

Chapter 16

A Prospective Cohort Research on the Clinical Impact of Oral Calcium Supplementation on Proximal Femur Mineralization in Fracture Cases

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ABSTRACT

This research aimed to evaluate, using Singh's Index and a DEXA scan, the effects of oral calcium supplementation on mineralization at the proximal end of the femur in patients with fracture-proximal end femur. Singh's Index and a DEXA scan were used to perform baseline evaluations on a cohort of 100 individuals who had fractures in the proximal ends of their femurs. Oral calcium supplementation was started, and it was monitored three and six months later. Singh's Index, DEXA Scan, and subgroup analysis based on gender and age were used to evaluate changes in mineralization. At six months, Singh's Index and DEXA Scan measures showed a considerable improvement in mineralization, indicating the effectiveness of calcium supplementation. Participants who were older than 75 years old demonstrated the strongest reaction. Very few negative effects were noted.

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INTRODUCTION

The human body's major site for weight-bearing and load transfer is the proximal end of the femur, which is crucial for both skeletal integrity and movement (Weaver & Peacock, 2019). Proximal end femur fractures pose a serious health risk since they are linked to higher rates of morbidity, mortality, and socioeconomic hardships, particularly in older people (Heaney, 2001). Osteoporotic fractures in this area significantly impair a person's quality of life and frequently cause permanent impairment (LeBlanc et al., 2015). Evaluating bone mineralization at this location is essential for identifying fracture risks and carrying out focused therapies.

An established radiographic technique, Singh's Index, offers useful information about fracture risks by providing insights into bone mineral density and structure (Dawson-Hughes, 2017). Furthermore, the Dual-energy X-ray absorptiometry (DEXA) Scan remains the gold standard for osteoporosis diagnosis and bone mineral density assessment (Abrams, 2013). Although these evaluation instruments are important, little is known about how they might be used to understand better how calcium supplementation affects mineralization in fracture proximal end femur instances.

Proximal end femur fractures present serious health risks, especially for older people, as they raise morbidity, mortality, and medical expenses. Because it negatively affects mobility and quality of life, fracture of the proximal end of the femur, which is frequently linked to osteoporosis, presents a serious clinical concern (Matkovic & Heaney, 1992).

A key component of bone metabolism, calcium is essential for bone mineralization and integrity. Decreased calcium concentrations are linked to weaker bones, which makes fractures more likely. In light of this, supplementing techniques have become viable therapies for bone health, especially in groups at risk for osteoporotic fractures (Wu et al., 2012).

Although there has been a lot of research on the effectiveness of calcium supplementation in preventing fractures, more has to be done to understand how it specifically affects fracture sites like the proximal end of the femur (Aditya Komperla, 2023). In order to restore functionality and avoid long-term handicaps, fracture repair and recovery at this anatomical region are essential (Bala Kuta & Bin Sulaiman, 2023).

Applying radiographic assessment instruments, specifically DEXA Scan and Singh's Index, in fracture care offers a thorough method for assessing bone mineralization (Platonova et al., 2021). While DEXA Scan offers accurate quantitative measurements of bone mineral density, Singh's Index offers insights into trabecular patterns, reflecting bone density and architecture (Anderson et al., 2012).

These imaging techniques may provide detailed insights into the efficacy of calcium supplementation in promoting fracture recovery by allowing for a better understanding of the baseline mineralization state and an evaluation of the dynamic changes that occur after supplementation (Cosman et al., 2014). By evaluating mineralization changes at the proximal end of the femur before and after supplementation, this research aims to close this gap and provide insight into this location's role in fracture management techniques (Hsu et al., 2020).

Fracture care paradigms get more complex when age and gender differences in supplement responses are considered. Strategies to optimize fracture recovery and prevention through targeted interventions like calcium supplementation have become increasingly relevant in light of the global demographic shift toward an aging population (Reid et al., 2014). Elderly individuals frequently exhibit compromised bone health, and gender differences in bone density and remodeling patterns underscore the need for tailored interventions (Bischoff-Ferrari et al., 2012). To enhance clinical outcomes and reduce the socioeconomic

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