Case Report

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Snapping Knee Caused by a Superiorly Displaced Medial Meniscus: Knee Dynamic Ultrasonographic Findings

위쪽으로 전위된 안쪽 반달연골에 의해서 발생하는 튕김현상: 무릎 실시간 초음파 영상 소견

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The causes of snapping knee include meniscal instability, but dynamic ultrasonographic findings have rarely been reported. Here, we report a case of snapping knee due to direct trauma to the right knee of a 79-year-old woman. Dynamic ultrasonography is used to confirm the snapping phenomenon caused by the anterosuperior displacement of the truncated posterior horn and body of the right medial meniscus.

Index terms Knee; Ultrasonography; Meniscus; Torn Tibial Meniscus

INTRODUCTION

The snapping phenomenon that occurs in the knee is uncommon. The cause can be intra-articular or extra-articular. Extra-articular snapping of the knee joint is mainly associated with impingement of the biceps femoris tendon, popliteus tendon, pes anserinus tendon, or iliotibial band. Intra-articular snapping of the knee joint is associated with the meniscus, synovial plica, or intra-articular tumor or bodies (1).

Among the modalities used to image the knee meniscus, MRI has the advantage of visualizing meniscal lesions in all spatial planes with an excellent non-invasive soft-tissue resolution. Therefore, the meniscal anatomy, anatomic variants, and particularly the characterization of a meniscal tear can be effectively evaluated (2). However, MRI lacks time frame resolution, which limits the evaluation of pathologic conditions caused by real-time motion, such as impingement or snapping (1). The use of ultrasonography

has its limitations in that it cannot evaluate the overall meniscus. However, the isolated peripheral meniscal problem can be evaluated by ultrasonography effectively. In addition, dynamic ultrasonography enables real-time diagnosis of the snapping phenomenon for an unstable meniscus and simultaneously correlates with the patients' symptoms (1).

Here, we report the snapping phenomenon of the right knee due to meniscal instability that occurred after direct trauma in a 79-year-old woman, which was confirmed by dynamic ultrasonography.

CASE REPORT

A 79-year-old woman presented with a snapping motion and clicking sound accompanied by pain that occurred whenever she bent and extended the right knee. She had fallen and experienced direct trauma to the knee 1 month before, with the direct onset of symptom.

On physical examination of the patient in the supine position, a mass could be palpable on the medial side of the right knee during full extension, and this mass disappeared during knee flexion. It was felt again during knee extension with the patient complaining of pain and a clicking sound.

Osteoarthritic changes, Kellgren–Lawrence grade 3, was observed on an initial plain radiograph of the right knee. The patient with clinically suspected medial bursitis or synovitis was recommended for sonographic evaluation at our hospital.

A sonographic evaluation was performed using the Philips iU22 Color Ultrasound system (Philips, Bothell, WA, USA) with a 5–12-MHz linear array transducer. First, the patient was placed in the prone position. The transducer was placed on the medial side of the right knee, and imaging in the coronal view was performed. The right medial femoral condyle was displayed on the left-hand side of the screen, while the right medial tibial condyle was displayed on the right-hand side. When the patient rested, the knee was fully extended. When the knee was moved, an active 90° flexion was performed.

