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Case report

A case report of a fingerlike meniscal exostosis

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ABSTRACT

Introduction and importance: The menisci are intra-articular fibrocartilagenous structures that optimize the joint function. They have several functions. Meniscal malformations are rare and different in shape. The most common are classified in public and known classifications, but some are very rare like finger like exostosis, so it is useful to highlight these rare malformations, that helps in the development of typing and classification, and may explain some unclear mechanisms of injuries.

Proprioception: We know that meniscal tears in young people usually result from clear mechanical causes, like twisting or direct trauma, so we always need a cause, but when your patient does not explain a clear movement or mechanical trauma, you will ask and ask to conclude why. Yes, keep in mind that; it may be caused by a very rare congenital malformation.

Case presentation: A 20 years old male patient presented with a history of left knee pain for 6 months. MRI revealed a horizontal tear with abnormal thickness in the posterior horn of the lateral meniscus. The primary arthroscopic examination discovered a horizontal tear in the PHLM with atypical downward directed fingerlike exostosis. By using an arthroscopic hock, grasper and scissors, the exostosis was removed, and the nearby tear was smoothed with the shaver.

Clinical discussion: Diagnosis of finger like exostosis is challenging and needs strong clinical suspicion because most of the time, it is not predictable and MRI signs may lead to unclear differential diagnosis. The presence of exostosis give a causative explanation of PHLM horizontal tear especially in absence of clear twisting or direct trauma. It may increase the forward directed pull forces of the nearest part of the meniscus during normal gait and gym exercises.

Conclusion: Fingerlike exostosis and other meniscal malformations should be in mind as rare cases. They may explain the presence of tears in young patients with no clear trauma.

1. Introduction

The menisci are intra-articular fibrocartilagenous structures that optimize the joint function [1]. They have a half-moon shape and present a wedge shape in the concave of its transversal section [2]. This shape could be seen since the eighth week of the embryonic period [3], presenting the adult characteristics at the 14th weeks, with a prominent vascularization and cellularity which will be decreased by the hand of maturation [1]. There is an abundant extracellular matrix, which has a 70% of water, collagen type 1, proteoglycans and elastin 3 in which few cells (fibrochondrocytes) are embedded. Concerning its ultra-structural architecture, the great majority of bundles are circumferential which confers compression forces support. There are also radial bundles that give stability to the prior ones and help to support longitudinal tension. Finally, there is a superficial layer with a disorganize distribution which shares the stress [4]. The menisci are inserted into the tibia through their horns (anterior and posterior) and peripherally to the joint capsule [2]. The medial meniscus has a little mobility in comparison to the lateral one due to anchors to the posterior oblique fibers of the medial collateral ligament [2,5]. Tensile forces act into the menisci moving them to the periphery, making the longitudinal bundles of collagen support traction forces between both horns. Shear stress is not well tolerated; this fact explains the longitudinal injuries observed during childhood [6]. The medial meniscus is affected more often than the lateral one. The pattern of lesion differs from adults; in young kids, meniscal detachments are more common, however, during adolescence, up to 90% present with a longitudinal injury (bucket handle injuries) [5,6].

The menisci have several functions [7] such as; 1. Load sharing: This is the main function, and it's possible due to the configuration of the collagen bundles. About 50%-70% of the body weight is transmitted through the menisci during knee extension and could be up to 85%-90% while the knee is in flexion. These mobile structures maintain joint

