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MORPHOLOGICAL ANALYSIS OF THE FABELLA

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Abstract

There is variable number of sesamoid bones in the human body; one of them is fabella, located in the tendon of the gastrocnemius muscle. This study was conducted to examine the frequency of occurrence of fabella in the Macedonian population and to discuss the clinical implications of this bone. Over a time span of six months, 53 patients (38 males and 15 females, age range 19-60 years) were examined with computed tomography (CT) or magnetic resonance imaging (MRI). The reports were reviewed for the presence of fabella. In five (9.43%) patients of 53 analyzed reports, fabella was found in the lateral tendon of gastrocnemius muscle. Fabella is present in the Macedonian population and we should think of this sesamoid bone while performing diagnostic and surgical procedures.

Key words: fabella, sesamoid bone, anatomy, surgery.

Introduction

Galen is reputed to have first used the term "sesamoid" because of the resemblance of these bones to sesame seeds. Most sesamoid bones are only a few millimetres in diameter and vary in shape. The location of some saesamoids is constant, but many other sesamoids exist with variable frequency and sites. They are more frequent in hands and feet fingers. Most sesamoid bones are structures inside the tendons or in periarticular areas in close proximity to joints; however, their precise role is not understood. It is believed that they alter the direction of muscle pull, decrease friction and modify pressure. Some sesamoids ossify, whereas others remain cartialaginous [1].

In humans we can find about 46 sesamoid bones; fabella is found on knee joint. Fabella is placed inside the tendon of the gastrocnemius lateral muscle in posterior part of the condylus lateralis femoris. It is usually located in the lateral head of the muscle, and occasionally may occur in the tendon of the medial head of the muscle [2].

The aim of this study was to investigate the frequency of occurrence of fabella in the Macedonian population and to emphasize the clinical importance of this in some cases forgotten bone.

Material and methods

We retrospectively examined radiographs of 53 patients who had knee exams undertaken for a variety of clinical reasons, performed as a part of their medical treatment at the University Clinic for Radiology in Skopje, R. Macedonia. For the purpose of this study 15 females and 38 males, ranging in age between 19 and 60 years, mean age of 36.7±12.3 years, were examined. The patients were examined using CT or MRI. We received high quality images, which met the requirements of our study. Anatomical analysis of the images realized for medically justified goal was done. Images for each of the 53 patients were retrospectively analyzed by two independent authors.

Results

The radiological reports were reviewed for the presence of fabella. In five (9.43%) patients of 53 analyzed reports fabella was found in the lateral head of the gastrocnemius muscle. We did not find a significant gender or side difference in the appearance of fabella.

Fig. 1. CT images of the knee showing the presence of fabella.

Discussion

The fabella, or "little bean," is a bony or cartilaginous structure in the posterolateral aspect of the knee. It is generally believed to reside in the tendon of the lateral head of the gastrocnemius; however, many structures merge at the fabella. The fabella ranges in size from approximately 5 mm to over 20 mm in diameter, with the majority being oval in shape [3]. There are a few reports on the fabella's histology. Histological the fabella is classified by the predominant tissue as bone tissue, fibrous tissue and fibrocartilaginous [1, 4].

Until now, several studies reporting the incidence of the fabella have been published in the literature. Fabella was found by Silva in 3.1% of cases, Weiner in 12% of the cases, Phukubye in 23.5% of the cases and by Sarin in 31% of the cases. The results obtained in our study (9.43%)

for the frequency of the fabella are consistent with the published literature. Data derived from our study suggest that gender has no role in the appearance of the fabella, and confirmed some earlier findings by Sarin and Phukubye.

The search for elucidation the mysteries of formation and frequency of the sesamoid bones has been promoting the activity of many researchers. There are two theoretical propositions for the development of these bones, a functional and a phylogenetic. The functional theory finds support in the biomechanical aspect, where these bones are described as pulleys, reducing the friction of the tendons and potentiating the muscular handspike. The phylogenetic theory suggests genetic intrinsic factors developed during the evolutionary process that can be the key for development of sesamoid bones. They appear in the womb period. Initially cartilaginous they can calcify or not after the birth depending on the kind of activity done by the individual, that is, a "biomechanics embryological" origin [6].