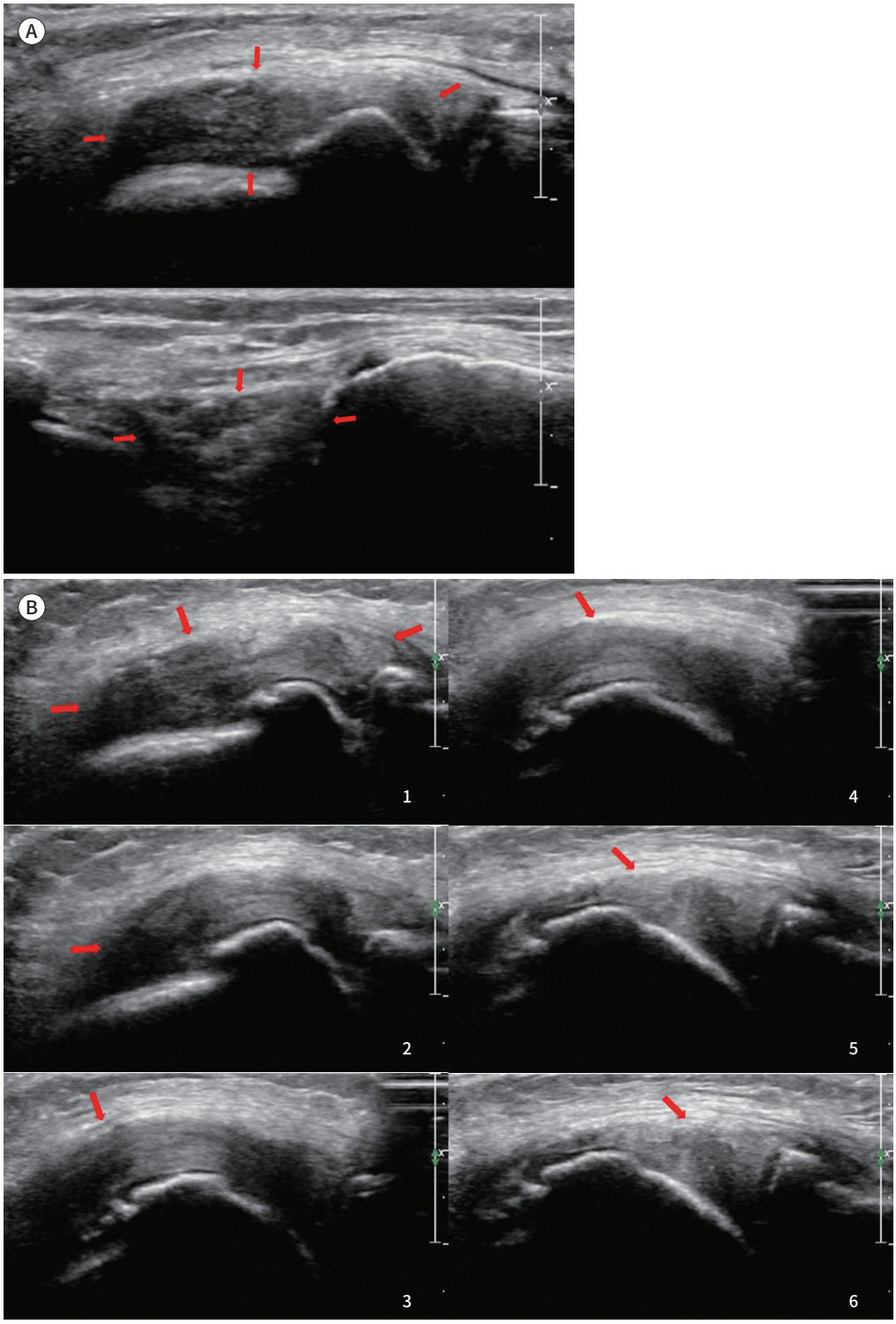
The pes anserinus tendon and medial collateral ligament around the knee joint were relatively normal, and mild joint effusion was observed. A heterogeneous hypoechoic mass-like lesion (~2.64 cm) without vascularity was observed in the medial aspect of the right femoral medial condyle at full extension of the right knee in the prone position (Fig. 1A).

Dynamic ultrasonography was performed, and the hypoechoic mass reentered into the knee joint during the patient's 90° knee flexion (Fig. 1B, Supplementary Video 1A in the online-only Data Supplement). Again, during the knee extension, the mass rapidly popped out from the knee joint to the medial aspect of the femoral medial condyle (Fig. 1C, Supplementary Video 1B in the online-only Data Supplement). Simultaneously, the patient complained of pain accompanied by a snapping sound.

We confirmed that the snapping knee was caused by the parameniscal displacement of the intra-articular lesion of the right knee by dynamic ultrasonography, and we recommended knee MRI.