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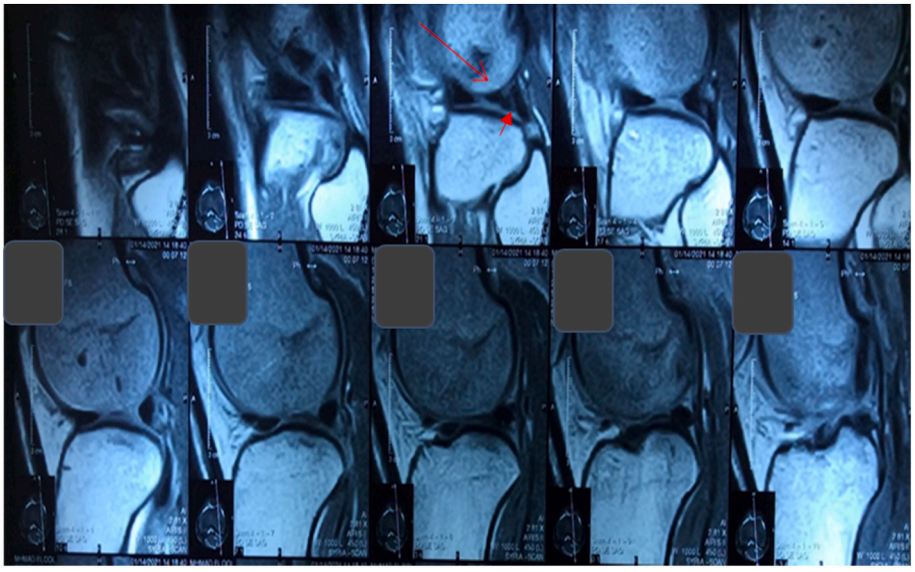


Fig. 1. PD MRI Imaging shows thickness In the PHLM.

congruency during knee flexion [8] 2. Secondary stabilizers of the knee; they compensate the incongruence between the articular surfaces of the femur and tibia. When the ACL is incompetent, the posterior horn of the medial meniscus prevents anterior translation of the tibia, most of all during knee flexion [9–11]. 3. Absorption of compression loads; Due to theirs viscoelastic properties, they attenuate the impacts during walking and running [5]. 4. Lubrication and nutrition of the joint cartilage; Enhance the production of synovial fluid, especially in children younger than 10 years of age, where there is a synovial layer [1]. 5. Proprioception; Due to the presence of mechanoreceptors and nervous endings, they have an important role during pain perception and acquisition of protective reflexes [12,13].

- Meniscal Injuries: we distinguish between to statements;
  1. Normal meniscus: Injuries are rare in kids younger than 10 years-old and more common during the adolescence when high performance sports activities begin, with 90% of these injuries occurring during sports activities [14]. The mechanism of injury is a combination of rotation and extension of the knee, where the meniscus is trapped between the joint surfaces [5]. The medial meniscus is affected more often than the lateral one.
  2. Atypical meniscus (Discoid meniscus): This is a congenital anatomic variant [15] characterizes by the lack of the usual half-moon shape, adopting a discoid one [16] with a subsequent higher percentage of tibial coverage. There is also a decrease of the meniscus thickness, which alters the normal loading share in the affected knee compartment [17].
- Meniscal malformations: The most common and the most described malformation of the menisci is the discoid meniscus. Watanabe and Takeda classification [18], which is widely used, describes three types of discoid meniscus:
  1. Complete: This is the most common type, described in up to 80% of cases and it characterizes by a complete coverage of the tibial surface.
  2. Incomplete: A variable size could be seen with a lower percentage of coverage of the tibial surface in comparison with the complete type. These two types have normal posterior menisco tibial attachments.
  3. Weisberg ligament: This is a meniscus without posterior attachments, except for the posterior meniscofemoral ligament, this makes it extremely mobile. It's shape is not necessarily discoid, being more similar to a normal meniscus.

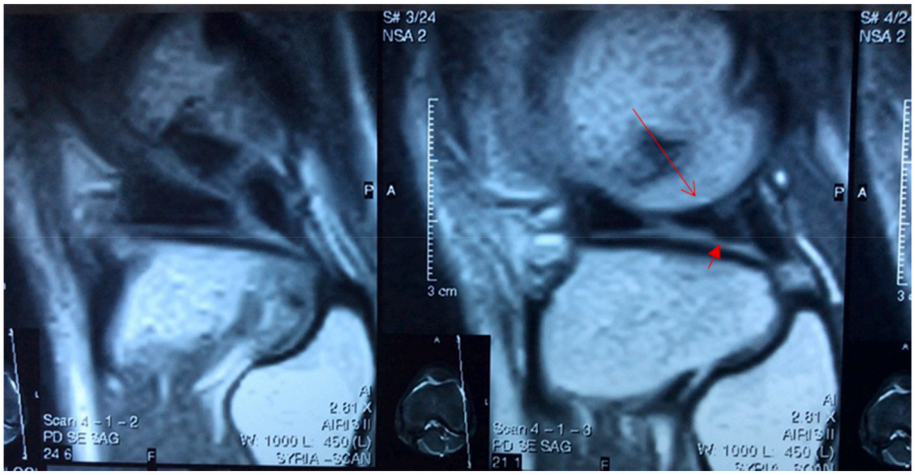


Fig. 2. PD MRI Imaging shows thickness In the PHLM.

