Original Research Paper

Volume - 13 | Issue - 07 | July - 2023 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Orthopaedics

# CORRELATION OF THE SINGH'S INDEX WITH THE CALCANEAL INDEX IN THE ASSESSMENT OF OSTEOPOROSIS IN FRAGILITY FRACTURES OF THE DISTAL END OF RADIUS

**Dr. Ramesh. G** Junior Resident, Department of Orthopaedics, Medical College Hospital, Kozhikode, Kerala. 673008

**ABSTRACT** **Introduction:** Osteoporosis is a rapidly growing major public health problem of the aging population and has been termed as a "silent epidemic". Hip and vertebral fractures constitute a majority of fragility fractures which in turn contribute to a prolonged immobilization, dependence upon caregivers and a drop in the quality of life. This necessitates the need for a screening tool to assess Osteoporosis. Prior to the advent of DEXA and Quantitative Ultrasound (QUS), the trabecular pattern of cancellous bone was used in the assessment of Osteoporosis. **Objective:** To study the correlation of Singh's index with the Calcaneal index while assessing Osteoporosis in patients with fragility fractures of the Distal end of Radius. **Methods:** The proforma was used for collecting patient demographics and data required for the study. Clinical and radiological assessment were done simultaneously. The Calcaneal and Singh's indices were noted. We required a minimum sample size of 58, and 65 samples were collected. The correlation between the indices were assessed and charted. **Results And Discussion:** Out of the 65 samples, there were 33 male and 32 female patients. On cross tabulation between each of the four variables (Calcaneal Index right, Calcaneal Index left, Singh's index right and Singh's index left) obtained from each of the 65 samples, and applying the Chi-square test, we obtained a statistically significant p value of 0.000. Thus, we observed that the Calcaneal index in a patient with fragility fracture strongly correlates his/her Singh's index at the time of presentation. **Conclusion:** In this study, we have observed that the Calcaneal index in a patient with fragility fracture strongly correlates with his/her Singh's index. It is advisable to adopt prophylactic measures to avoid fragility fractures among screened patients.

**KEYWORDS :** Osteoporosis; Fragility fractures; trabecular pattern; plain radiographs; Singh's index; Calcaneal index.

## INTRODUCTION

Osteoporosis or skeletal fragility may be defined as "*increased porosity of the skeleton, resulting from a reduction in bone mass and enlargement of the bone spaces, which leads to a reduced bone density, strength and flexibility*". This systemic disease of the skeleton is highly associated with fragility fractures. During the early stages of the disease, most patients have no symptoms, until the first osteoporotic fracture occurs. The fracture sites associated with the disorder include the vertebrae, hip, pelvis, distal radius, and proximal humerus. [1]

The most widely available and commonly used in practice measurement of bone mass is densitometry. The principle is based on the "T-score", which is expressed as the standard deviation difference between the bone mineral density (BMD) of a patient and that of a young adult female reference population. The diagnosis of osteoporosis can be confirmed by DEXA but this should only be performed in patients who have an increased risk of fracture on the basis of clinical risk factors.

For the detection and management of osteoporosis and osteoporosis-related fractures, quantitative ultrasound (QUS) is emerging as a relatively low-cost and readily accessible alternative to dual-energy X-ray absorptiometry (DXA) measurement of bone mineral density (BMD) in certain circumstances. [2]

But neither of these tools is available in the primary, secondary and even most tertiary level hospitals and medical centres in our country. This necessitates the need for an adequately reliable tool that is available at all levels of health care. The Singh Index (SI) is a simple, semi-quantitative evaluation tool for diagnosing osteoporosis with plain radiographs. [3] The SI is based on the trabecular pattern of the proximal femur and classifies osteoporosis into six grades.

The normal trabecular pattern of the calcaneum has been described by Lockhart, Hamilton and Fyfe (1959) [4]. In a sagittal longitudinal section, the trabeculae are arranged in two groups corresponding to compression stresses and to tensile stresses- the compressive trabeculae and the tensile trabeculae respectively. Calcaneal indexing, described by Jhamaria et al [5], could provide an effective method of surveying osteoporosis so as to predict the population at risk of sustaining fractures. It could also be used to assess the efficacy of methods of treating osteoporosis. The procedure is cheap, technically simple and the grading systems are easily reproducible.

Fragility fractures are the clinical outcome of osteoporosis. Fragility fractures are those which result from low energy trauma, such as a fall from standing height or less. They are a sign of underlying osteoporosis. A patient who has sustained one fragility fracture is at high risk of experiencing secondary fractures, especially in the first two years following the initial fracture. [5]

Fractures occurring in a setting of low-level or low-energy trauma, defined as falling from standing height or less, are usually considered as osteoporotic.

In this study, we aim to assess the *correlation of the Singh's index with the calcaneal index in the assessment of osteoporosis in fragility fractures of the distal end of radius.* The use of plain radiographs for the assessment of osteoporosis makes this method feasible even in primary care centres and outpatient clinics. The use of two indices shall make the assessment more reliable, as the margin of error when using two indices simultaneously is reduced considerably.

**Study Design:** Cross sectional study

**Study Period:** 2 years

**Source Of Data/setting:**
Patients reported to Department of Orthopaedics, Government Medical College, Kozhikode during January 2021 to November 2022 with fragility fractures of the Distal end of radius.