Using 3T Magnetomskyra MRI (Siemens, Erlangen, Germany), a scan was acquired of the patient's right knee in full extension. Full joint emptying was observed in the intra-articular space where the posterior horn and body of the right medial meniscus should be observed.

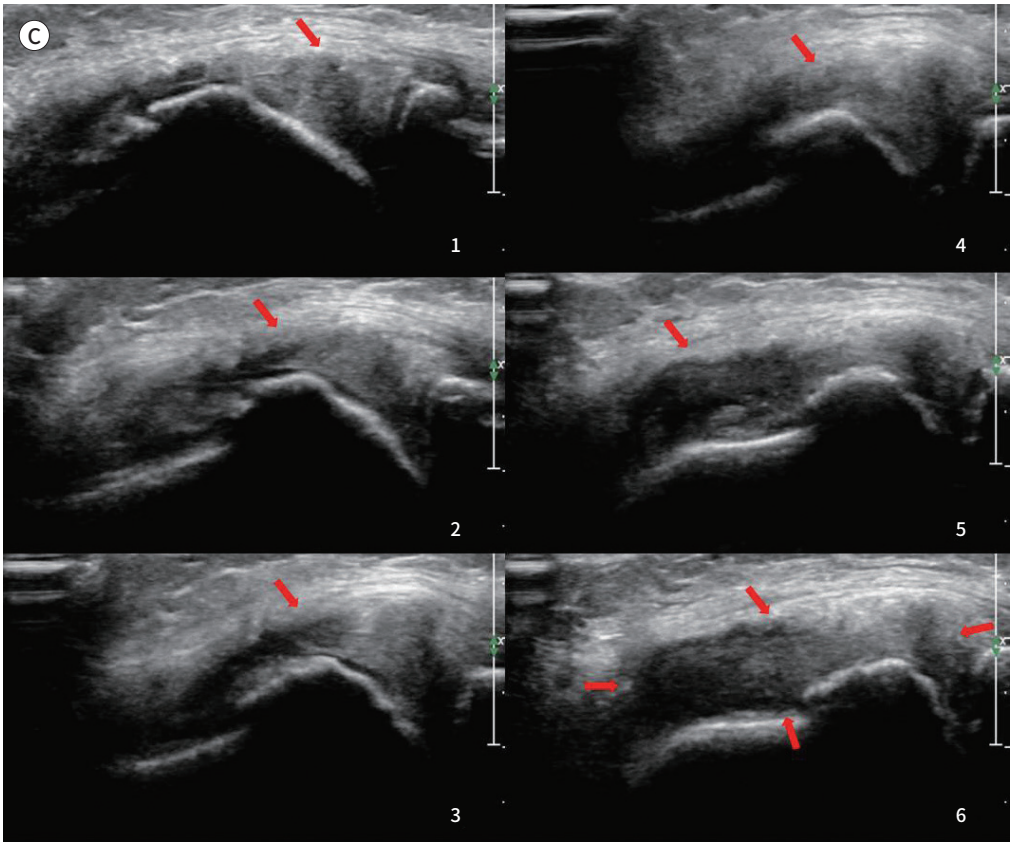
Fig. 1. A 79-year-old woman with a snapping knee caused by a displaced fragment of the posterior horn and body of right medial meniscus.
A. On static ultrasonography, the heterogeneous hypoechoic mass-like lesion (arrows) is observed inside the medial parameniscal recess of the right knee during knee extension (upper panel), and during knee flexion (lower panel), it reenters the knee joint.
B. On dynamic ultrasonography, the heterogeneous hypoechoic mass-like lesion (arrows) suddenly reenters into the knee joint during knee flexion.