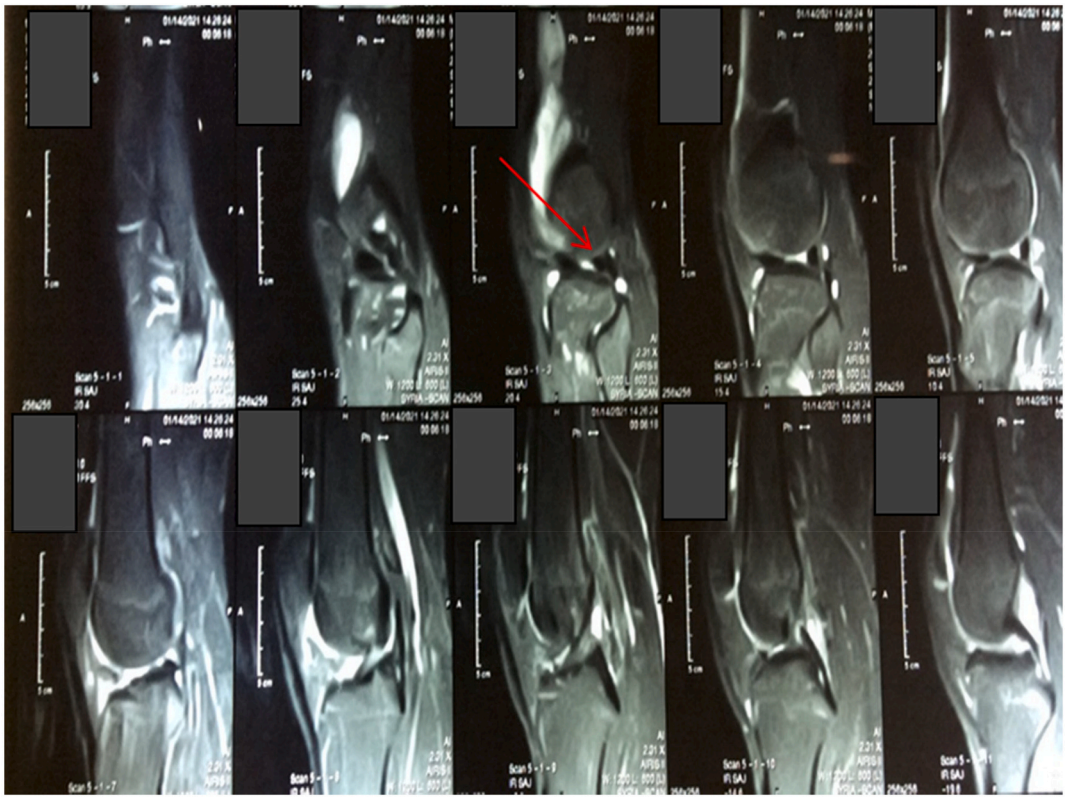


Fig. 3. PD SE MRI Imaging shows thickness In the PHLM.

