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Original Research Article

# STUDY OF INCIDENCE AND OSSIFICATION OF SESAMOID BONES IN HANDS OF SOUTH INDIAN POPULATION

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## ABSTRACT

**Introduction:** The word Sesamoid bone is attributed to "Galen" who described small bones of hands and feet which resembled the seed of the "Sesamum Indicum "an ancient East Indian plant used for purging by the Greeks. The mechanical role of sesamoid bones is to protect the tendon from damage and in some cases increase the efficiency or mechanical advantage of associated muscle. They begin as cartilaginous nodules that undergo endochondral ossification during early to late childhood. There is a rather extensive variability in the reported incidence of sesamoid bones in the hand within different ethnic groups and populations.

**Materials and Methods:** The present study was a retrospective review of 99 plain AP and Lateral view radiographs of 82 adults (54males and 28 females >17years of age)and 17 children (males and females<17 years)attending the Radiology department of Gandhi Hospital/Gandhi Medical College during 2011-2012 to assess the location, incidence and ossification of sesamoid bones in the hands of South Indian population.

**Results:** The most common incidence of sesamoid bones was found at the MCP and IP joints of thumb (97.4% and 41.5%) respectively, followed by 5$^{th}$ digit (16.25%)and least incidence was found at the 4$^{th}$ digit(0%).Ossification commenced first in the thumb at 12 years in females and 14 years in males and ended at the age of 16 years in both sexes.

**Conclusion:** This anatomical data can help the physicians and surgeons in the diagnosis and management of disorders of sesamoid bones.

**KEY WORDS:** Sesamoid bones, Metacarpophalangeal Joint, Proximal Interphalangeal Joint, Distal Inerphalangeal Joint.

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## INTRODUCTION

Sesamoid bones are small round or oval shaped nodules that are embedded within certain tendons, where they pass over a joint of hand,

wrist, knee and foot [1,2]. They protect the tendon from damage and in some cases increase the efficiency or mechanical advantage of their associated muscle [1]. Most sesamoids begin as cartilaginous nodules that undergo endochondral ossification during early to late childhood [1]. Ossification commences first at the age of 10 years in females and 11 years in males and is completed by the age of 13 years and 14 years respectively [3]. Sesamoid bones are usually asymptomatic, but may be associated with fracture dislocation, infection, inflammation, necrosis and tenosynovitis. Sometimes sesamoid bones can be misdiagnosed as fractures [4].

There is a rather extensive variability in the reported incidence of sesamoid bones in the hand within different ethnic groups and different populations [3]. The present study has been taken up to assess the incidence ,ossification and location of sesamoid bones in the hands of South Indian population with the help of plain Anteroposterior and Lateral radiographs of hand to investigate the ages at which these bones will begin and complete ossification and also the sexual variation.

## MATERIALS AND METHODS

The present study was a retrospective review of hand radiographs to assess location, incidence and ossification of sesamoid bones. A total of 99 plain Anteroposterior and Lateral view hand radiographs of 82 adults(54 males and 28 females of age group >17 years) and 17 children (<17 years)were studied during 2011-12 in patients referred to Radiology department of Gandhi Medical College/Gandhi Hospital, Secunderabad. On the basis of hospital data only South Indian population was included. The radiographs were studied for the location and number of sesamoid bones on the palmar aspects of MCP&IP joints of all the digits of hands .The commencement and completion of ossification of sesamoid bones was studied in the radiographs of 4-17 years age group. The results were analysed for side and sexual variations in the incidence.

## RESULTS

The incidence of sesamoid bones at each joint of the digits of hand were calculated separately in right and left hands of males and females.

Table I shows the distribution and percentage of incidence of sesamoid bones on the palmar aspect of MCP joints and IP joints in the right hands of adult males (also depicted in Bar Diagram 1). In thumb, MCP joints show an incidence of 96.9%[32 radiographs, of them 30.3%( 10 radiographs) were showing 2 sesamiod bones and the remaining 66.3% were single]and IP joints show single bone incidence of 39.4%(13 radiographs).In the MCP joints of index, middle and little fingers the single sesamiod bone incidence was 18.2%(6 radiographs),12.1%(4 radiographs) and 21.2%(7 radiographs) respectively. NO sesamiod bones were found at MCP joints of ring finger and PIP&DIP joints of II-IV digits.

