RESEARCH
Hip Knee J. Vol. 5, No. 1, 2024, pp.25-31
p-ISSN: 2723-7818
e-ISSN: 2723-7826
http://dx.doi.org/10.46355/hipknee.v5i1.146

CHARACTERISTICS OF INTERTROCHANTERIC FEMUR FRACTURE AT BALI MANDARA GENERAL HOSPITAL

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ABSTRACT

Intertrochanteric femur fracture is an extracapsular fracture that occurs along the line that is located between the greater and lesser trochanters. This study aims to determine the characteristics of intertrochanteric femur fracture cases at Bali Mandara General Hospital Denpasar from January to August 2022. Method: This retrospective descriptive study evaluated the characteristics of intertrochanteric femur fracture patients at Bali Mandara General Hospital Denpasar from January to August 2022. The patient's characteristics included in this study were age, sex, fracture classification according to Boyd and Griffin classification, mechanism of trauma, management, and energy of trauma based on the Singh index. The result based on data collected from medical records from January to August 2022, there were 36 intertrochanteric femur fracture patients (8.78%). Intertrochanteric femur fracture patients are mostly found in female patients (25 patients [69.4%]). Based on the age groups, most intertrochanteric femur fracture patients were elderly. Based on the mechanism of trauma, 33 patients had a fracture due to low-energy trauma. According to Boyd and Griffin's classification, type 2 intertrochanteric femur fracture was more common (14 patients [38.9%]). All patients had PFNA (100%) and most of them had a grade B Singh index (16 patients [44.4%]). Conclusion: The incidence of intertrochanteric femur fracture was 8.78%. The intertrochanteric femur fracture was more common in the female patient, aged more than 60 years old, occurs due to low energy trauma, has a type 2 Boyd and Griffin classification, had a grade B Singh index, and was treated using PFNA.

Keywords: Intertrochanteric femur fracture, characteristics, Bali Mandara General Hospital Denpasar.

Article History:
Submission : January 20th, 2023
Revision : December 19th, 2023
Accepted : February 28th, 2024

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INTRODUCTION

An intertrochanteric femur fracture is an extracapsular fracture that occurs along the line located between the greater and lesser trochanters which is characterized by a break of bone continuity in the area between the greater trochanter and lesser trochanter. The greater trochanter is the attachment site for the gluteus Medius and minimums tendon (hip extensor and abductor). Meanwhile, the lesser trochanter is the attachment site for the iliopsoas tendon (hip flexor) (1–3). According to CDC data, there were 300.000 cases of fracture is treated in hospitals every year and about 50% of cases of proximal femur fracture were intertrochanteric femur fractures. Intertrochanteric femur fractures commonly occur in the elderly population aged more than 60 years old. The prevalence of intertrochanteric femur fracture in women is two to eight times higher than in men which may be caused by changes in bone density in postmenopausal women (4,5).

In general, there are two types of trauma mechanisms for intertrochanteric femur fracture, namely high-energy trauma and pathological or low-energy trauma. Almost 90% of cases of intertrochanteric femur fracture occur due to low-energy trauma, such as falling from a standing position. This low-energy trauma usually occurs in female patients aged more than 50 years old with osteoporosis. Meanwhile, high-energy trauma was less common in intertrochanteric femur fracture and mostly occurs in male patients aged less than 40 years old (2,6).

Intertrochanteric femur fractures are often associated with osteoporosis which occurs due to decreased bone density and is usually found in the elderly population. Singh index is a method to evaluate the distribution of trabecular bone density in the proximal femur by assessing the pelvic X-ray. Singh index is classified into 6 grades from grade I to VI where a higher grade means higher distribution of trabecular bone density.

There are several surgical options using implants or nailing that can be used for the management of intertrochanteric femur fractures. Those surgical options include extramedullary fixation with Dynamic Hip Screw (DHS), Compression Hip Screw (CHS), Percutaneous Compression Plate (PCCP), Medoff sliding plate, Less Invasive Stabilization System (LISS), Intertrochanteric Antegrade Nail (InterTAN), and Proximal Femoral Nail Antirotating (PFNA).7 This study aims to determine the characteristics of intertrochanteric femur fracture cases at Bali Mandara General Hospital Denpasar from January to August 2022.