- Dickhaut & De Lee [19] established a relationship between the Watanabe classification and symptomatology. They found that the complete and incomplete types are used to be asymptomatic, unless a tear was associated; however, the Wrisberg ligament type was used to be associated with the "snapping knee syndrome".
- Jordan et al. [20] established a new classification based on clinical and arthroscopic findings:
  1. Stable: This type correlates with the complete and incomplete types described by Watanabe; and its stability depends on the presence of posterior menisco-tibial attachments independently of the posterior menisco-femoral ligament. The treatment is similar to a classic meniscal tear.
  2. Unstable: This is the symptomatic discoid meniscus and correlates with the Wrisberg ligament type. It has hypermobility due to lack of posterior attachments. Its shape could be normal or discoid.
- Meniscal malformations are rare and different in shape. The most common are classified in public and known classifications, but some are very rare like finger like exostosis, so it is useful to highlight these rare malformations, moreover, it may help in the development of typing and classification, and may also explain some unclear mechanisms of injuries.
- This case report has been reported in line with the SCARE 2020 criteria [21]

2. Case report

A 20 years old male patient presented in Al Assad University Hospital Damascus (AUHD) with a history of left knee pain for 6 months. He was a University student, with no familiar, drug, psychosocial or personal histories. The pain increased gradually with no clear start point. He had a history of interrupted gym exercises like squatting, stepping, jumping and boxing, with no clear twisting or direct trauma in the left knee. The knee was swollen and painful with restriction at the end of extension and flexion. Mc-Murray test was positive with clear click in the lateral

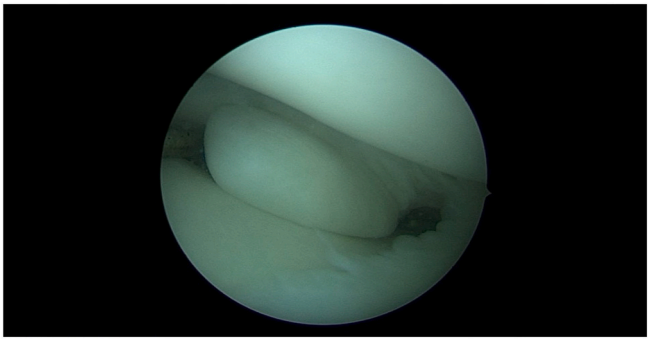


Fig. 4. Arthroscopic view of the exostosis.

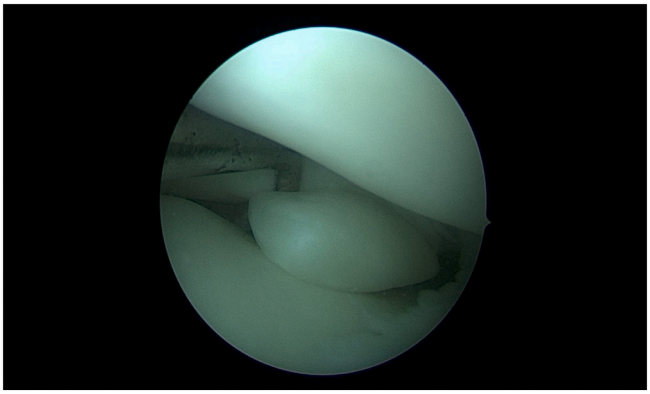
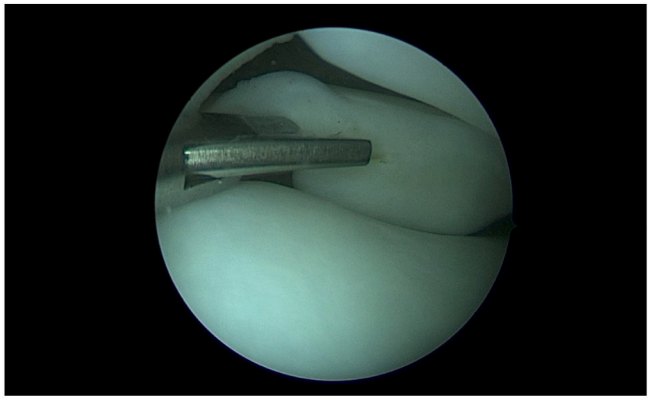
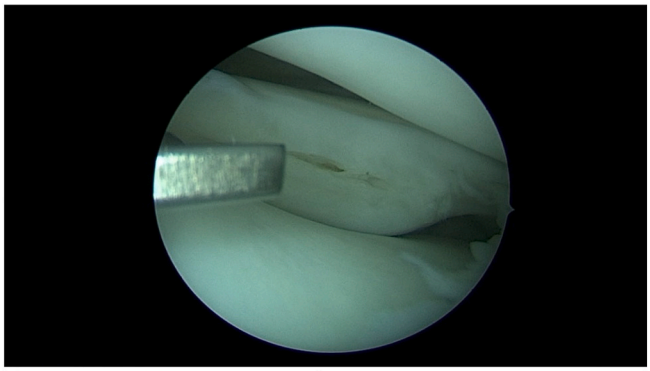