**Table & Bar diagram 1:** Distribution and percentage of incidence of sesamoid bones on palmar aspect of MCP&IP Joints in the digits of right hand in adult males.

| No. of Hands | Thumb | | 2 | | | 3 | | | 4 | | | 5 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MCP | IP | MCP | IP | | MCP | IP | | MCP | IP | | MCP | IP | |
| | | | | PIP | DIP | | PIP | DIP | | PIP | DIP | | PIP | DIP |
| 33 | 32 | 13 | 6 | - | - | 4 | - | - | - | - | - | 7 | - | - |
| | 96.90% | 39.40% | 18.20% | - | - | 12.10% | - | - | - | - | - | 21.20% | - | - |

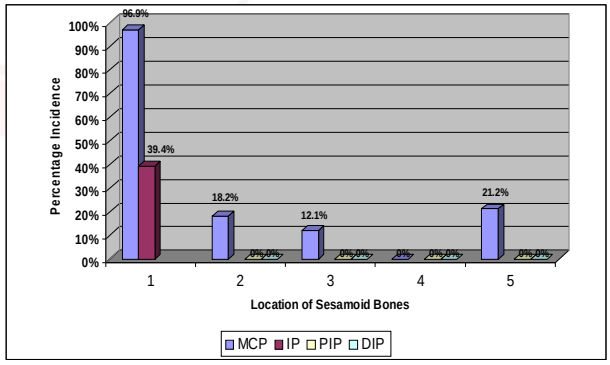


**Fig. 1:** Plain AP Radiograph of the hand showing two sesamoid bones at MCP joint one at IP joint of thumb in right hand of male aged 30 years.

**Table 2** shows the distribution and percentage of incidence of sesamoid bones on the palmar aspect of MCP joints and IP joints in the left hands of adult males (**also depicted in Bar Diagram 2**).In thumb MCP joints show an incidence of 95.2%[20 radiographs,of them 14.3%(3 radiographs)were found to have 2 sesamiod bones and the remaining 80.9% were single]and IP joints show single bone incidence in 23.8%(5 radiographs).In the MCP joints of index,middle and little fingers the incidence of single bone was 9.5%(2 radiographs),4.8%(1 radiograph) and 9.5%(2 radiographs)respectively.NO sesamiod bones were found at MCP joints of ring finger and PIP&DIP joints of II-IV digits.

**Table & Bar Diagram 2:** Distribution and percentage of incidence of sesamoid bones on palmar aspect of MCP&IP Joints in the digits of left hand in adult males.

| No. of Hands | Thumb | | 2 | | | 3 | | | 4 | | | 5 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MCP | IP | MCP | IP | | MCP | IP | | MCP | IP | | MCP | IP | |
| | | | | PIP | DIP | | PIP | DIP | | PIP | DIP | | PIP | DIP |
| 21 | 20 | 5 | 2 | - | - | 1 | - | - | - | - | - | 2 | - | - |
| | 95.20% | 23.80% | 9.50% | - | - | 4.80% | - | - | - | - | - | 9.50% | - | - |

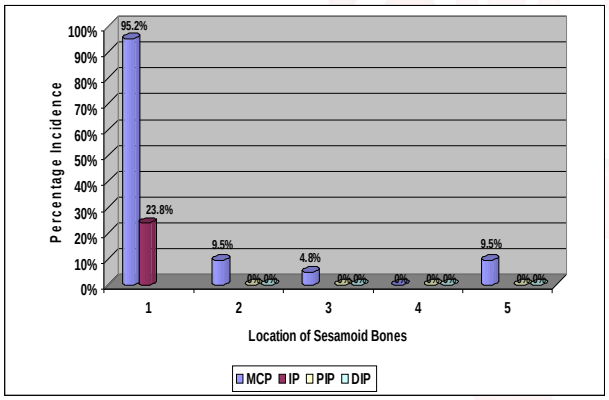


**Table 3** shows the distribution and percentage of incidence of sesamoid bones on the palmar aspect of MCP joints and IP joints of in the right hands of adult females (**also depicted in Bar Diagram 3**).In thumb MCP joints show an incidence of 100%[18 radiographs,of them 33.35(6 radiographs) were found to have 2 sesamoid bones and the remaining 66.7% were single]and IP joints show single bone incidence in 44.4%(8 radiographs).In the MCP joints of index,middle and little fingers the incidence of single seasamoid bone was 5.5%(1 radiograph), 5.5%(1 radiograph) and 16.7% (3 radiographs) respectively. NO sesamiod bones were found at MCP joints of ring finger and PIP&DIP joints of II-IV digits.

