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16 Sesamoid bones in the hands of healthy patient: case report

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SUMMARY

The sesamoid bones are round or oval bones that are located within tendons, and most theories consider that sesamoid bones in humans develop in response to local mechanical stress on a joint. Although their function is not well understood, it is known that they act as a pulley modifying the angle of movement and their insertion. They are mostly inconsistent, which is why they tend to be supernumerary and are located in different parts of the body at the level of the extremities, with the patella being the largest, most constant and best known. The prevalence and distribution of sesamoids in the hand varies between different populations and sex. They are rarely reported since they are only considered anatomical variants, but clinically there are several pathologies related to the sesamoid bones in the hand such as: trauma, degenerative disorders, giant cell tumors, osteochondroma, avascular necrosis, tendon ruptures, genetic disorders and attention should be paid in patients with acromegaly where their length is increased. In this article, we report a total of 16 sesamoid bones, symmetrically distributed 8 in each hand of a healthy individual treated in the Plastic Surgery Department of the "Dr. Rubén Leñero" Hospital in Mexico City. In the literature reviewed, we did not find a report with the presence of so many sesamoid bones in both hands, which motivated us to report it.

Key words: Gross anatomy – Sesamoids – Supernumerary bones – Anatomy of the hand – Anatomical variants

INTRODUCTION

The term sesamoid from the Latin sesamum was first used by Galen of Pergamum in the 1st century to describe the small rounded bones present near the joints; the name was attributed due to the resemblance to the seeds of "Sesamum Indicum", which has a flat oval shape and comes from an ancient East Indian plant used for purgation by the Greeks (Olave et al., 2014).

The sesamoid bones are often found in joints and under the tendons (Dabrowski et al., 2020); these bones may or may not be constant, and are located mainly in the hands and feet. However, they are found in other places such as the wrist (pisiform) and knee (patella). Based on the description by Keats and Anderson (2012), the sesamoid bones of the hand are distributed only in the metacarpophalangeal and interphalangeal joints, unlike the accessory ossicles, which are located

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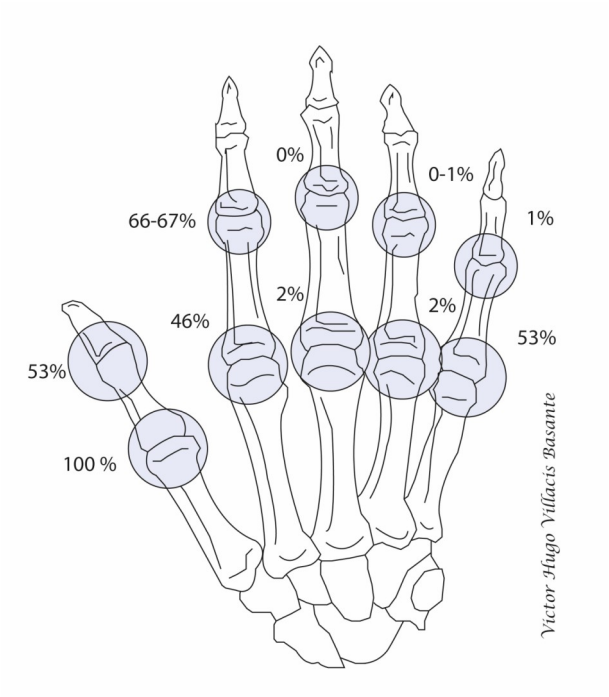

Fig 1. The prevalence of distribution of sesamoid bones in the proximal metacarpophalangeal and interphalangeal joints.

only in the carpus.

Usually there are five sesamoid bones in the hand: these are distributed in the metacarpophalangeal joint of the first, second and fifth fingers (Raines and Oakes, 2016). Reports of sesamoid bones vary according to geography and sex (Amar et al., 2011; Ting et al., 2017), and report a prevalence of sesamoids distributed as follows in the metacarpophalangeal joints (MCP): MCP I (100%), MCP II (46%), MCP III (2%), MCP IV (2%), MCP V (53%), (Koo et al., 2017), while in the proximal interphalangeal joints (PIP) the following distribution is reported: PIP I (66-67%/), PIP II (0%), PIP III (0-1%), PIP IV (0-1 %), PIP V (1%) (Seki et al., 2013) (see Fig. 1).

In a multicenter study (Wei Chen and Jiaxiang, 2015) 850 individuals were evaluated by radiography, reporting similar percentages of presentation of sesamoid bones. However, reports in the literature on a maximum number in one or two hands in the same individual are counted; Jacobs (1974) reported six sesamoids in one hand and nine in the other; Boelch and Jansen (2015) reported six sesamoids in each foot for a total of 12; our team makes a report with a total of 16 sesamoid bones, symmetrically distributed 8 in each hand, which were found as a finding in a healthy patient (Fig. 2).

CASE REPORT

In the Plastic and Reconstructive Surgery Service of the Hospital “Dr. Rubén Leñero” from Mexico City, attached to the Autonomous University of Mexico (UNAM), a healthy 39-year-old male patient with no relevant clinical history arrived for medical assessment for right hand contusion caused by crushing with a door; it retained its mobility in all angles and axes; mild edema and pain on palpation of the dorsal region of the metacarpal bones were found in through physical examination, which is why a hand radiograph was performed and bone involvement was ruled out, but the existence of multiple sesamoids distributed in all the metacarpophalangeal joints was striking, subsequently a computed tomography scan of both hands (Fig. 2) was requested to, finding 8 sesamoid bones in each hand, all in the metacarpophalangeal joints, distributed symmetrically as follows: 2 MCP I, 1 MCP II, 1 MCP III, 2 MCP IV, 2 MCP V, making in total 16 supernumerary bones, none of them exceeding 3 millimeters in diameter.