MATERIAL AND METHODS

This retrospective descriptive study is conducted by evaluating the characteristics of patients with intertrochanteric femur fractures treated at Bali Mandara General Hospital Denpasar from January to August 2022. The research is conducted by collecting data from medical records of patients with intertrochanteric femur fractures treated at Bali Mandara General Hospital Denpasar. This study involves all patients that are

diagnosed with intertrochanteric femur fractures from history taking, physical examination, and additional examinations using femur and hip X-rays.

All patients (regardless of their age) who were diagnosed with intertrochanteric femur fractures based on examinations and came to the hospital within the period of study (from January to August 2022) were included in this study. Meanwhile, patients with congenital bone disease, a history of recurrent fractures at the same location, and incomplete data in the medical record according to the characteristics reviewed are excluded from this study. The total sampling method was used for all patients with intertrochanteric femur fractures who were treated at the Bali Mandara General Hospital from January to August 2022.

The characteristics described in this study include age, gender (male and female), fracture classification according to Boyd and Griffin, trauma mechanisms (low energy and high energy), treatments, and trauma energy based on the Singh index. Based on their age, the patients were classified as elderly (older than 60 years old, according to World Health Organization classification 8) and younger than 60 years old. This study uses the Boyd and Griffin's classification to classify the types of fractures into Type I: simple fractures that extend along the intertrochanteric line (from the greater trochanter to the lesser trochanter), Type II: Comminuted fractures, the main fracture is located along the intertrochanteric line, but is accompanied by multiple cortical or comminuted fractures in the coronal plane, Type III: Fracture of the lesser trochanter with multiple comminutions and extend into the subtrochanteric region (reverse subtrochanteric), Type IV: Fracture of the trochanteric region and proximal shaft, with fractures in at least two planes (9).

This study also uses the Singh index to determine the femoral neck density based on the visible trabecula. The density is then classified into 6 grades, namely Grade 6: all trabecular groups are clearly visible. Grade 5: Groups of secondary compressive trabeculae are not clearly visible. Grade 4: the secondary compressive trabeculae groups are not visible. Grade 3: Tensile trabeculae are only prominent at the superior part of the neck of the femur. Grade 2: only principal compressive trabeculae stand out prominently. Grade 1: principal compressive trabeculae are greatly reduced in number and no longer prominent (10). In this study we classified the Singh index into Grade A (I-II), Grade B (III-IV), and Grade C (V-VI) (10,18).

The data obtained were analyzed descriptively to provide an overview of the characteristics. SPSS software (IBM SPSS 25.0) was used to conduct computational analysis. The confidence interval in this study is 95% and a p-value of <0,05 is considered significant. The data is then presented in narratives, tables, and diagrams.

RESULTS

Based on the medical records from January until August 2022, there were 36 patients with intertrochanteric femur fractures who were admitted to the Bali Mandara General Hospital Denpasar. From all the data collected during the study period, there

were 410 orthopedic surgeries performed at Bali Mandara General Hospital and the incidence of intertrochanteric femur fractures is 8,78%. Characteristics of the intertrochanteric femur patients are shown in (Table 1.).

Based on the age groups, there are more elderly patients (>60 years old) with intertrochanteric femur fractures. There were only four patients younger than 60 years old (≤ 60 years old), namely 17 years old, 36 years old, 46 years old, and 50 years old. There are more female patients with intertrochanteric femur fractures, with as many as 25 patients (69,4%) compared to male patients.

Table 1. Characteristics of Intertrochanteric femur Fractures in Bali Mandara General Hospital.