**Table & Bar Diagram 3:** Distribution and percentage of incidence of sesamoid bones on palmar aspect of MCP&IP Joints in the digits of right hand in adult females.

| No. of Hands | Thumb | | 2 | | | 3 | | | 4 | | | 5 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MCP | IP | MCP | IP | | MCP | IP | | MCP | IP | | MCP | IP | |
| | | | | PIP | DIP | | PIP | DIP | | PIP | DIP | | PIP | DIP |
| 18 | 18 | 8 | 1 | - | - | 1 | - | - | - | - | - | 3 | - | - |
| | 100% | 44.40% | 5.50% | - | - | 5.50% | - | - | - | - | - | 16.70% | - | - |

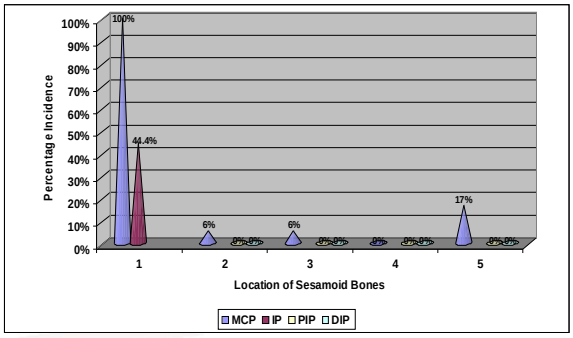


**Fig. 2:** Plain radiograph of Right hand showing sesamoid bone at MCP joint of index finger in 20 years old female.

**Table 4:** shows the distribution and percentage of incidence of sesamoid bones on the palmar aspect of MCP joints and IP joints of in the left hands of adult females (**also depicted in Bar Diagram 4**). In thumb MCP joints show an incidence of 100%(10 radiographs,of them the incidence of double and single sesamoid bones was equal)and IP joints show single bone in 80%(8 radiographs).No sesamoid bones were found at the MCP joints of II-IV digits and PIP&DIP joints of III-V digits.The index finger PIP Joint showed one sesamoid bone in 1 radiograph(10%).The little finger MCP joint showed one sesamoid bone in 2 radiograph(20%).

**Table & Bar Diagram 4:** Distribution and percentage of incidence of sesamoid bones on palmar aspect of MCP&IP Joints in the digits of left hand in adult females.

| No. of Hands | Thumb | | 2 | | | 3 | | | 4 | | | 5 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MCP | IP | MCP | IP | | MCP | IP | | MCP | IP | | MCP | IP | |
| | | | | PIP | DIP | | PIP | DIP | | PIP | DIP | | PIP | DIP |
| 10 | 10 | 8 | - | 1 | - | - | - | - | - | - | - | 2 | - | - |
| | 100% | 80% | - | 10% | - | - | - | - | - | - | - | 20% | - | - |

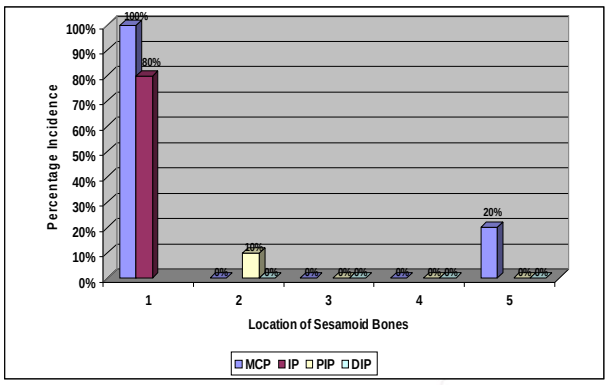


**Fig. 3:** Plain radiograph of left hand showing two sesamoid bones at MCP joint of thumb and one at IPjoint of index finger in 40 years old female.

