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Original Article

Os fabella; radiologic study on 500 cases

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Abstract

Aim: Aim of the present study is to indicate the incidence of os fabella in our population and to evaluate the side and gender related differences.

Material and Methods: 500 patients (224 females, 276 males) who underwent Magnetic Resonance Imaging (MRI) for various indications were enrolled in the present study. Patients had no history of trauma or surgery. MR images of the patients were evaluated retrospectively.

Results: 140 patients with os fabella were reported (28%). 52 of the 140 patients were females (37%) 88 were males (63%). Male predominance in this study was statistically significant. (p= 0.003). Bilaterality incidence of os fabella was 25.71%. There was no statistically significant incidence difference between left and right sides. (p = 0.1005) Difference between genders according to length and width of os fabella was evaluated in 96 patients who underwent bilateral knee MR imaging. Length of right sided os fabella was greater in males than in females (p = 0.003).

Conclusion: Proper understanding of anatomy and variations of knee region is important for diagnosis and treatment of patients with knee problems. Os fabella is one of the variations in the knee region which has clinical importance and may cause diagnostic pitfalls and surgical complications.

Keywords: Os fabella; sesamoid bone; bone variation

INTRODUCTION

Os fabella is a variant sesamoid bone embedded in the tendon of lateral head of gastrocnemius muscle (1,2,3). It articulates with the lateral condyle of femur (3). In the literature ıts incidence is reported to be about 10-30% of the population and it is found bilaterally in about 80% of cases (4).

Os fabella may be identified as bony or cartilaginous sesamoid bone and can be identified in X-ray radiographs, computed tomography (CT) and magnetic resonance imaging (MRI) (5,6). It is usually an incidental finding for the radiologists and requires differential diagnosis from a fracture fragment, osteophyte or an ossified intra articular loose body (5). It is located in the fabella complex, which consists of arcuate ligament, oblique popliteal ligament, and plantaris muscle besides the lateral head of gastrocnemius muscle (7).

Although it is a normal structure, it is occasionally reported to cause knee pain. Common fibular nerve palsy, popliteal entrapment syndrome and fractures are other clinical presentations of this variation. Conservative treatment options of os fabella are steroid or local anesthetics injection and physical therapy. Fabellectomy is the second choice of treatment and is performed when the symptoms persist (4).

MATERIAL and METHODS

Ankara Yildirim Beyazit University Yenimahalle Research and Training Hospital Ethics Committee received ethics committee approval (Number: 91).

500 images of patients (224 females, 276 males) who underwent MRI for various indications were included in the study. MR images of the patients were evaluated retrospectively. Patients with osteoarthritis, osteomyelitis, history of fracture, surgery and trauma were excluded from the study.

All MRI examinations were performed using superficial coils and 3T MRI machines (GE HEalthcare, SIGNA Pioneer).

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MRI examinations had routine sequences including axial, coronal and sagittal fat suppression proton density and sagittal T1-weighted sequence.

Field of view (FOV) was 16 - 10 cm, matrix was 356 x 224 pixels, slice thickness was 3 mm. MRI examinations were reevaluated using the picture archiving and communication system (SARUS PACS, Ankara, Turkey).

All these measurements were repeated at two different times and averaged by a single expert radiologist experienced in the field of musculoskeletal radiology (14 years). The intraobserver reliability was calculated and presented as intraclass correlation coefficient for the study parameters. In addition, the intraobserver variability for the measured parameters was assessed and, the variability analyses of the study measurements showed low variability for all measured parameters (all coefficients of variation for four variables, <5%) (Table 1).

Table 1. Intraclass correlation coefficients for intraobserver reliability for measured parameters

Parameter	Intraclass correlation coefficient for intraobserver reliability	95% Confidence interval	P value
Right knee-fabella length	0.999	0.999-1.000	<0.001
Right knee-fabella width	0.999	0.998-0.999	<0.001
Left knee-fabella length	0.999	0.999-1.000	<0.001
Left knee-fabella width	0.999	0.999-0.999	<0.001

Statistical Analysis

Data were analyzed using IBM SPSS and MedCalc software for Windows. Categorical variables were presented as frequency and percentage. The $\chi 2$ test and comparison of proportions were used to compare categorical variables. The t test and comparison of means were used for continuous variables, and the values were presented as mean ± SD. Some values obtained were presented as median (50th percentile) values and interquartile ranges (25th and 75th percentiles). A two-tailed p value of <0.05 was considered statistically significant.