**Study Population:**
- Male and female patients aged 60 years or above
- Radiologically proven fragility fractures of the

1. Distal end of radius
2. Distal end of Radius with distal end of ulna

**Study Sample:**
Patients presenting to Casualty/OPD at Govt Medical College Hospital Kozhikode

**Sample Size:**
As per the study and reference, Cross sectional study, assessing the correlation between 2 indices, the sample size was calculated.

**Minimum Sample Size (n) = 58**

**Total Number Of Samples Includede In The Study: 65**

**Inclusion Criteria:**
1. Patients 60 years of age or above with fractures of the distal end of radius
2. Patients having additional fractures of the distal end of ulna/ulnar styloid
3. Both males and females were included
4. Patients who were willing to participate in the study

5. Patients with controlled co-morbidities such as DM/ Hypertension/CKD/Thyroid disease.

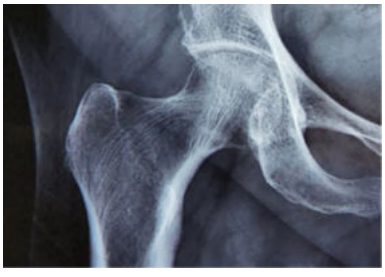
**Exclusion Criteria:**

1. Not willing to give consent
2. Patients with uncontrolled co-morbidities or malignancies.
3. Patients less than 60 years of age

## RESULTS

Right Calcaneum: Grade Ii (definite Osteoporosis)

Left Calcaneum: Grade Ii (definite Osteoporosis)



Right Femur: Grade Iii Singh's Index (definite Osteoporosis)

Left Femur: Grade Iii Singh's Index (definite Osteoporosis)

Out of the **65 samples**, **29** patients (44.6%) belonged to the **60-70** years age group, **21** patients (32.3%) belonged to the **70-80** years age group, and **15** patients (23.1%) belonged to the **80-90** years age group. Among the 65 samples, **33** patients were **male**, and **32** patients were **female.** None among the 65 patients had any neurovascular complication. There were no patients with a Type 7 fracture. There were no patients with Grade 6(Normal) or Grade1 (Severely Osteoporotic) Singh□s index.

On cross tabulation between each of the four variables(Calcaneal Index right, Calcaneal Index left, Sinh's index right and Singh's index left) obtained from each of the 65 samples, and applying the Chi-square test, all four cross tabulations delivered an **Asymptomatic Significance of 0.000** ( p value of 0.000).

With a **Confidence level of 95%**, where 1- $\alpha$ = 0.95, the significance level $\boldsymbol{\alpha}$ = 1- 0.95= **0.05.**

In this study, we obtained a significance level of 0.000, which is lower than the assumed minimum value of 0.05. This implies that the value is statistically significant. Thus, we observed that the **Calcaneal index** in a patient with **fragility fracture strongly correlates** with his/her **Singh's index**.

## DISCUSSION:

Thus, we observed that the **Calcaneal index** in a patient with **fragility fracture strongly correlates** with his/her **Singh's index**.

In this study, we did not segregate patients into those suffering from primary osteoporosis and those suffering from secondary osteoporosis. All patients who fit the inclusion criteria were assessed as a single group. Fragility fractures of the vertebrae, pelvis/hip and proximal humerus were not included in the study. The trabecular pattern of cancellous bones other than the proximal femur and calcaneum were not assessed. We studied only a small population of people, from a geographically limited area and a single ethnic group was studied.

## CONCLUSION:

In this study, we observed that the **Calcaneal index** in a patient with **fragility fracture strongly correlates** with his/her **Singh's index**. Hence, the Calcaneal index can be used in isolation or with the Sing's index in screening patients for Osteoporosis in settings where there is no access to DEXA or QUS. It is advisable to adopt prophylactic measures to avoid fragility fractures among screened patients, whose Calcaneal index indicates signs of Osteoporosis. This includes pharmacotherapy, and lifestyle changes such as control of/ quitting smoking and alcohol, dietary changes and fall prevention.

## REFERENCES:


1. Osteoporosis: A Silent Epidemic – Maria Polikandrioti, Health Science Journal, 2010, Volume 4, Issue 1.
2. Hans D, Krieg MA. The clinical use of quantitative ultrasound (QUS) in the detection and management of osteoporosis. IEEE Trans Ultrason Ferroelectr Freq Control. 2008 Jul;55(7):1529-38. doi: 10.1109/TUFFC.2008.829. PMID: 18986943.
3. Singh M, Nagrath AR, Maini PS. Changes in trabecular pattern of the upper end of the femur as an index of osteoporosis. *J Bone Joint Surg Am.* 1970;**52**(3):457–67. doi: 10.2106/00004623-197052030-00005.
4. Jhamaria NL, Lal KB, Udawat M, Banerji P, Kabra SG. The trabecular pattern of the calcaneum as an index of osteoporosis. J Bone Joint Surg Br. 1983 Mar;65(2):195-8. doi: 10.1302/0301-620X.65B2.6826630. PMID: 6826630.
5. Bledsoe L, Alessi K, Toro JB, Giordano B, Hanypsiak BT. Fragility Fractures: Diagnosis and Treatment. Am J Orthop (Belle Mead NJ). 2018 Dec;47(12). doi: 10.12788/ajo. 2018.0112. PMID: 30650167.