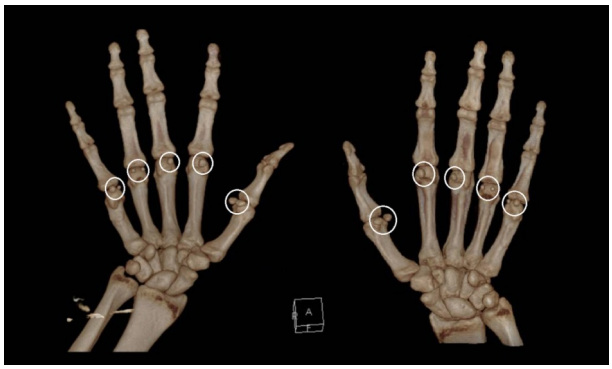

Fig 2. Computerized axial tomography of a patient with 16 sesamoid bones in both hands.

It is important to mention that in the reviewed literature we did not find cases presenting two sesamoid bones in the same joint as well as in all the metacarpophalangeal joints and bilaterally.

DISCUSSION

Sesamoid bones are small, inconsistent bone structures, with the patella being the most constant. Despite having been described early in the human history, their in-depth study has not always been carried out by the scientific community.

A constant discussion when a case like this is presented, is whether these are sesamoid bones, accessory bones or some pathology, which can be confused between them.

After a review in the literature, we have confirmed that the case we report is of sesamoid bones. According to Keats and Anderson (2012), the distribution of sesamoids is only in the metacarpophalangeal and interphalangeal joints. It is also important to emphasize that the presence of this anatomical variant did not condition the appearance of any pathology in this patient, as it was an incidental finding.

In the literature, the function of sesamoid bones

is different depending on the author being consulted, for example Capo et al. (2013) mention that they act as a pulley; Deabate et al. (2011) comment that they are capable of transmitting the force of tendon movements. Moreover, Sun et al. (2017) consider that they develop in response to local mechanical stress in a joint.

Abdala et al. (2019) mention that there is a growing interest in research in the developmental biology and mechanics of sesamoids: within his hypotheses he mentions that the development of these bones with other bone segments such as the epiphyses and the apophysis can grow or transform into more complex bone units through stress or epigenetic stimuli, enriching the phenotypic variability of the skeleton, and contributing in the long term even to the formation of new species. In the evolutionary case of primates, it is observed that the hominidae line (humans) consists of a greater number of sesamoid bones in the hands and even the presence of fabella in the lower extremities, compared to others such as the pongidae (gorillas, orangutans) or hylobatidae (gibbon). Apparently standing and opposing thumb has contributed to mechanical stress by stimulating the formation of more defined skeletal bones, such as the scaphoid or the patella (Sarin et al., 1999).

It would be very interesting to carry out studies in populations where their jobs involve high mechanical stress on the joints: for example, construction workers and athletes with high impact on joints (such as gymnasts or soccer players), as well as to perform anatomical-functional studies that allow a consensus on the function of these bones.

Authors like Wood (1984), Mohler and Trumble (2001), Clarke and Pritchett (1998), Sabapathy et al. (1994) and Goldberg and Nathan (1987) mention that there is an under-report of pathologies associated with sesamoid bones such as: sesamoiditis, fractures, degenerative disorders, giant cell tumors, osteochondroma, avascular necrosis, genetic disorders and even an increase in size in patients with acromegaly, which have always been understudied and poorly described, a reason for which they have been subject of case reports by other authors (Hobart, 1929; Ayhan, 2017; Ahmet and Nevres, 2018). In general, they are diagnoses little taken into account by medical staff when evaluating a patient, secondary to the poor knowledge of these structures and the diseases mentioned above. Authors like Ozcanli et al. (2015) also relate spontaneous tendon ruptures with the existence of sesamoid bones. Occasionally, tendon ruptures that do not have an apparent cause arrive in our service. Therefore, from now on we will intentionally seek direct association with these structures.

It is interesting to see even more unusual pathologies such as the nail-patella syndrome, which was described by Little. Later Álvarez-Martín et al. (2013) identified an alteration in the LMX1B gene that is expressed in up to 70% of patients with the absence of the patella, having a great impact on the onset of gait and its quality; concomitantly, a renal condition manifested by nephrotic syndrome occurs in patients with these condition. All of the aforementioned indicates that there are probably genes shared with other regions of the body that would determine the existence or absence of sesamoid bones, and could even influence the amount of them in the body. We did not find studies in the literature that relate genes with the presence of inconsistent sesamoid bones; we even think that, in syndromes such as the nail-patella, it should be sought intentionally if other inconsistent sesamoid bones are affected.

This case report involves one of the least investigated topics by the anatomical scientific literature. We think that sesamoid bones could harbor knowledge not yet exploited by the medical community. These types of studies are an invitation to the scientific guild to keep in mind these small bones, which could hold interesting secrets and go deeper in their study.

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