joint capsule and are noted on the plantar aspect. The incidence of these sesamoids in our study is 15.2%. In our study we observed in 7 limbs (05-Right and 02-Left) with interphalangeal hallucal sesamoids (Fig.3). The incidence of this sesamoid ranges between 2-13 % [23]. In case of interphalangeal joint dislocations, these sesamoids if present can interpose between the particular surfaces thus hindering the reduction [24].

The lesser metatarsal sesamoids in the 2nd, 3rd, 4th and 5th toes are usually found in the medial side, embedded in the joint capsule. They may present with or without partition. The incidence of 5th metatarsophalangeal joint sesamoid in the present study is 4.3% (Fig.4 & 5). In our study we observed these sesamoids in 2 limbs (01-Right and 01-Left). Our results coincide with the results of Coskun et al [25]. These sesamoids don’t carry much clinical significance. However it may get infected if a nearby soft tissue infection is present resulting in pain in the ball of the little toe.

The prevalence of 2nd, 3rd and 4th toe has been reported as 0.4%, 0.2% and 0.1% respectively. In our study, we never came across a sesamoid bone in the 2nd through 4th toes.

The sesamoids receive blood supply from the plantar aspect. The blood supply is rich in the proximal part. Because of this, the distal aspect is more prone for osteonecrosis [26]. Partitions in the sesamoid bone (more commonly on the medial hallucal) has been attributed to incomplete ossification [27].

**CONCLUSION**

The tiny sesamoid bones of the feet carry clinical significance. However, the importance given to them in practice is too little. The present study highlights the incidence and morphology of the sesamoids of the feet in south Indians. The authors have conducted the study with limited samples in cadaveric specimen. We further recommend studies in live individuals using imaging techniques including age and gender with larger samples in future.

**Conflicts of Interests:** None

**REFERENCES**


