

A Study of Third Trochanter in Femora of Pakistani Population

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150 pairs of male and 15 pairs of female Pakistani femora were studied for the presence of third trochanter and other features classified by previous workers. Third trochanter was found to be present in 13.9% (10.9% in male and 3.0% in female) femora. Crista glutea was found present in 27.8%, with males showing a higher percentage. Frequency of various types of crista glutea and gluteal tuberosity showed dominance on right side in both sexes. Incidence of third trochanter in Pakistanis (13.9%) was markedly less than Asians (50.0%), more than Indians (5.6%) and almost close to Chinese (9.45%), Germans (17.94%) and French (18.3%).

Key Words: Femur, Third Trochanter

The third trochanter is a phylogenetic curiosity. It is a primitive mammalian character present in horse and some rodents (Muskrart) and absent in ox, pig, dog and chicken. It is found in man and other lower primates and said to be present in primitive races and less frequent in the civilised races. Third trochanter is a rounded bony projection similar to lesser trochanter present along the superior border of gluteal tuberosity of the femur¹. It provides an attachment area for ascending tendons of gluteus maximus. Pull of gluteus maximus does not always produces this elevation. Different varieties of impressions produced by the muscle have been classified by various workers in the past^{2,3,4,5}. This impression has been classified into different categories. It occurs as an oblong, rounded or conical bony elevation which may be continuous with the gluteal ridge and is manifested as a distinct femoral entity¹. The nomenclature used for the classification of this trait is same as used in a study in Indians,^{6,7} described by a previous worker⁸. According to this nomenclature, a conical projection should be called as third trochanter, an oblong rough elevation, crista glutea, a rough surface only a gluteal tuberosity and a groove as fossa hypotrochanterica. The word tuberosity is used to denote a level rough surface and a ridge to denote an elevated portion, as recommended previously⁶. Regional variations in frequency of third trochanter in Indian Femora have been recently studied⁷. The relationship between third trochanter incidence and femoral metric trait covariation has been investigated in a group of 60 left human femora⁹. It was said to be associated with short femora displaying robust proximal diaphyses. This trait appears well suited for human taxonomy studies. No information is available about the frequency of third trochanter in Pakistani femora.

Materials and Methods

The bones examined in this study consisted of 150 pairs of male and 15 pairs of female femurs taken from the collection of the department of Anatomy, King Edward Medical College, Lahore, during 1990-96. The bones were examined for the presence of third trochanter and other features classified under the following heads⁸ i.e. absence of any feature (Fig-1), third trochanter (Fig-2), crista glutea (Fig-3), gluteal tuberosity (Fig-4) and fossa hypotrochanterica (Fig-5). The third trochanter was considered to be present only if a distinct conical elevation was separate from gluteal ridge. The tuberosity and crista when present were further classified as (1) Slight (2) Medium and (3) Pronounced. All these features were separately recorded for right and left sides. The observations were tabulated and compared with the available data.

Discussion

Incidence of various impressions in Pakistani Femora has been studied (Table-1), especially crista gluteal tuberosity (Table-2). The frequency of third trochanter among Pakistanis is 13.9%, which is higher than found in Indians (5.6%)⁷.

Its percentage is higher in American Indians because in that study, crista glutea was included with third trochanter (Table - 3) When these two characters were studied separately, their individual values were less than the present study. The incidence of third trochanter is seen to be more among males (10.9%), as compared to females (3.0%). These results agree with similar observations in Hungarians, American Whites and Indians. However, frequency of third trochanter was greater in American Indians and English females as shown in Table - 3. Crista glutea

is more common in males (25.5%) as compared to females (2.4%), showing dominance on right side in both sexes (Table -1) as compared to no dominance on either side in Indians. The pronounced forms of crista are less common in females than males (Table - 2). Females show higher frequency of crista on right The proportion of third trochanter to crista glutea in Indians and American whites is 1:54, in Chinese, it is 4.73:1 and in Pakistanis, it is 1:2. The highest incidence of third trochanter is still (94.6%) among Feuegians. The upper limit of third trochanter and crista glutea are said to be constant as noticed by previous workers. In present study, 5 male and one female femora, showed their extension upto the base of greater trochanter. Frequency of all the impressions present at the site of attachment of gluteus maximus

muscle in males confirms the principle that muscular markings are more prominent in the male bones. Percentage of third trochanter among Indians and Pakistanis is less than the average for Asians except in case of Chinese (Table - 3). Third trochanter has been claimed differently in the past. It was said to be a human excess structure¹¹, it is analogous with mammalian third trochanter^{12,13}. It was attributed to developed gluteus maximus due to erect posture and bipedal human locomotion. It was also said to be an atavism¹⁵. Concentration of gluteus maximus fibres in a limited space, contraction of whom may result in the production of third trochanter¹⁶. This statement was supported with the observation that there is no ossification centre in the third trochanter.