Although initial anatomic studies emphasized a lack of significance of the fabella, this sesamoid bone has been associated with a spectrum of pathology affecting the knee ranging from fabellar syndrome to peroneal nerve injury, fabellar impingement and fracture [7].

Fractures of the fabella are extremely rare but important clinical entity, which may be easily overlooked clinically and radiographically, with few cases reported in the literature. Clinical information can provide a high index of suspiction, and when coupled with radiographic and CT findings, may lead to correct diagnosis [7]. Fractures of the fabella cause a severe posterolateral knee pain associated with decreased range of motion, inability to bear weight, and limited knee extension. On exam, tenderness is elicited with either hyperextension or compression of the fabella over the lateral femoral condyle [8]. Fracture etiologies include direct trauma to the lateral or posterolateral knee, repetitive microtrauma, and altered biomechanics in patients after total knee arthroplasties [9]. Early recognition and conservative treatment with rest, immobilization, and physical therapy are believed to be effective at relieving symptoms. However, fabellectomy is recommended only after a failed trial of conservative therapy or if there is impingement of the common peroneal nerve [7, 8, 9].

Several researchers have reported fabellar impingement after total knee replacement on either the tibial polyethylene component or the femoral component [10, 11, 12, 13]. Fabellar impingement can cause postoperative pain, swelling, catching and clicking around the knee joint, and can significantly compromise the results of total knee arthroplasty [10]. Diagnosis was made using lateral radiographs, and the symptoms resolved after fabellectomy [10, 11, 12, 13]. The cause of fabellar impingement after total knee replacement is probably multifactorial. It could be related to the large size (> 1 cm) of the fabella or to anatomic variation in the location of the fabella in the lateral head of the gastrocnemius muscle that may affect the relationship of the fabella to the prosthetic components. Other causes of postoperative fabellar impingement include incorrect positioning of the prosthetic components, a mismatch in sizes of the prosthetic and native femoral condyles, or ligament instability [11]. To avoid painful fabellar impingement after total knee arthroplasty, the preoperative radiograph should be carefully scrutinized. If there is a fabella that is larger than normal, thought should be given to its excision during replacement of the knee [12].

The common peroneal nerve is the most frequently damaged nerve in the lower limb. Until now, several studies reporting a peroneal nerve injury resulting from a fabella have been published in the literature. According to these studies we can conclude that the fabella should be considered as one of the possible reasons for peroneal nerve palsy. Therefore, whenever a patient complains of pain, palsy, or sensory changes in the distribution of the common peroneal nerve, and whenever a mass is found posterolateral to the head of the fibula or posterior femoral condyle, the presence of a fabella must be considered [14, 15].

The most common pathologic condition is fabellar syndrome characterized by posterolateral sharp knee pain, usually exacerbated in extension, and local tenderness over the region of the fabella, due to chondromalacia fabellae [2, 4, 5, 11, 14, 15, 16, 17]. The condition usually occurs during adolescence and is not related to previous knee surgery. Conservative treatment includes steroid injections, immobilization, rest from activity, and analgesics for up to 6 months. Indication for surgical treatment is failed conservative therapy after 6 month trial. Surgical intervention for recurrent knee dysfunction associated with this accessory bone has been reported as successful. A simple manual therapy intervention and subsequent education for effective self management strategies could significantly reduce the incidence of surgical excision of the fabella. Physical therapists need to be aware of fabella syndrome as a possible diagnosis for patients with posterior knee pain and need to include appropriate examination procedures to rule out or correctly diagnose this syndrome [16].

Conclusion

In conclusion, fabella in the Macedonian population was dominantly present in the tendon of the lateral head of the gastrocnemius muscle. Based on the presented information we highlighted the clinical significance of this bone. The authors believe that this article will add important contribution to the anatomical and clinical knowledge of the fabella and will refresh our knowledge for fabella.

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