RESULTS

500 patients who underwent MR imaging for various indications were included in this study. Of the 500 patients; 224 were females (45%) and 276 were males (55%). Patients had either no history of trauma or surgery. Mean age of the participants was 42±13 years.

In this study 140 patients with os fabella were reported (28%). 52 of the 140 patients were females (37%) 88 were males (63%). Male predominance in this study was statistically significant (p=0.003).

Of the 140 cases 36 ones had bilateral os fabella. Bilaterality incidence of os fabella was 25.71%. Of the 176 os fabella 96 (69%) were right sided and 80 (57%) were left sided. There was no statistically significant incidence difference between left and right sides (p=0.1005) (Table 2).

Table 2. Side distribution of os fabella

Location	Number	%
Right Fabella	96	69
Left Fabella	80	57
Right and Left Fabella	36	26

The mean length of right sided os fabella was 8.22 ± 1.73 mm while of the left sided one was 7.61 ± 2.44 mm. The length difference between the right and left sides was not statistically significant (p = 0.0546). The mean width of right sided os fabella was 4.13 ± 1.66 mm and left sided one was 3.98 ± 1.21 mm. The width difference between right and left sides was not statistically significant (p = 0.5020) (Table 3).

Length difference of the opposite sides was evaluated. Length of right sided os fabella was 8.22 ± 1.73 mm and length of left sided os fabella was 7.61 ± 2.44 mm. No statistically significant length difference was found (p = 0.0546). Width difference was also evaluated. Width of the right sided os fabella was 4.13 ± 1.66 mm while of the left sided one was 3.98 ± 1.21 mm. No statistically significant difference was found (p = 0.5020).

Table 3. Side distribution of os fabella

Location	SIZE(mm)					
	L (Mean±SD)	L Min	L Max	W (Mean±SD)	W Min	W Max
Right knee	8.22±1.73	4.70	10.80	4.13±1.66	1.50	8.20
Left knee	7.61±2.44	3.20	12.00	3.98±1.21	1.50	6.50

L: Left; R:Right; SD: Standard Deviation

Difference between genders according to length and width of os fabella was evaluated in 96 patients who underwent bilateral knee MR imaging. Length of right sided os fabella was greater in males than in females (p = 0.003). Difference between genders according to width was not significant on the right side (p = 0.470). Difference between genders according to length and width was not significant on the left side. (p = 0.751, p = 0.372) (Table 4).

Table 4. Size side and sex relationship of os fabella

Sex-Location	Number	Size(mm)	p
RML	52	7.75±1.82	0.003
RFL	44	8.78±1.45	
RMW	52	4.24±1.50	0.470
RFW	44	3.99±1.84	
LML	52	7.67±2.62	0.751
LFL	28	7.49±2.10	
LMW	52	4.07±1.36	0.372
LFW	28	3.81±0.76	

RML: Right knee fabella male length
RFL: Right knee fabella female length
LML: Left knee fabella male length
LFL: Left knee fabella female length
RMW: Right knee fabella male width
RFW: Right knee fabella female width
LMW: Left knee fabella male width
LFW: Left knee fabella female width

DISCUSSION

Os fabella is a sesamoid bone located at a convergence point of tensile stresses from lateral head of the gastrocnemius muscle, the arcuate ligament, the oblique popliteal ligament and fabellofibular ligament (1). These intersecting forces lead high rates of ossification of fabellae (8). Os fabella contributes to the stabilization of posterolateral corner of knee (2,7). It is more than a variation because of its biomechanical role. Hence it deserves more attention. Its clinical importance is evident in differential diagnosis of knee pain. Despite limited attribution to its clinical significance Patel et al. emphasized radiologic diagnostic pitfalls of os fabella which may be misdiagnosed as intra-articular loose body, fracture or osteophyte (9).