The distribution of sesamoid bones in different locations between male and female subjects were statistically similar in hands(P=0.08; >0.05).The occurance of sesamoid bones in MCP joints of thumb(P=0.05) was statistically similar in males and females on both sides.

**Table 5:** Comparing the incidence between right and left hands of males and females.

| Hand | Male | Female | Total |
|---|---|---|---|
| Right | 33 | 18 | 51 |
| Left | 21 | 10 | 31 |
| Total | 54 | 28 | 82 |

**Table 6:** Comparing the incidence between right and left MCP joint of thumb of males and females.

| MCP joint of Thumb | Male | Female | Total |
|---|---|---|---|
| Right | 32 | 18 | 50 |
| Left | 20 | 10 | 30 |
| Total | 52 | 28 | 80 |

**Ossification Of Sesamoid Bones:** The sesamiod bones in the thumb MCP joint were the first to be ossified. **Table 7** shows the ossification of sesamoid bones in the MCP joints of thumb in 17 radiographs of hands in boys and girls of age 4-17 years.Ossification commenced in them at 12 years in females and 14 years in males and was completed by the age of 16 years in both the sexes.

**Table 7:** Showing ossification of sesamoid bones in MCP Joints of the thumb in radiographs of hands of boys and girls between ages 4-17(n=17).

| Age (years) | Male | | Female | |
|---|---|---|---|---|
| | Present | Absent | Present | Absent |
| 4(n=1) | - | 1 | - | - |
| 5(n=2) | - | - | - | 2 |
| 6(n=1) | - | - | - | 1 |
| 7(n=1) | - | 1 | - | - |
| 8(n=2) | - | 1 | - | 1 |
| 9(n=0) | - | - | - | - |
| 10(n=0) | - | - | - | - |
| 11(n=0) | - | - | - | - |
| 12(n=1) | - | - | 1 | - |
| 13(n=2) | - | 2 | - | - |
| 14(n=4) | 4 | - | - | - |
| 15(n=0) | - | - | - | - |
| 16(n=3) | 1 | - | 2 | - |
| 17(n=0) | | - | - | - |

**Fig. 4:** Plain radiograph of right hand of 4 years old male child with no sesamoid bones.

**Fig. 5:** Plain AP Radiograph of hand showing commencement of ossification at MCP joint of thumb in 14 years old male child.

## DISCUSSION

Although sesamoid bones are generally asymptomatic there are several exceptions described in the literature,that they may cause painful syndromes and degenerative changes in response to overuse and trauma.They may be

involved in fractures, periostitis as in Reiter's syndrome or may increase in size in conditions like Acromegaly.

In the present study,the sesamoid bones were found palmar to the MCP joint of thumb in 79 hand radiographs(97.5%) of which 24(30% had 2 sesamoid bones and the remaining were single.Only single sesamoid bone was found at the IP joint of 32(41.5 %) radiographs. **Table 8** shows the comparative values of incidence of sesamoid bones at MCP&IP joints of thumb between various authors.

**Table 8:** Showing comparative values of incidence of sesamoid bones at MCP and IP joints of thumb between various authors.

| S.No | Year | Author | Thumb | |
|---|---|---|---|---|
| | | | MCP joint | IP joint |
| 1 | 1987 | Goldberg and Nathan H. [6] | 100% | 100% |
| 2 | 2001 | Msamati BC, Ighighi PS. [7] | 100% | 100% |
| 3 | 2004 | Dharap A.S et al [3] | 100% | 100% |
| 4 | 2009 | Eyal Amar et al [1] | 99.50% | 26.20% |
| 5 | 2011 | Ozkan Kose et al. [2] | 100% | 21.30% |
| 6 | 2012 | Seki.Y et al. [9] | - | 67% |
| 7 | 2014 | Present Study | 97.50% | 41.50% |

In the present study incidence of sesamoid bones at 2nd,3rd,4th and 5th MCP joints was found to be 10.1%,6.5%,0% and 16.25% respectively. Least incidence was found in 3rd finger (6.5%) and 4th(0% ) fingers.None of the above digits showed sesamoid bones at PIP joints,except the index finger(1.2%),which was reported in the available literature.None of the DIP joints showed sesamoid bones in the above digits.