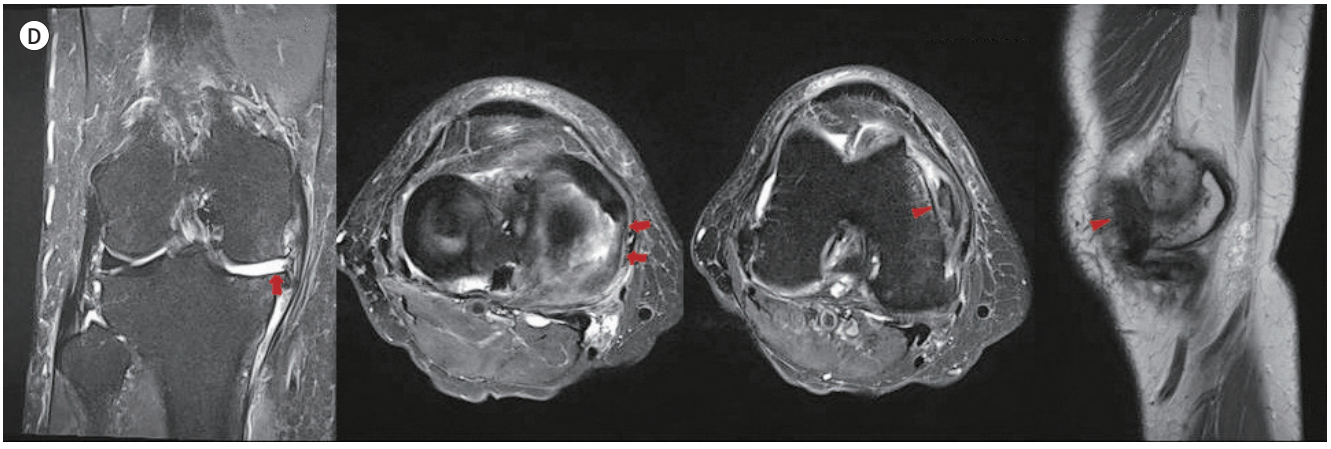


Further, the torn posterior horn and body connected to the anterior horn was displaced anterosuperiorly to the medial parameniscal recess of the right knee (Fig. 1D).

The displaced flap tear into the superior medial parameniscal recess resulted from full truncation of the right medial meniscal posterior horn and body. Dynamic ultrasonography confirmed that the snapping knee ensued while the torn meniscal fragment popped out to

Fig. 1. A 79-year-old woman with a snapping knee caused by a displaced fragment of the posterior horn and body of right medial meniscus.
C. On dynamic ultrasonography, the heterogeneous hypoechoic mass-like lesion (arrows) shows an anterosuperior displacement as it rapidly pops out into the medial parameniscal recess during knee extension.
D. MRI on the right knee (fat-saturated T2 weighted image on coronal and axial images and T2-weighted sagittal image) indicates joint emptying in the intra-articular space where the medial meniscal body should be (arrows), and an anterosuperior displacement of the truncated meniscal fragment into the medial parameniscal recess is observed (arrowheads).





medial parameniscal recess anterosuperiorly during knee extension and then reentered into the joint space during knee flexion.

The patient underwent total knee arthroplasty on the right knee, and full truncation of the right medial meniscal posterior horn and body was confirmed in the medial parameniscal recess during the operation. Postoperatively, the snapping phenomenon completely resolved.

DISCUSSION

The intra-articular cause of the snapping knee could be synovial plica, intra-articular bodies or tumors, such as osteochondral bodies, a ganglion cyst, localized nodular synovitis, a lipoma, exostosis, a rheumatoid nodule, or a sarcoidosis nodule. In addition, the snapping knee associated with the meniscus caused by the loss of the posterior horn fixation of the discoid meniscus or meniscal instability due to a meniscal tear is also a leading intra-articular cause (1).

Ultrasonography is limited to the evaluation of the meniscal component and is operator-dependent (2). However, evaluation is possible when the meniscus is displaced out of the knee joint, into the parameniscal recess of the joint, or involved in the joint periphery (1, 3). In our case, evaluation of the meniscus was possible because of the anterosuperior displacement into the parameniscal recess of the right knee during knee extension.

A few reports have introduced ultrasonographic findings of the meniscus being displaced out of the knee joint, and in addition, studies evaluating meniscal snapping motion using dynamic ultrasonography are rare.