Fig. 5. The exostosis pulled forward by an arthroscopic hock.



a



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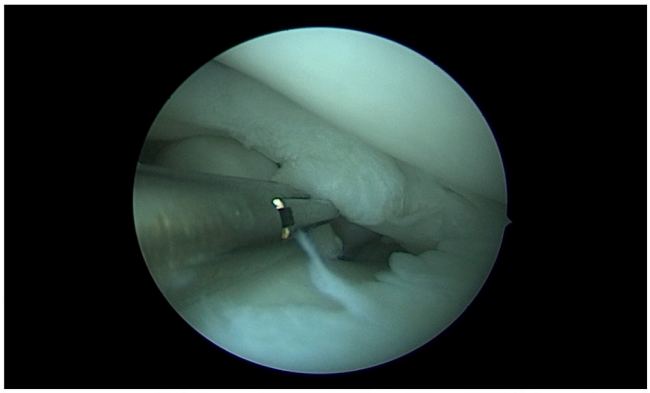


c

Fig. 6. a. Exostosis removal by arthroscopic scissors.
b. Exostosis removal by arthroscopic scissors.
c. Exostosis removal by arthroscopic scissors.

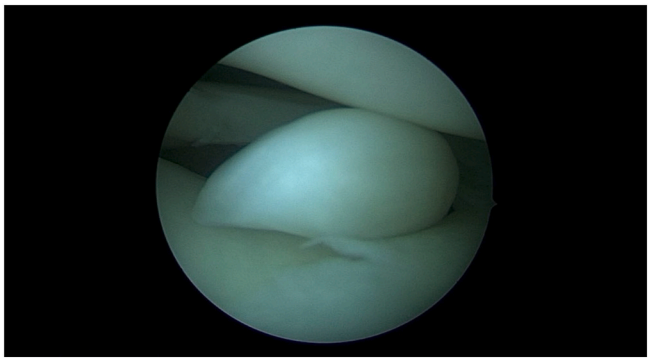


Fig. 7. Free exostosis after scissoring.

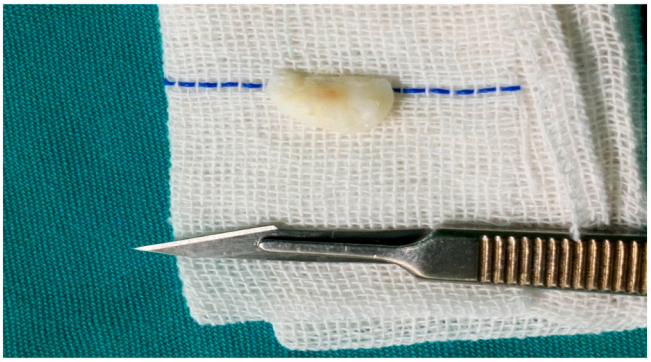
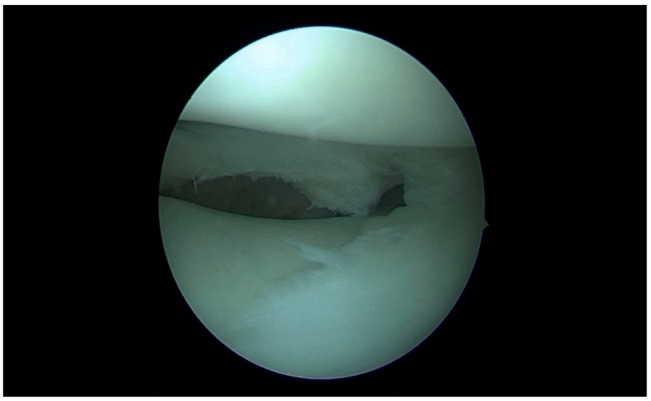
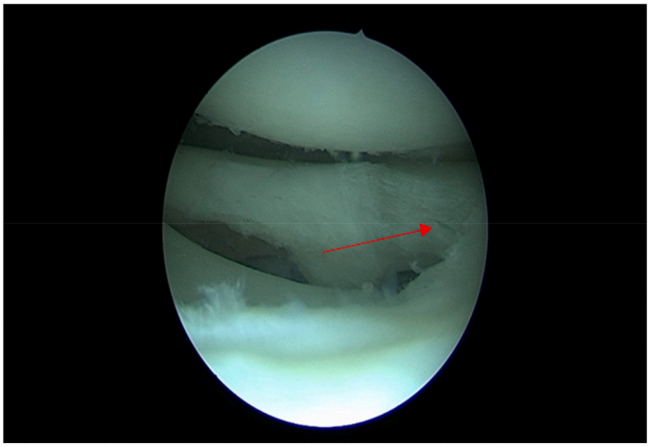


