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ORIGINAL ARTICLE

Anatomical Variations of Gerdy's Tubercle: The Distal Attachment Site of the Iliotibial Tract

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ABSTRACT

Background: Morphometric evaluation of Gerdy's tubercle located on upper end of tibia has very significant role in orthopedics for the treatment and surgeries of total knee replacement. A triangular facet known as Gerdy's tubercle is located on the lateral tibial condyle.
Aim: To analyze and evaluate the variations in size, shape, prominence and localization of Gerdy's tubercle in dry human tibial bones.
Study Design: Cross sectional morphological study
Place and Duration of Study: Department of Anatomy, Akhtar Saeed Medical & Dental College Lahore from 1st July 2022 to 31st December 2022.
Methodology: To record the variations of Gerdy's tubercle in this research work, 50 dry human tibial bones were obtained. Morphologically shape and bony prominence of this tubercle was noted. Vernier caliper and ruler were used to measure the diameter and localization of the tubercle.
Results: The calculated mean diameter of Gerdy's tubercle irrespective of the side of tibia was 12.5±2.85mm. This tubercle on tibia was noted as triangular in shape in 60% bones and oval in 30% and irregular in 10%. The surface prominence of Gerdy's tubercle was observed to be rough in 20%, smooth in 80% of the total bones. For localization of the tubercle, the distance measured between the tibial tuberosity to the Gerdy's tubercle. It was 54.5±6 mm on all total bones.
Conclusion: The present study provides the morphological and morphometrical evaluation of the variations in Gerdy's tubercle on upper end of tibial bones, furnishing an anatomical correlation of these anatomical information of the tubercle with the orthopedic and radiological manifestations.
Keywords: Tibial anterolateral facet, Gerdy's tubercle, Localization of Gerdy's tubercle, Anatomical variations

INTRODUCTION

On the antero-lateral aspect of lateral tibial condyle, a prominent facet is present known as Gerdy's tubercle[1]. A Pierre Nicolas Gerdy (1797-1856) a French surgeon identified the tubercle so it was named after his name as Gerdy's tubercle.[2] The gross Anatomy books was described that the tubercle is to be identified antomically almost 1cm below the knee joint line joining the two condyles. From tibial tuberosity it is located 2cm laterally. It is basically appeared as prominent tubercle on the upper lateral surface of tibia due to the attachment of iliotibial tract[3]. The fascia lata become thickened and form a strong fibromuscular band over the lateral surface of thigh, the iliotibial tract. The tensor fasciae latae muscle is enclosed in between two slips of fascia lata and anchored by the iliotibial tract proximally. Posteriorly it receives the tendinous fibers of largest gluteal muscle, gluteus maximus. The superficial layer of the fascia lata ascends laterally and attached to the iliac crest of hip bone; its deep fascial layer passes deep to this tensor fasciae latae and fuses with the fibrous capsule of hip joint. Distally the iliotibial tract is attached to a smooth, triangular facet, the Gerdy's tubercle, and also fuses with an aponeurotic fibers of vastus lateralis muscle of thigh[4]

Generally, tubercle is a round projection, nodular elevation or small eminence on the surface of the bone. Whereas the small articular surfaces of synovial joints are known as facets.[5] The bony surfaces of facets are smooth and also provide attachments of some large tendons, these are poorly vascularized articular areas that lack regular contours and are mostly depressed[2,3].

Recognition and identification of Gerdy's tubercle is an important and very critical landmark for surgical approaches to the knee. In the knee arthroplasty, an orthopedic surgeon couldn't deny the clinical significance of Gerdy's tubercle which is related to tibia's big oblong-shaped prominence. Most surgical approaches to the upper tibia and distal femur showed Gerdy's tubercle as a very significant and important anatomical landmark[6].

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Proximally the morphological and morphometric parameters of tibia are mostly used in the knee arthroplasty and total knee replacement surgeries to provide adequate guidance for better treatment strategies. It is the most favorable site for periosteal needle insertion required for infusion of the intramedullary fluids in the neonates[7]. The fractures of this tubercle may also have associated fracture of tibial tuberosity. It has been used as a source of bone graft[8]. As the common peroneal nerve runs along the neck of fibula near this tubercle, it serves as an important landmark for localization of this nerve that provides motor and sensory supply to the leg[5].

The main purpose of the present study is to determine an authentic way of identifying the normal anatomical localization, size and shape of Gerdy's tubercle with reference to the surrounding bony features during several surgical approaches to the knee using simple morphometric measurements. Clear knowledge on the morphology and morphometry of upper end of the tibia is of utmost importance as it provides reliable method of evaluating knee deformity and related arthroplastic surgeries.

MATERIALS AND METHODS

A total of 50 fully ossified and dry human Tibia bones were selected from the bone bank of Anatomy Department, Akhtar Saeed Medical and Dental College Lahore. Then evaluated and analyzed the morphometric parameters. With the help of Vernier caliper, the Gerdy's tubercle was evaluated for size, shape, prominence and localization. The diameter of the tubercle was determined by measuring the width as two short side to side margins and the length was measured as the longest superior to inferior margins of the tubercle. Localization of the tubercle was determined by taking tibial tuberosity as reference point thereby measuring the distance between tibial tuberosity to Gerdy's tubercle. Tubercle's surface texture was categorized into rough and smooth and shape was noted as circular, oval or triangular The shapes and prominences of this tubercle were observed morphologically and then evaluated and photographed.

