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Original Article

THIRD TROCANTER OF HUMAN FEMORA IN NORTH KARNATAKA REGION

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ABSTRACT

Introduction: In orthopaedic surgery, trochanteric region is an important as it's an entry point, usually lateral side of the great trochanter, although anterior and posterior approaches have variable interest. For implants such as plates and DHS (dynamic hip screw), lateral approach is standard. After skin, fat tissue and fascia lata, vastuslateralis muscle is reached and elevated to approach lateral surface of subtrochanteric area. For implants as intra-medullar nail, minimally invasive approach is in routine use. Despite abundant research of general femoral morphology, especially its specific morphological parts (femoral head, neck, shaft, and its distal part involved in knee joint).

Materials and methods: Study on 158 dry adult human femur of unknown age & sex collected from the department of anatomy and phase I students of KBNIMS, Kalaburagi, Karnataka. The broken or non-dried specimens were excluded from the study.

Results: The third trochanter was present in 4.43% of the femora. Although the incidence was higher on the right side it was not statistically significant.

Discussion: Another study which reported the side variations in Whites and Negroes, documented higher incidence on right side in White and on left side in Negro population; it also reported the trait to be more common in females in both Whites and Negroes.

Conclusion: The presence of third trochanter at the proximal part of the femur has been found to alter the break lines in the pertrochanteric fracture patients. This study dealt with the incidence of third trochanter in north Karnataka region.

KEY WORDS: Third Trochanter, Gluteal Tuberosity, Proximal End Femur.

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INTRODUCTION

The third trochanter may perhaps serve to increase attachment surface area for the gluteal musculature thereby providing greater efficiency of contraction. Gluteus maximus function may exert a mechanical loading on the third trochanter thereby altering surface morphology. The presence of bony crests, ridges and tuberosities are directly correlated to the function of contiguous muscle activity [1]. In anthropometric studies on various populations the third trochanter is the commonly used non-metric variation in the post-cranial skeleton [2]. Apart from anthropometric, comparative and functional studies, the third trochanter is a structure of minor importance in humans.

The clinical significance of this structure as the insertion of the gluteus maximus muscle is similar to that of the gluteal tuberosity of the femur, the iliotibial tract of the fascia lata and the lateral femoral intermuscular septum. However, in some species of laboratory mammals the third trochanter plays an important role as a useful landmark for biomechanical studies and densitometry and as the access point of choice for the medullar cavity [3,4,5]. The correlation between muscle insertions and topography of break lines in pertrochanteric fractures of the proximal femur has been recently discussed. A studysuggested that bone covered only with periosteum with no reinforcing elements of the attachments of muscles and ligaments, represent minor resistance for onset of fractures. Variability in the sizes and shapes of pertrochanteric fracture fragments depend on variability of the locations and sizes of soft tissue attachment areas at specified sites on the proximal femur [6]. In many anthropometric studies the third trochanter and the hypotrochantericfossa are commonly used non metric variations of the postcranial skeleton. They serve for descriptive purposes of the proximal end of the femur in various ethnic groups. The third trochanter functions to provide an attachment area for the ascending tendon of the gluteus maximus. This skeletal variant, when present, occurs as an oblong, rounded or conical, roughened or smoothened bony elevation which may be continuous with the gluteal ridge and is manifested as a distinct femoral entity [7]. The strong entheseal development in the femoral attachment of the gluteus maximus suggest strong mechanical effort of the joint in extension, lateral stabilization and control of the thigh indicating medio-lateral reinforcement to resist high mechanical stress in erect posture and locomotion [8].

MATERIALS AND METHODS

A study on 158 dry adult human femur of unknown age & sex collected from the department of anatomy and phase I students of KBNIMS, Kalaburagi, Karnataka. The study was done over a period of 8 months (July to Febuary 2015). All the femur were examined carefully for any variations by visual inspection. Appropriate measurements were taken and specimen was photographed. The clinical importance due to variations are discussed. The broken or non-dried specimens were excluded from the study.

RESULTS

The third trochanter was present in 4.43% of the femora. Although the incidence was higher on the right side it was not statistically significant.

The Hypotrochantericfossae is absent.

Fig. 1: Showing third trochanter of femur.

Fig. 2: Showing right side third trochanter of femur.

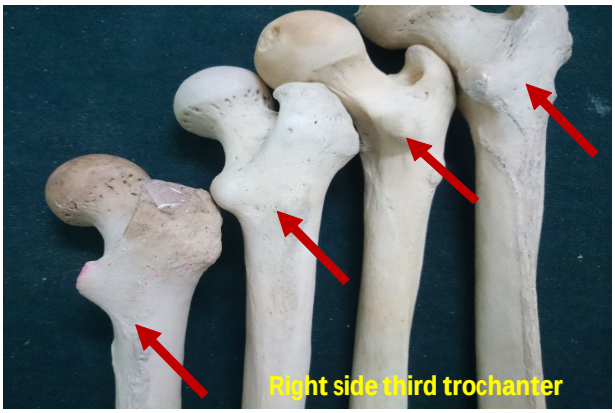

Fig. 3: Showing left side third trochanter of femur.

Table 1: Occurrence of the third trochannter.

Trait	Number of femur		Incidence
	Right	Left	
Third trochanter	4	3	4.43%
Hypotrochatric fossa	–	–	Absent

DISCUSSION

The incidence of the third trochanter in our study is 4.43% with right sided predominance. A study done on excavated femora from Poland which showed anincidence of 6.2%. However they did not take any gender or side variations into consideration [9]. Another study which reported the side variations in Whites and Negroes, documented higher incidence on right side in White and on left side in Negro population; it also reported the trait to be more common in females in both Whites and Negroes [10]. The phenotypic development and expression discontinuous skeletal traits were originally considered to be controlled by genetic factors [11].

Recent researches indicate the significance of various biological and environmental factors such as age, sex, nutritional status or side dependence influencing the manifestation of certain non metrictraits in non human and human populations [12,13,14]. Expression of the third trochanter may be affected by mechanical stress exerted by the gluteus maximus; this muscle functions to decrease limb speed during the lateswing and heel strike phases of locomotion. The third trochanter may perhaps serve to increase attachment surface area for the gluteal musculature thereby providing greater efficiency of contraction. Gluteus maximus function may exert a mechanical loading on the third trochanter thereby altering surface morphology. The presence of bony crests, ridges and tuberosities are directly correlated to the function of contiguous muscle activity [1]. The fossa hypotrochanterica is a fossa, groove or pit at the site of insertion of Gluteus Maximus on the femur. The presence of gluteal ridge, third trochanter or fossa hypotrochanterica are all associated with Gluteus maximus insertion in Man. In Gorilla, Chimpanzee and Orangutan, fossa hypo-trochanterica is found at this muscle attachment whereas in Gibbons a gluteal ridge is found [14].

CONCLUSION

The incidence of the third trochanter in the femora analysed was 4.43%.The third trochanter was not correlated with any morphological feature of the femoral head, neck and shaft.The third trochanter was correlated with transverse flattening of the superior end of the femur.

The results of the study suggest that the third trochanter is a structure which is correlated with an altered gluteal muscle function.The knowledge of the occurrence would be crucial for the diagnosis and management of pertrochanteric fractures and also in the study of microevolutionary trends in the anthropometric and comparative studies of humans.The presence of third trochanter at the proximal part of the femur has been found to alter the break lines in the pertrochanteric fracture patients. This study dealt with the incidence of third trochanter in north Karnataka region.

Conflicts of Interests: **None**

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