Fig. 8. The exostosis pulled out by the grasper.



a



b

Fig. 9. a. the posterior horn of the lateral meniscus after exostosis removal.
b. The PHLM with the clear Horizontal tear.

compartment. Lachman, Anterior drawer and posterior drawer tests were negative. MRI revealed a horizontal tear in the posterior horn of the lateral meniscus (PHLM) with an abnormal thickness in that part of the meniscus (Figs. 1, 2 & 3).

The patient was planned for knee arthroscopy, to confirm the previous diagnosis and to deal with the findings. In the operating room, he was positioned supine and a tourniquet was used to the upper thigh. Arthroscopy was performed through standard anteromedial and anterolateral portals. The primary arthroscopic examination discovered a horizontal tear in the PHLM with abnormal thickness in it. Medial meniscus and cruciate ligaments were intact. When the lateral

compartment was clearly opened by figure of four position, atypical downward directed fingerlike exostosis appeared from the PHLM (Figs. 4 & 5). It measured about 12 × 8 × 3 mm^3. By using an arthroscopic hock, grasper and scissors, the exostosis was eremoved (Fig. 6-a, b & c), (Figs. 7 & 8). Finally, the nearby tear was smoothed with the shaver (Fig. 9).

After surgery, he was allowed to start partial weight bearing with passive and active physiotherapy. Full weight bearing was allowed at 2 weeks, and the patient returned to his normal daily life activities.

3. Discussion

Fingerlike Exostosis is a rare congenital finding in the knee menisci. It is not clearly defined or classified in the known classifications of the congenital malformations. The closest described malformation may be the incomplete discoid meniscus, which partially covers the tibial surface. Diagnosis of this malformation is challenging and needs strong clinical suspicion because most of the time, it is not predictable and MRI signs may lead to unclear differential diagnosis like double delta sign of flipped meniscus or partially entrapped meniscal slice. The presence of exostosis give a causative explanation of PHLM horizontal tear especially in absence of clear twisting or direct trauma. The exostosis may increase the forward directed pull forces of the nearest part of the meniscus during normal gait and gym exercises. It may cause a symptomatic snap, which in turn magnifies during weight lifting or squatting to be gradually painful, as a tinny tear appears in the nearest part of the meniscus and get bigger slowly to be clear and symptomatic by the time.

4. Conclusion

Fingerlike exostosis is a very rare malformation of the knee menisci. It may cause symptoms like snapping, and it also may cause tears in the nearby parts of the meniscus as a result of minimal trauma by increasing the forward directed pull forces during normal gait or exercises like stepping, squatting and kicking. Therefore, it can explain the mechanism of tear's development without clear twisting or direct trauma. As a conclusion, we should always predict meniscal malformations as causative diagnoses with minimal traumata.

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Ethical approval

This study is exempt from ethical approval in our institution.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Abdullah Noufal PhD, MD: conceptualization, investigation, data curation, writing, editing and reviewing.

Registration of research studies

Not applicable.

Guarantor

Abdullah Noufal PhD, MD.

Provenance and peer review

Not commissioned externally peer-review.

Declaration of competing interest

The author has no conflicts to disclose.

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