Fig 1. Absence of any feature



Fig 2. Third trochanter , a conical projection

Table-1 Incidence of various impressions in Pakistani femora.

	n=	Male (300)			Female (30)			Total (330)	%age	
		R	L	%age	n=	R	L			%age
1. Absent	20	14	06	6.0	8	6	2	2.4	28	8.5
2. Gluteal tuberosity	92	52	40	27.8	9	4	5	2.7	101	30.6
3. Crista glutea.	84	50	34	25.5	8	5	3	2.4	92	27.8
4. Third tronchanter.	36	26	10	10.9	10	7	3	3.0	46	13.9
5. Fossa hypotrochanterica.	82	52	30	24.8	6	4	2	1.8	88	26.6

Table-2 Incidence of various types of crista glutea and gluteal tuberosity.

	Male						Female					
	Right			Left			Right			Left		
	Slight	Medium	Pronounced	Slight	Medium	Pronounced	Slight	Medium	Pronounced	Slight	Medium	Pronounced
Crista	14	10	6	17	12	6	6	2	2	5	4	-
Tuberosity	30	17	10	28	15	10	2	4	-	8	6	-

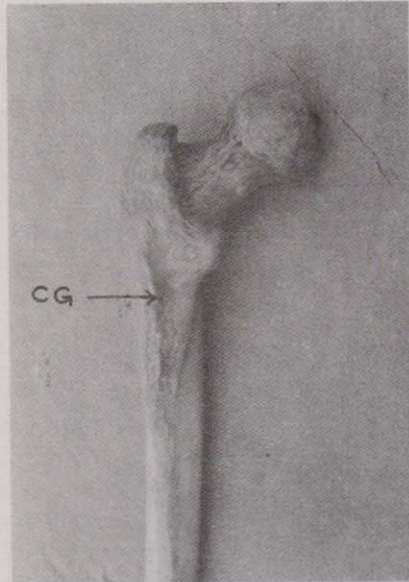


Fig 3. Crista glutea



Fig 4. Gluteal tuberosity

Table-3 Comparative data of various features in different populations. (After Martin 1938)

Population	Third trochanter %age	Fossa hypotrochanterica %age	Crista glutea % age .	M:F.
1. Feuegians	94.6	100.0	94.6	-
2. Americans	64.3	87.6	35.7	-
3. Asians	50.0	66.0	-	-
4. Africans	33.0	50.0	25.0	-
5. Europeans	30.4	29.4	33.0	-
6. Italians	23.57	-	-	-
7. French	18.33	-	-	-
8. Germans	17.94	-	-	-
9. English	52.47	-	-	F>M.
10. American Indian (Hrdlika, 1938)	43.25	-	-	F>M
11. American Whites (Hrdlika, 1938)	20.01	-	-	M>F
12. Hungarians	36.0	-	-	M>F
13. Indians	5.6	22.0	30.4	M>F
14. Present study	13.9	26.6	27.9	M>F

Table-4 Comparison of third trochanter and crista glutea in different populations.

Source	Conical	Crista	Multiple			
American Whites	4.7%	25.4%	0.2%	Chinese	9.45%	2.0%
Indians	5.6%	30.4%	-			
Present Study	13.9%	27.9%	-			



Fig 5. Fosa hypotrochanterica

It was also concluded that it is evolutionary and is neither postural nor due to muscular exercise. It represents a relic of mammals and is in direct relation to the development of gluteus maximus¹. In a recent study on Indian femora, third trochanter was proved to be a remnant of regressive survival as it is often related to a slender and lighter femur and has no relation to the strength of muscle⁶. In contrast to this observation, third trochanter was found more commonly in males than in females in the present study and the femora of males were heavier and stronger with prominent muscle markings. Which proves that third trochanter has definite relation to the strength of gluteus maximus muscles.

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