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ASSESSMENT OF CORRELATION BETWEEN SERUM VITAMIN D3 AND CALCIUM LEVELS WITH DIFFERENT TYPES OF PROXIMAL FEMORAL FRACTURES

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ABSTRACT

INTRODUCTION

Age-related and osteoporotic fracture, especially hip fracture, is one of the most common injuries in the elderly population. It has been more prominent with the increase of aging population. There has been a continued effort to different characteristics between femoral neck fracture and femoral intertrochanteric fracture, and suggested that femoral intertrochanteric fracture is more common in patients with old age and low bone mineral density is being strongly related to fracture neck of femur. Calcium has anti-fracture effect based on its key structural role in bone and metabolic balance.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Orthopaedics of AJ Institute of Medical Sciences, Mangaluru, India, from August 2018 to September 2020 after obtaining approval from the Human Ethics Committee.

The study was conducted after institutional research board clearance and after approval from the human ethics committee. All patients fulfilling the inclusion and exclusion criteria admitted at A.J.I.M.S. were considered for the study after obtaining informed written consent. Preoperatively the blood was sent for analysis of serum calcium and vitamin D3 levels . The collected data was analysed by SPSS 17.0 version software

RESULTS

Among the 100 patients analyzed in this study; with 53 females and 47 males, 45 patients had sustained neck of femur, 47 had inter trochanteric fractures while remaining 8 had sustained subtrochanteric fracture. 29 patients among 100 had calcium deficiency (NOF-14, IT-14, Subtroc-1), $P < 0.05$. While 47 patients had vitamin D3 deficiency (NOF-21, IT-24, subtroc-1), $P < 0.05$.

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CONCLUSION

Based on the data analysis, elderly females with low serum calcium and vitamin D3 levels had a higher incidence of intertrochanteric fractures as compared to the other types of proximal femoral fractures.

Keywords: Serum Vitamin D3, Calcium Levels, Proximal Femoral Fractures

INTRODUCTION

Age-related and osteoporotic fracture, especially hip fracture, is one of the most common injuries in the elderly population. It is more prominent as the increase of aging population[1]. The number of hip fractures throughout the world is estimated approximately to 2.6 million by the year 2025, and 4.5 million by the year 2050[2]. Because of high mortality and morbidity and high socioeconomic costs, hip fracture has been studied in many aspects ranging from its mechanism and treatment, as well as the concerns to minimize medical expense. There are two main types of hip fractures according to the involved anatomic site: femoral neck fracture and femoral intertrochanteric fracture. They may have different characteristics and outcome. Some factors may induce different types of hip fractures. Some authors have attempted to identify the different characteristics between femoral neck fracture and femoral intertrochanteric fracture, and suggested that old age is more common in patients with femoral intertrochanteric fracture and low bone mineral density is more strongly related to femoral neck fracture[3]. Calcium has anti-fracture effect based on its key structural role in bone and metabolic balance. Serum calcium level shows some changes in different periods of fracture healing process. The fluctuation of serum calcium levels may represents the capability of calcium transportation, reservation, metabolism, and restoration[4]. Here in view of the above said, an attempt has been made to investigate the correlation between the different types of proximal femoral fractures and its correlation with serum calcium and vitamin D3 levels in this study.

MATERIALS AND METHODS

This cross sectional study was conducted in the Department of Orthopaedics of AJ Institute of Medical Sciences, Mangaluru, India, from August 2018 to September 2020 after obtaining approval from the Human Ethics Committee. Simple random sampling was adopted to select the patients who meet the inclusion criteria for the study with a sample size of 100. Inclusion Criteria comprised of patients of both sexes who were more than 30 years of age having sustained fracture of the neck, intertrochanteric or subtrochanteric region of the femur.

Patients less than 30 years of age, post operative patients, patients unwilling to undergo investigations or give written consent and patients with fractures of the shaft or distal femur were excluded from the sudy.

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Preoperatively the blood was sent for analysis of serum calcium and vitamin D3 levels .patient were categorized as per the xray of the patient in to neck,intertrochanteric and subtrochanteric fractures. The collected data was analysed by SPSS 17.0 version software.

