

Prevalence of Accessory Ossicles and Sesamoid Bones in Hallux Valgus

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Background: Sesamoid bones and accessory ossicles of the foot and ankle, although mostly asymptomatic, can be sources of pain or degenerative changes in response to overuse and trauma. We investigated the prevalence of accessory ossicles and sesamoid bones in a population of Italian women with hallux valgus.

Methods: A single-center study was performed to determine the prevalence of accessory ossicles and sesamoid bones in the ankle and foot. A total of 505 women with hallux valgus aged 26 to 80 years at the time of hallux valgus correction were examined. Anteroposterior, oblique, lateral foot radiographs and a Muller view were examined regarding the presence, prevalence, coexistence, and distribution of accessory ossicles and sesamoid bones in both feet. The radiographs were analyzed independently by three experienced specialists in foot and ankle surgery. Disagreements were discussed in a consensus meeting, where the radiographs were reevaluated and a final decision was made.

Results: There was no statistically significant difference between data of the accessory ossicles and sesamoid bones according to the χ^2 test. Sesamoid bones were detected in 404 of the 505 patients. The fifth metatarsal sesamoid bone was found in 97 patients. All of the patients presented hallucal sesamoid bones.

Conclusions: This is the first detailed report of the prevalence of accessory ossicles and sesamoid bones of the feet in Italian women with hallux valgus. These findings could help clinicians in the diagnosis and management of disorders of accessory ossicles and sesamoid bones, which are often undiagnosed, painful foot syndromes. (J Am Podiatr Med Assoc 103(3): 000-000, 2013)

Sesamoid bones of the foot and ankle develop from their own ossification center, measure 5 to 10 mm, and are round or oval.¹⁻⁴ Sesamoid bones are partially or completely embedded in the corresponding tendon.⁵ The function of sesamoid bones is to reduce friction between the tendon and other

rigid structures, producing a more efficient gliding mechanism between adjacent tissues.⁶⁻⁸ In the first metatarsophalangeal joint, sesamoid bones are considered physiologic, whereas sesamoid bones of the lesser toes are seen only rarely.⁹

Accessory ossicles and the sesamoid bones cause various painful syndromes or mimic fractures of foot bones.^{10,11} Accessory ossicles differ from sesamoid bones because they develop from the secondary center originating from the ossification center of the main bone, adjacent to or separated from the main bone.^{3,12,13} They are also considered as developmental anomalies that may occur as subdivisions of normal bones or as a separate prominence of an ordinary bone.^{3,12,13} They may occur bilaterally or unilaterally. Avulsion fractures

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can be confused with accessory bones. The distinction between an avulsion fracture and the presence of a sesamoid bone has to be made on a clinical and radiologic basis. In the case of fracture, a positive history of trauma is essential. The bone chip is the most common radiologic finding. Soft-tissue swelling and lack of cortication are also elements to support a traumatic event.^{3,12,13}

Several reports about accessory ossicles are published in the scientific literature.¹⁴⁻¹⁶ However, the number of studies with large sample sizes is still low.¹⁷ Recently, the prevalence of accessory ossicles and sesamoid bones in the feet has been studied in a sample from the Turkish population.¹⁷

We are not aware of any study reporting on the prevalence of accessory ossicles and sesamoid bones in women with hallux valgus. The aim of the present study was to analyze the prevalence of accessory ossicles and sesamoid bones of a sample of Italian women with hallux valgus according to sex, frequencies and locations of the bones, coexistence, and bilaterality by plain radiographs.

Materials and Methods

A single-center study was performed to determine the prevalence of accessory ossicles and sesamoid bones in the ankle and foot. In this study, 505 women with hallux valgus aged 26 to 80 years who were treated at the Orthopaedics Department of University Campus Biomedico of Rome were examined. Anteroposterior, oblique, lateral foot radiographs, as well as a Muller view, of 505 patients were examined regarding the presence, prevalence, coexistence, and distribution of accessory ossicles and sesamoid bones in both feet. The radiographs were analyzed independently by three experienced specialists (A.M., S.P., and F.S.) in foot and ankle surgery. Disagreements were discussed in a consensus meeting, where the radiographs were reevaluated and a final decision was made.

Results

Sesamoid bones were detected in 404 of the 505 patients. There was no statistically significant difference between data of the accessory ossicles and sesamoid bones according to the χ^2 test. The most common sesamoid bone of the ankle and foot region was the fifth metatarsal sesamoid bone, found in 97 patients (Fig. 1). We also detected an os peroneum in 40 patients (Fig. 2), os trigonum in 34 patients (Fig. 3), os supranaviculare in six patients,



Figure 1. Dorsoplantar radiograph showing second and fifth metatarsal sesamoid bones.

os vesalianum in 43 patients (Fig. 4), os supratalare in 13 patients, os intermetatarsium in six patients, accessory navicular bone in 34 patients (Fig. 5), second metatarsal sesamoid bone in 15 patients, third metatarsal sesamoid bone in six patients, and fourth metatarsal sesamoid bone in nine patients.