Characteristics	Frequency (%)
Age (mean; range)	69.22; 17 – 92 years old
< 60 years old	4 (11.1)
≥ 60 years old	32 (88.9)
Sex	
Male	11 (30.6)
Female	25 (69.4)
Trauma mechanism	
Low energy	33 (91.7)
High energy	3 (8.3)
Classification	
Type 1	9 (25.0)
Type 2	14 (38.9)
Type 3	6 (16.7)
Type 4	7 (19.4)
Singh Index	
Grade A (I and II)	7 (19.4)
Grade B (III and IV)	16 (44.4)
Grade C (V and VI)	13 (36.1)

According to the trauma mechanisms, there were 33 patients with low energy mechanisms. This mechanism involves falling from a standing position or is related to pathological conditions such as osteoporosis. Three patients had high energy mechanisms and all of them were younger than 60 years old. Based on the Boyd and Griffin's classification, type 2 fractures are more common in this study (14 patients [38,9%]), followed by type 1, type 4, and type 3. All of the patients in this study underwent the proximal femoral nail antirotation (PFNA) surgery (100%) and there were more findings on the grade B Singh index (16 patients [44,4%]).

DISCUSSION

Intertrochanteric femur fractures are commonly found in the elderly. The most prevalent cause of intertrochanter fractures is falling (low energy) or trauma (high energy). These issues are more likely to occur in older people since they are more prone to falling. In several cases, people with weak bones can experience fractures just because they fall while walking or standing. Traffic accidents may also cause hip fractures (11) Similar to this study, fracture cases are more common on older and female patients with low energy trauma mechanisms. This study also found that all patients with high energy trauma mechanisms were younger than 60 years old.

Older women are at a higher risk of intertrochanteric femur fractures occurrence. Lower bone density in this population is the main reason for higher extracapsular-intertrochanteric fractures. In patients with intertrochanteric femur fractures, reduced trabecular density is substantially associated with osteoporosis (12).

This study revealed that there are more patients with a grade B (III and IV) Singh index. In 1978, Singh et al. suggested the concept of the Singh index, a semiquantitative morphology index that is used to determine the loss of trabecular bone in the proximal femur with plain x-ray films. Liu et al. reported that the Singh index has a significant correlation with hip bone density. For patients with a low Singh index, total hip replacement can be a suitable option. Another study by Pellegrini et al. considered the Singh index as an important index to predict hip fractures. (16,17)

Since most patients diagnosed with an intertrochanter fracture require emergency surgery, the Singh index is used as an imaging-based evaluation tool that is simple, fast, inexpensive, and useful for doctors in deciding the appropriate surgical methods and postoperative care (15).

In this study, all the patients had PFNA surgery. PFNA is an intramedullary nail that uses a spiral blade to fix the femoral head. PFNA blade is stated to be able to add more density to the spongiosa bone that increases stability. This blade is biomechanically proven to prevent varus collapse and rotation. Switching the collum screw to a helical blade increases the contact surface between the purchase-holding tool and the spongy bone of the femoral head, slightly compressing the bone because the core of such a device is generally small. Once it is locked tightly, it can prevent rotation of the surrounding fragment of the head or neck of the femur. There is another surgical method that is frequently used in the management of intertrochanter fractures, namely the intertrochanteric antegrade nail (InterTAN) procedure. This procedure is an effective surgical method for treating unstable hip fractures in elderly patients and may effectively improves hip pain and function (13,15).

According to Hao et al. (2018), operative measurement with proximal femoral nail anti-rotation or PFNA is more effective than other methods in intertrochanteric femur fractures. PFNA surgery is proven to result in the least blood loss and has the shortest operating time compared to other methods such as percutaneous compression plate (PCCP), dynamic hip screw (DHS), gamma nail (GN), and artificial femoral head replacement (FHR) (14).

CONCLUSIONS

Intertrochanteric femur fracture was more common in female patients with as many as 25 patients (69,4%). Based on the age groups, intertrochanteric femur fractures are more common in the elderly (>60 years old). Based on the mechanism of trauma, there are 33 patients with low energy, while three patients had high energy mechanisms. According to Boyd and Griffin's classification, there are more type 2 fractures (14 patients [38,9%]). All of the patients underwent PFNA (100%) and there are more patients with grade a B Singh index (16 patients [44,4%]).

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