Incidence of third trochanter and hypotrochanteric fossa in human femora in Indian population.

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Abstract

Introduction

Third trochanter is described as an oval tubercle at the superior end of the gluteal tuberosity. The importance of the third trochanter in pertrochanteric fractures have been recently hypothesized to be correlated with the fracture break lines in pertrochanteric fractures. The third trochanter may function to provide increased skeletal mass as a reinforcement mechanism for the proximal diaphysis in response to increased ground reaction force. The hypotrochanteric fossa is considered to be a varied manifestation of the attachment of gluteus maximus present on the posterior superior part of the femoral diaphysis. Due to the paucity of literature on the incidences of third trochanter and hypotrochanteric fossa in Indian population, this study was undertaken.

Materials and methods

The study was conducted on 152 adult dried femora in the Department of Anatomy, Maulana Azad Medical College, New Delhi, India. The positive findings were photographed. The significance of the correlation was found out using Chi-square test.

Results

In our study, third trochanter and the hypotrochanteric fossa were found to occur in 6.6% and 31.6% of the total bones assessed. The hypotrochanteric fossa was seen significantly higher on right side. Both the traits were found to be more in males.

Conclusion

This study dealt with the incidence of third trochanter and hypotrochanteric fossa in the Indian population due to scant previous literature.

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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 Gorillas, Chimpanzees and Orangutans, fossa hypotrochanterica is found at the muscle attachment whereas in Gibbons a gluteal ridge is found. So the exact aetiology still remains obscure as to why in certain cases a ridge or a fossa is found. This spectrum of ridge, trochanter and fossa may possibly represent a microevolutionary trend. Hence our study took into account the incidence of these traits in Indian femora, not mentioned in any previous study. In our study, the Hypotrochanteric fossae were present in 31.6 % of femora with higher significant incidence on the right side.

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.14

It was also higher in males but not of significance. Significant right side predominance was also documented in Negros but not in Whites. This study also did not report any significant gender variation.6 The phenotypic development and expression of discontinuous skeletal traits were originally considered to be controlled by genetic factors.8 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 metric traits in non human and human populations.6,10,11 Local mechanical factors also represent potent sources of epigenetic information which influence the incidence and expression of discontinuous variants.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 late swing and heel strike phases of locomotion.

### Table 3: Chi square test significance of gender variation of the trait

<table>
<thead>
<tr>
<th>Trait</th>
<th>Male</th>
<th>Female</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Third Trochanter</td>
<td>7</td>
<td>3</td>
<td>0.191</td>
</tr>
<tr>
<td>Hypotrochanteric Fossa</td>
<td>26</td>
<td>22</td>
<td>0.485</td>
</tr>
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Figure 3: Right female Femur showing Hypotrochanteric Fossa.

Figure 4: Left male femur showing a ridge at the attachment of Gluteus Maximus – Gluteal Tuberosity.

Figure 5: A graphic representation of the traits with respect to gender and side of bone.

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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 and hypotrochanteric fossa in the Indian population due to scant previous literature. 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.

References