RESULTS

This tubercle on tibia was noted as triangular in shape in 58% bones and oval in 30% and irregular in 10%. The surface prominence of Gerdy's tubercle was observed to be rough in 24%, smooth in 76% of the total bones (Table 1). The mean diameter of Gerdy's tubercle irrespective of the side of tibia was 12.5±2.85 mm. For localization of the tubercle, the distance measured between the tibial tuberosity to the Gerdy's tubercle. It was 54.5±6 mm on all total bones (Table 2).

Table 1: Shape and texture of the Gerdy's tubercle

Shape & texture	No. of bones	%
Triangular	29	58.0
Oval	15	30.0
Irregular	6	12.0
Smooth	38	76.0
Rough	12	24.0

Table 2: Diameter and localization of tubercle

Parameter	Mean±SD
Diameter of tubercle	12.5±1.69
Location of tubercle	54.5±3.02

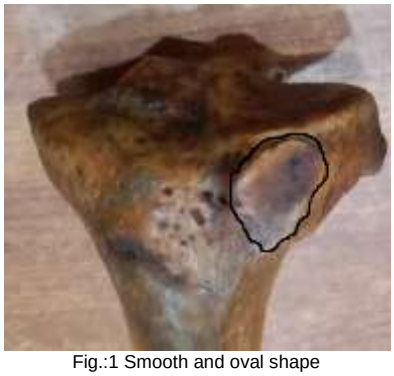

Fig.:1 Smooth and oval shape

Fig. 2: Smooth and triangular

Fig. 3: Rough and oval

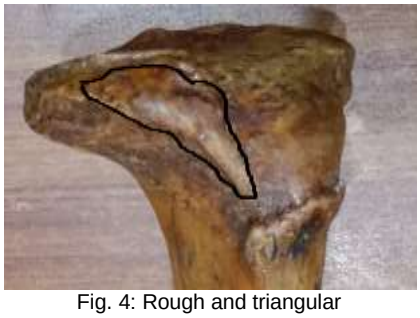

Fig. 4: Rough and triangular

Fig. 5: Smooth and circular

Fig. 6: Rough and circular

Fig. 7: Smooth circular and depressed

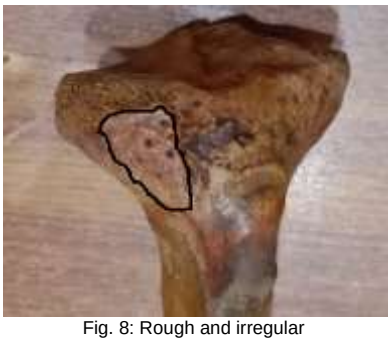

Fig. 8: Rough and irregular

DISCUSSION

The present study represented the anatomical variations and different shapes, size, texture and localization of this prominent Gerdy's tubercle that is attachment site of strong iliotibial tract distallay, in the human's dry tibia. These variations can't be neglected as having the surgical significance and also have not been reported previously in the literature of gross anatomy of the tibial bones. Although some researchers have described about the different shape and size of this tubercle but it is not well documented. On reviewing various Atlas of Anatomy it has been observed that, Netter's Atlas of Human Anatomy shows that this tubercle is oval transversely as well as triangular[8]. Few other studies have documented that Gerdy's tubercle is flat in shape but having definite anatomical marking, and others demonstrated it as triangular facet on the lateral condyle of tibia anterolaterally but it lacks approved documentation and representation of various shapes[9].

Generally, the ligaments and tendons advance obliquely towards their point of attachment sites on the bones as a result they make contacts with the bones of that specific joint where they act upon and produce various movements by the contraction of these muscles. Such contact between the tendon, ligament and bone determines the stress impact and dissipation at the insertion site of muscles and are vital for the transmission of forces. By doing so the muscle, tendon and ligament makes a rigid contact and upon continuous contractions may produce subsequent erosions due to the friction and repeated pull of the muscles on the point of contact on bone which determines the shape, size and texture of any facet or tubercle[10,11].

The significance of Gerdy's tubercle in surgical approaches is also vital. Its importance as an anatomical landmark for many surgical procedures in the knee region can't be neglected. So the proper determination and localization of this tubercle is vital for the knee arthroplasty, total knee replacement and bone grafting. Gerdy's tubercle is also utilized as a light-house for proper identification of common peroneal nerve at the proximal tibia close to knee joint and should be identified properly before the device placements and the instrumentation, which would help to avoid damage and injury to the common peroneal nerve and its branches in the leg[12].

By the osteotomy of Gerdy's tubercle of tibia and retraction of ilio-tibial band a modern technique has been introduced now that allows excellent and proper visualization in fixation of the intra-articular fractures of lateral condyle of tibia[13]. For these fractures the surgical treatment plan required are the open reduction and internal fixation.

Another study suggested that for various surgical procedures, the bone grafts comprising cancellous bone have been best harvested from Gerdy's tubercle as it is closer to metaphysis of proximal tibia[14]. Harvesting the proximal aspect of tibia is a well recognized and famous surgical procedure for various pathological bony defects of leg[5,13]. The lateral approach has gained popularity by giving an oblique incision from Gerdy's tubercle to tip of tibial tuberosity and it successfully help to approach the bone cortex and juxtaendosteal zone to harvest cancellous bone. This approach also help to avoid the injury to the epiphyseal line of the upper end of the tibia[14,15].

CONCLUSION

The examination of Gerdy's tubercle at anterolateral aspect of lateral condyle of tibia shows more variations in its morphological shape and texture. Also the study reflects that, the Gerdy's tubercle more resembled to a flat facet than a tubercle. The study demonstrates morphological and morphometrical variation of tibial bones with respect to Gerdy's tubercle, representing an anatomical baseline and light-house for the best correlation of these anatomical landmarks and findings with radiological and surgical manifestations especially during orthopedic surgeries to knee joint.

Conflict of interest: Nothing to declare

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