Moraux et al. (3) describe ultrasonographic findings inferiorly displaced to meniscotibial recesses by flap tears in the medial meniscus. Ultrasonography showed the band-like hypoechoic lesion in the medial aspect of the medial knee joint. After confirming the continuity with the medial meniscus inside the knee joint, it was diagnosed by ultrasonography as a displaced meniscus with a flap tear. However, in our case, continuity of the meniscus inside the knee joint could not be confirmed by ultrasonography; therefore, it was difficult to presume that the hypoechoic lesion was a displaced meniscal fragment by ultrasonography. As confirmed by knee MRI, the posterior horn and body of the medial meniscus was truncated; the intra-articular space was empty; and the truncated meniscal fragment connected with the anterior horn was anterosuperiorly displaced to the medial parameniscal recess.

The most common symptom of limited knee movement due to a meniscal tear is knee locking, which usually occurs with a bucket handle tear (4). The snapping symptom due to a meniscal tear is uncommon, and studies reporting it are rare. Marchand et al. (1) have described a homogeneous isoechoic meniscal fragment popping out during knee extension in the lateral knee joint of an 11-year-old girl, similar to the ultrasonographic findings we have described. In our case, dynamic ultrasonography of the hypoechoic meniscal fragment popped out during knee extension and bounced into the knee joint during knee flexion, resulting in a snapping phenomenon.

In our case, the meniscal fragment appears to be relatively heterogeneous hypoechogenicity than the meniscal fragment described by Marchand et al. (1), which is thought to be because of the degeneration of the meniscus or a focal tear (5).

In the evaluation of the intra-articular structure of the knee, the use of ultrasonography is limited and remains controversial. However, knee ultrasonography is a useful modality to evaluate extra-articular factors, such as the ligaments, pes anserinus tendon, muscle, peripheral joint effusion, or soft tissue masses (5, 6), and enables diagnostic exclusion for extra-articular pathology. It also allows for a multiplanar and dynamic study and is therefore very useful in evaluating a snapping knee (1). Our dynamic study helped accurately evaluate the snapping motion of the anterosuperiorly displaced meniscal fragment in the knee joint, and if it correlates with the knee MRI, as required, a more accurate diagnosis is possible.

In summary, meniscal instability due to a meniscal tear is a cause of the snapping knee. Dynamic ultrasonography plays a key role in demonstrating real-time snapping motion by the torn fragment of the displaced meniscal flap tear.

Supplementary Video Legend

Video 1. A. As a dynamic ultrasonographic finding during knee flexion, an anterosuperiorly displaced heterogeneous hypoechoic mass-like lesion rapidly reenters into the knee joint. B. As a dynamic ultrasonographic finding during knee extension, a heterogeneous hypoechoic mass-like lesion suddenly pops out into the parameniscal recess.

Supplementary Materials

The online-only Data Supplement is available with this article at http://dx.doi.org/10.3348/jksr.2020.0051.

Author Contributions

Conceptualization, K.T.E.; investigation, O.H.S.; project administration, all authos; supervision, K.T.E.; visualization, O.H.S.; writing—original draft, O.H.S.; and writing—review & editing, all authos.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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위쪽으로 전위된 안쪽 반달연골에 의해서 발생하는 퉁김현상: 무릎 실시간 초음파 영상 소견

오현석 · 김태은*

무릎 퉁김 현상의 원인 중에서 반달연골의 불안정에 의해서 발생하는 무릎 퉁김을 소개하는 논문은 드물며, 특히 실시간 초음파 소견을 소개한 논문도 드물다. 우리는 오른쪽 무릎에 직접적인 손상을 받은 후 무릎 퉁김이 발생한 79세 여자 환자를 보고하고자 하며, 절단된 오른쪽 내측 반달연골의 뒤뿔과 몸통의 앞위쪽 전위에 의해 발생한 퉁김현상을 실시간 초음파를 사용하여 확인하였다.

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