Total knee arthroplasty is a common surgical procedure in the world. Post-operative persistent pain in the knee may depend on infection, instability and fractures. To prevent diagnostic pitfalls surgeons should consider not only prosthetic region but also they should keep peri-articular tissues in mind. Reported in the literature that persistent postoperative pain may be a result of fabella fracture (1). Also incorrect positioning of prosthesis may lead fabellar impingement which presents with postoperative knee pain (3,10). Besides surgery direct trauma or chronic stress forces may cause fracture of fabella. Long term chronic knee pain may be linked to this entity (2,8,11).

Other more common clinical implications of os fabella are primary osteoarthritis, chondromalacia of fabella, tendinitis of lateral head of gastrocnemius muscle and common peroneal nerve compression (1,12). Conservative treatment options of fabella are steroid or local anesthetics injection and physical therapy. Fabellectomy is the second choice of treatment and is performed when the symptoms persist.

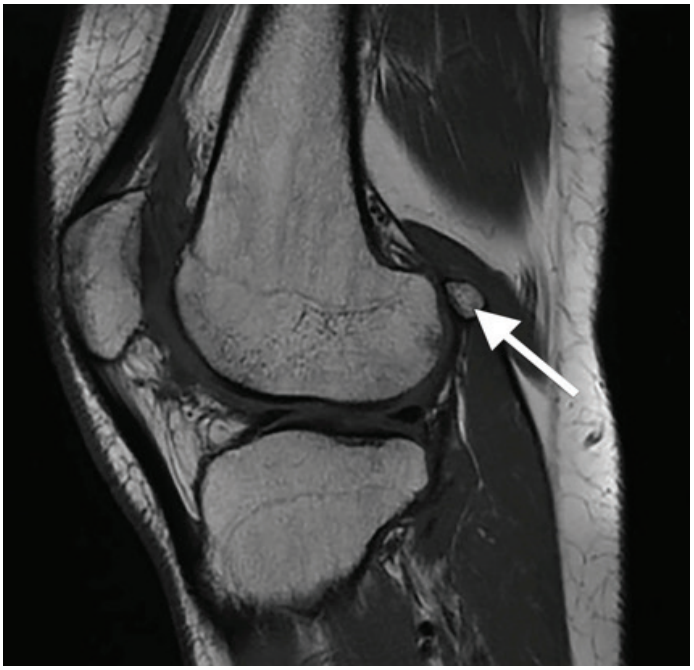

Figure 1. Sagittal T1 weighted fat suppressed MRI demonstrated os fabella (White arrow)

Os fabellae were demonstrated in cadaveric, radiologic and surgical studies in the literature many times (2,3,7,8,10). In the present study, we evaluated demographic variables, side and size measures, bilaterality and incidence of this variation in a large sample size with MRI in study

population (Figure 1, Figure 2). To our knowledge most of the studies in the literature enlighten this entity from one point of view. Different from the studies in the literature incidence and all morphometric details of this variation were indicated in the present work.

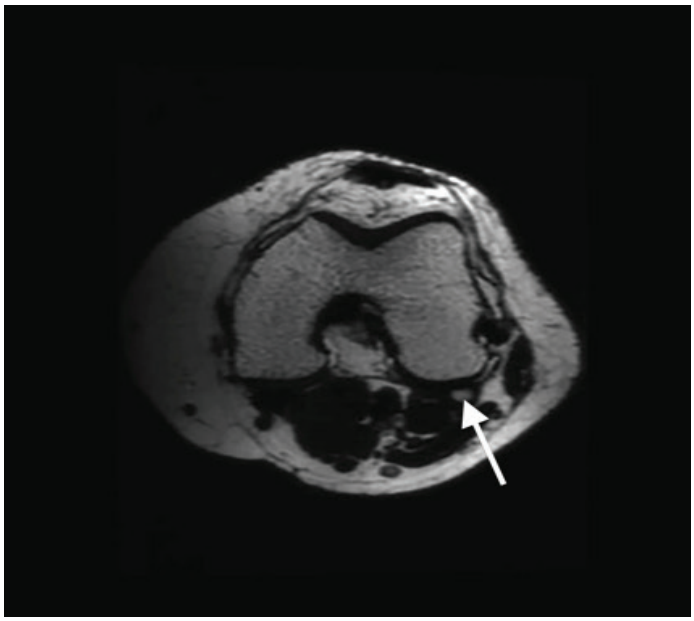

Figure 2. Axial T2 weighted fat suppressed MRI demonstrated os fabella (white arrow)