In all of the patients, hallucal sesamoid bones were present. We observed bipartite and tripartite hallucal sesamoid bones in five and two patients, respectively. An interphalangeal sesamoid bone of the hallux was seen in 21 patients. There were no significant differences in the prevalence of accessory ossicles and sesamoid bones according to the side (right versus left).



Figure 2. Lateral ankle radiograph showing an os peroneum.



Figure 3. Lateral ankle radiograph showing an os trigonum.

Discussion

Accessory ossicles and sesamoid bones can be found in the ankle and foot together with other major variations, such as bipartitions and coalitions.³ Usually, accessory ossicles and sesamoid bones do not cause pain and are visualized on plain radiographs performed for other medical reasons. They may also simulate fractures and restrict range of motion.^{3,12,18-21} The reported



Figure 4. Oblique ankle radiograph showing an os vesalianum.



Figure 5. Dorsoplantar radiograph showing an accessory navicular bone.

prevalence of accessory ossicles in the foot and ankle in the general population is 18% to 36.6%.^{3,9}

The accessory navicular bone, also called the os tibiale, os tibiale externum, or naviculare secundarium, is adjacent to the posteromedial tuberosity of the navicular bone. Some studies reported an association of the accessory navicular bone with flatfoot deformity.^{3,19} The os peroneum is a sesamoid bone embedded in the peroneus longus tendon, close to the calcaneocuboid joint. This latter entity may easily be misinterpreted as an avulsion fracture.^{3,16} The prevalence of accessory navicular bone, os peroneum, and os trigonum is variable in different studies. Kruse and Chen¹² stated that the most common accessory ossicles of the foot and ankle were the os peroneum, os accessory navicular, and os trigonum. The prevalence of accessory ossicles in Turkish patients was 18.3%,²² and the os peroneum, os accessory navicular, and os trigonum were the most common accessory bones. This study was performed only in males, and coexistence and bilaterality were not addressed.

The os supranaviculare is placed on the dorsal aspect of the talonavicular joint, close to the midpoint, and it is also named os talonaviculare dorsale, talonavicular ossicle, or Pirie's bone. The os vesalianum is a rare small accessory ossicle located adjacent to the tip of a well-developed tuberosity of the fifth metatarsal. The os supratolare

is located on the superior surface of the talar head. It is important to differentiate it from an avulsion fracture. The os intermetatarsaleum has various different shapes, and it is placed between the medial cuneiform and the base of the first and second metatarsals. The os intermetatarsaleum may be associated with hallux valgus deformity.^{3,22}

The prevalence of sesamoid bones is greatly variable. We do not know the number and pathogenesis of these ossicles in humans.^{1,4,9} Hallucal sesamoid bones are considered physiologic, and their absence is an uncommon variation,^{9,11} which we did not observe in the present patients. Bipartite hallucal sesamoid bones can mimic fractures.^{3,9} In the literature, partition of the hallucal sesamoid bones has a frequency of 7.8% to 33%, and bilateral involvement occurs in 13.5% to 90% of patients.²³ A bipartite medial sesamoid bone was reported in 7.2% to 30.6%, and a bipartite lateral sesamoid bone was reported in 0.6% to 2.5% of patients.²⁴ Bilateral involvement occurs in 13.5% to 90% of the populations studied, although division of the sesamoid bones of the hallux is often unilateral.²⁵ Kiter et al⁹ reported a lower rate of bipartite hallucal sesamoid bones (4%), mostly bilateral. In the foot, lesser toe sesamoid bones are much more common on the medial side than on the lateral side, and lesser toe sesamoid bones are always more predominant in the second and fifth toes than in the other lesser toes.^{1,11} A possible explanation for these differences in frequency are the asymmetry of the metatarsal head at the plantar surface of the foot and the transverse plantar arch, both of which lead to unequal stress on the metatarsal heads. Kiter et al⁹ showed the presence of metatarsophalangeal sesamoid bones in the second, third, fourth, and fifth digits in 2.8%, 0.5%, 1%, and 15.1%, respectively, in 371 Turkish individuals. The occurrence of sesamoid bones in the fifth digit was higher (2.7 times) in males.

The hallucal interphalangeal sesamoid bone is rare but is associated with the development of foot abnormalities because it affects biomechanical functions of the first metatarsophalangeal and hallucal interphalangeal joints.²⁶⁻²⁸

Conclusions

The present study is the first detailed report of the prevalence of accessory ossicles and sesamoid bones of the feet in Italian women with hallux valgus. These findings could help clinicians in the diagnosis and management of disorders of accesso-

ry ossicles and sesamoid bones, which are often undiagnosed, painful foot syndromes.

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