RESULTS :

In our study,majority of the patients were in the age group of 61 – 70 years, constituting 25 % of the total sample size.there was a Females predominance constituting 53% fn the the study population. Most common side of injury was right side accounting for 58%. Patients were subjected to X-rays and blood samples drawn for serum calcium and vitamin D3 analysis at the time of admission. Neck of femur and inter trochanteric fractures had incidence of 45 %(n-47) and 47 %(n-45) respectively and subtrochanteric fractures had the remaining 8 %(n-8).Mean serum calcium levels were 8.86 for neck of femur frature,8.13 for IT fracture,8.48 for subtrachanteric fracture.In neck of femur fracture 14 Patients had hypocalcemia levels with rest being normal.similarly 14 and 1 Patient were found to have hypocalcemia in IT and subtrochanteric fracture. In neck of femur 21 Patients had lower vit d3 levels with rest being normal.similarly 24 and 1 Patients were found to lower vit d3 levels in IT and subtrochanteric fracture. 29 patients cumulatively had hypocalcaemia while 47 patients had vitamin D3 deficiency.the distribution of subjects on levels on vit d3 and serum calcium can be seen in the table …..

DISCUSSION

In this study, it was found that patients with femoral neck fractures were generally younger and involved in more women than those with intertrochanteric fractures, and those with intertrochanteric fractures had lower serum calcium and vitamin D3 values. Hip and proximal femoral fractures are complex and involve many contributing factors. Age, injury mechanism, local anatomic factor, insulin-like growth factor and static balance ability are factors potentially inducing different types of proximal femur fractures. Calderazzi et al found that osteoarthritis strongly affects the location of the fracture in the proximal femur[5]. In other biomechanics study, 16 patients' images (8 femoral intertrochanteric and 8 femoral neck fractures) were collected, and analyzed the lateral lesion by finite element analysis, and found that the type of hip fracture may be influenced by different densities of fractured region, namely, bony mineral density may predict the location of hip fracture[6]. Larrosa et al compared 128 patients with femoral neck fractures and 196 patients with femoral intertrochanteric fractures. No difference was found in the age, sex, calcium level, nutritional, healthy, and functional status or presence of previous fractures between groups[7]. Since these data obtained were only from admission to surgical intervention, it did not represent the whole dynamic changes of serum calcium levels in two different types of hip fractures, which may not indicate the capability of calcium transportation, reservation, metabolism, and restoration.

Calcium balance refers to the state of the body stores up calcium at equilibrium over some

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extended period (usually days, weeks or months). Since all these fractures were acute injury cases and the blood samples were drawn at the time of admission when the fracture healing process had not yet started, admission sample would roughly predict the basic level of serum calcium (calcium reservation). The levels of serum calcium from admission were higher in femoral neck fracture group than femoral intertrochanteric fracture group. The magnitude of serum calcium fluctuation was larger in femoral neck group than femoral intertrochanteric group, indicating that the capability of reservation, restoration of serum calcium is better in patient with femoral neck fractures than those with femoral intertrochanteric fractures.

Vitamin D deficiency is rampant in elderly population and house bound patients. Synthesis of vitamin D3 in the skin under the influence of UV light and absorption from the gut decreases with age due to decreased functional capacity and insufficient sunlight exposure. The amount of 7-dehydrocholesterol in skin is relatively constant until old age, when it begins to decline.[8]

Deficiency of vitamin D is also known to cause proximal muscle weakness adversely affecting the mobility and functional ability to put an elderly person at increased risk of falling and sustaining hip and other fractures[9].

Inadequate serum vitamin D levels are associated with secondary hyperparathyroidism, increased bone turnover, bone loss and increased fracture risk. Vitamin D is well recognized to be suboptimal in older patients when compared to age-matched controls. There are no published studies on the prevalence of hypovitaminosis D in Indian population with fragility fractures around the hip associated with osteoporosis and comminution at the fracture site[10].

CONCLUSION

- In the present study it was found that there was a higher incidence of intertrochanteric fractures among the 3 different types of proximal femoral fractures taken into consideration.
- Female patients constituted the majority.
- Serum calcium and vitamin D3 levels were considerably lower among these female patients with intertrochanteric fractures.

Thus the final conclusion based on the data analysis of this study is that elderly females with low serum calcium and vitamin D3 levels have a higher incidence of intertrochanteric fractures as compared to the other types of proximal femoral fractures.

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