In the study of Kawashima et al. 75 knees from 39 Japanese cadavers were disected (7). They found the incidence of os fabella 66%. The high incidence measure in their study is not a proper result because medial and lateral heads of gastrocnemius muscle were taken into consideration. The incidence of os fabella in 150 gastocnemius heads was reported. In the present study, patient number was taken into account when calculating incidence. Incidence was found 28% in our work. Os fabella is not rare enough to be ignored. Even it is so frequent that physicians dealing with knee should keep all details of this structure in mind. Because cadavers were obtained from Japanese donation system the mean age in the study of Kawashima et al. was 82.9 years which does not accurately reflect the population (7). Corvalan et al studied on 111 knees of embalmed cadavers and indicated 60.8% incidence of os fabella (13). In the present study, radiologic views enrolled from the archive system enable us to study on a large data with an accurate distribution of age and gender reflecting population. This is an additional value of the present study. They did not measure the fabella size because isolating fabella from surrounding tissues was difficult. Cadaveric studies have such disadvantages. In the present study, we measured lenght and width of fabella (Figure 3). Moreover we compared the measures according to side and gender.

Incidence of os fabella reported in the literature varies in a range from 10% to 30% (4,6,14,15,16). Our result is in consistent with the literature. However Hou et al. indicated a prevalence of 48.8% in their study carried on 1150 subjects. To our opinion prevalence of this entity indicated in the study of Hou et al does not reflect accurate prevalence because they included patients with osteophytes which forms false radiologic images.(17)

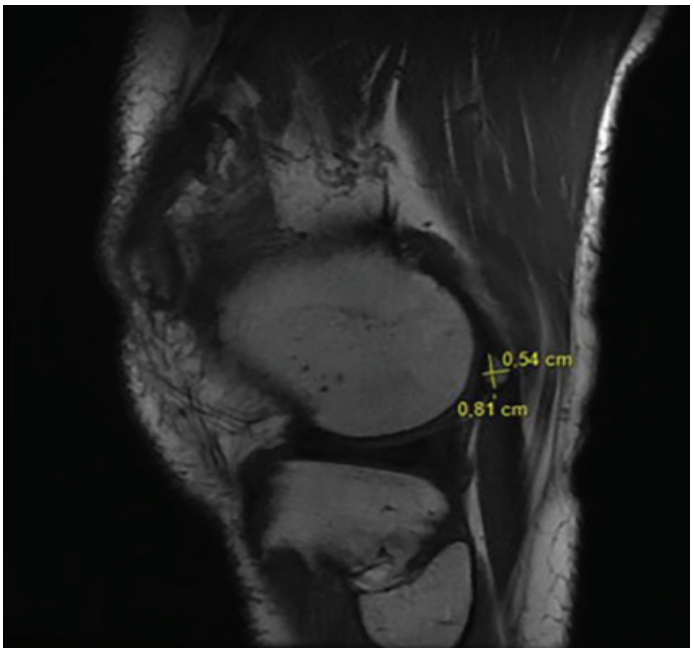

Figure 3. Sagittal T1 weighted fat suppressed MRI demostrated os fabella (lenght: 0,81cm width:0,54cm)

Bilaterality incidence was reported to be in a spectrum from 80% to 85% (3,4,5). We reported 25.71 % bilaterality incidence in the present study which is not in consistent with the cited articles.Radiologic studies enable researchers to reach larger patient numbers. To our opinion further radiologic studies in different populations with larger data will enlighten more accurate bilaterality rates of fabella.

CONCLUSION

Our data showed an inconsistent value of bilaterality of this variation among the literature. Also statistically significant difference between genders (male predominance) was indicated There was no statistically significant incidence difference between left and right sides. Length of right sided os fabella was greater in males than in females. Os fabella may be misdiagnosed as intra-articular loose body, fracture or osteophyte.To prevent misdiagnosis radiologists must keep this variation in mind. Besides, surgeons must be aware of os fabella to avoid neurovascular injuries. This study provides detailed information to the literature in terms of gender,side, size and frequency.

Competing interests: The authors declare that they have no competing interest.

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