**Table 9:** Showing comparative values of incidence of sesamoid bones at the joints of 2nd,3rd,4th and 5th digits between various authors.

| S.No. | Author | Digits of hand | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2nd | | | 3rd | | | 4th | | | 5th | | |
| | | MCP | PIP | DIP | MCP | PIP | DIP | MCP | PIP | DIP | MCP | PIP | DIP |
| 1 | Dharap A.S et al. [3] | 40.50% | 0% | 0% | 2.30% | 0% | 0% | 1.50% | 0% | 0% | 45.30% | 0% | 0% |
| 2 | Eyal Amar et al. [1] | 42.30% | 0% | 0% | 1.40% | 0% | 0% | 0.20% | 0% | 0% | 41.10% | 0% | 0% |
| 3 | Ozkam Kose et al. [2] | 36.60% | 0% | 0% | 1.30% | 0% | 0% | 0.90% | 0% | 0% | 53.20% | 0% | 0% |
| 4 | Goldberg and Nathan H. [6] | 50% | 0% | 0% | 3% | 0% | 0% | 1% | 0% | 0% | 70% | 0% | 0% |
| 5 | Seki.Y et al. [9] | - | 0% | 0% | - | 0.40% | 0% | - | 0.50% | 0% | - | 1% | 0% |
| 6 | Present study | 10.10% | **1.20%** | 0% | 6.50% | 0% | 0% | 0% | 0% | 0% | 16.25% | 0% | 0% |

## CONCLUSION

In the present retrospective review of hand radiographs to assess the location, incidence and ossification of sesamoid bones most common occurance was found to be at MCP(97.4%). IP(41.5%) joints of thumb. Next to thumb they occur at 5th digit of hand(16.25%).Least incidence was observed in the 4th digit of hand(0%). Incidence at PIP joints of index finger(1.2%),which was observed in this study was not reported in previous studies. In the hand ossification commenced first in the thumb, at the age of 12 years in females, 14 years in males and ended at the age of 16 years in both the sexes. In South Indian population incidence at MCP joint of thumb is close to the results previous studies and incidence at IP joints is less than in Arab population and more than in Mediterranian population. The incidence and ossification of sesamoid bones of hand vary in different populations due to genetic and environmental factors. It also provides data that could help clinicians in the diagnosis and management of disorders of sesamoid bones which are often overlooked in patients who present with pain and discomfort in the hands.

## Conflicts of Interests: None

## REFERENCES


[1]. Eyal Amar, Yishai Rozenblat and Ofir Chechik. Sesamoid and Accessory Bones of the hand-An Epidemiologic Survey in a Mediterranean Population. Clinical Anatomy 2011;24:183-187.

[2]. Ozkan Kose, Ferhat Guler, Adil Tarun, Kerem Canbora, Serdar Akalin. Prevalence and Distribution of Sesamoid Bones of the hand.A Radiographic Study in Turkish Subjects. Int. Morphol., 2012;30(3)1094-1099.

[3]. Dharap AS, Al-Hashimi H, Kasab S, Abu-Hijleh MF. Incidence and Ossification of Sesamoid Bones in the hands and feet;A Radiographic study in an Arab Population.Clinical Anatomy 2007;20;416-423.

[4]. Peter L.Williams.Gray'sAnatomy.37th edition. Churchill Livingstone.New York.1989,457-458.

[5]. Asim Kumar Datta.Principles of General Anatomy.6th edition.K.P.Basu Publishing co;2010.59-60

[6]. Goldberg and Nathan H. Anatomy and Pathologt of sesamoid bones.The hand compared to the foot.Int. Ortho.1987;11(2):141-7.

[7]. Msamati BC, Ighighi PS. Radiographic appearance of sesamoid bones in the hands and feet of Malawian subjects,2001 Wiley-Liss,Inc.

[8]. Samyuktha,Vinay Prabhu,Jayanthi V,Sandeep T and Kariappa MA.Incidence and Ossification of sesamoid bones in hands in South Indian Population .Journal Of Anatomical Society Of India.2006.

[9]. Seki Y,Hoshino Y,Karoda H.Prevalence of sesamoid bones in the interphalangeal joint of the thumb and fingers; Aradiographic study. Clin.Anat.2012 Dec 17.Doi;10.1002/ca.22201.


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