

Idiopathic Osteonecrosis of the Femoral Condyle after Meniscectomy

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Osteonecrosis of the medial femoral condyle rarely appears after an arthroscopic meniscectomy. However, in such cases, MRI is very important for early diagnosis. Here, we report two cases of osteonecrosis, which were not found in a preoperative MRI examination, but were then diagnosed after meniscectomy.

Although the etiology of osteonecrosis still remains unclear, microcirculation disorders and microfracture of the femoral condyle are believed by many investigators, and varus deformation of the knee joint caused by meniscectomy are considered to be risk factors causing osteonecrosis. Middle-aged and elderly patients are also particularly at risk. Such patients who undergo meniscectomy should be carefully observed, considering that osteonecrosis might appear postoperatively.

Key words : Osteonecrosis, Knee joint, Meniscectomy

INTRODUCTION

In 1968, idiopathic osteonecrosis of the femoral condyle was first reported by Ahlbäck *et al.* and the clinical symptoms, associated radiographs and pathogenesis were described [1]. A few cases of osteonecrosis after meniscectomy have also been reported [6, 11, 12], but a causal relationship between meniscectomy and osteonecrosis has not been shown definitively. Here, we present two case reports of patients who developed osteonecrosis of the femoral condyle after meniscectomy.

CASE REPORT

Case 1:

The patient was a 47-year-old businessman (height: 168 cm; weight: 72 kg). He suddenly developed a pain in the right medial knee for no apparent reason, and the pain increased, especially upon bending of the knee. The results of a physical examination, i.e., of pain and tenderness, were consistent with the development of a space in the medial knee joint. No limited joint flexibility or swelling

was observed and a McMurray test gave a positive result. No abnormalities were found in plain radiographs in the initial medical examination. The radiograph taken from the front in a standing and weight-bearing position showed bowing with an FTA of 183°. In an MRI examination, degenerative horizontal tear was found in the posterior horn of the medial meniscus (Fig. 1). The patient was diagnosed with meniscal injury and underwent arthroscopy 17 days after the onset of joint pain. In the arthroscopy, there was no evidence of degeneration of the articular cartilage, but degenerative tear, mainly in the posterior horn of the meniscus, was found. Therefore, a partial meniscectomy was conducted (Fig. 2). The pain diminished and he was then able to lead a daily life without any problems. However, four months after the operation, he felt a sudden pain in the medial knee after he sat in a train and kept the same crosslegged position for one hour. In a physical examination, pain in a space in the medial knee joint was confirmed, but no swelling, night pain or limited joint flexibility was observed. Radiographs showed

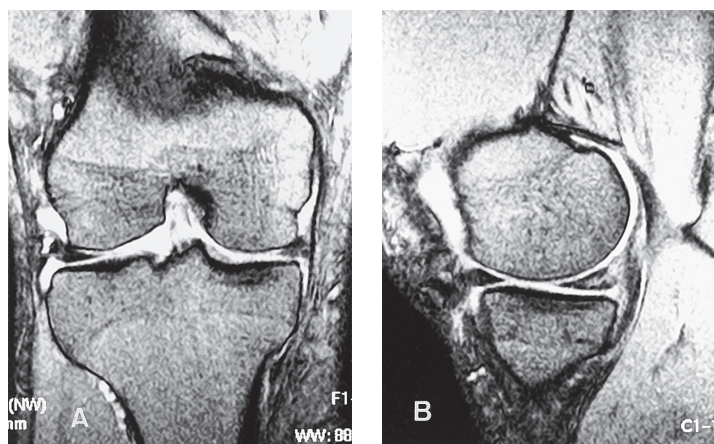


Fig. 1 Case 1: T2-weighted (A)coronal and (B)sagittal views. MRI shows the presence of a horizontal tear of the posterior horn of the medial meniscus. The medial femoral condyle indicates the integrity.

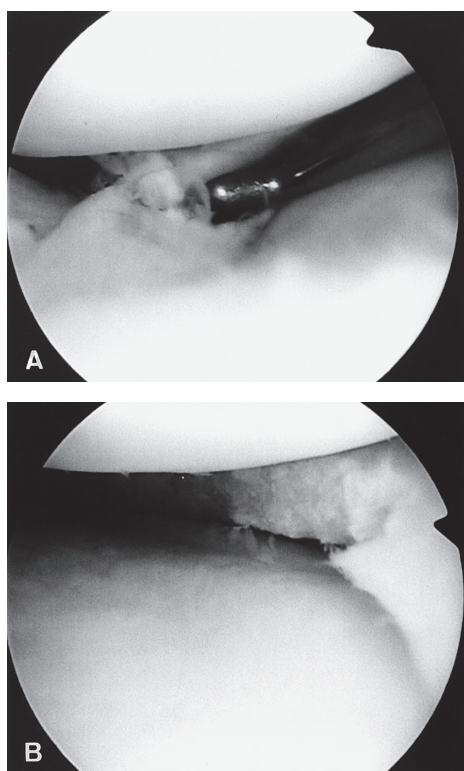


Fig. 2 Case 1: (A) Arthroscopic findings shows a horizontal tear accompanied with degenerative change of the posterior horn of the medial meniscus. (B) The articular cartilage of the femoral condyle indicates the integrity after partial meniscectomy of the posterior horn.



Fig. 3 Radiographs showed an inconsistent image of the medial femoral condyle and a plate-shaped piece of bone 4 months after meniscectomy.

an inconsistent image of the medial femoral condyle and a plate-shaped piece of bone, which was considered to be a detached piece of subcartilaginous bone (Fig. 3). MRI examination showed osteonecrosis in the medial femoral condyle (Fig. 4), but a preservation-based treatment was conducted because the area of osteonecrosis was considered small, based on the radiographic findings. This resulted in an improvement in the symptoms.

Case 2:

The patient was a 57-year-old businessman (height: 158 cm; weight: 72 kg). He had

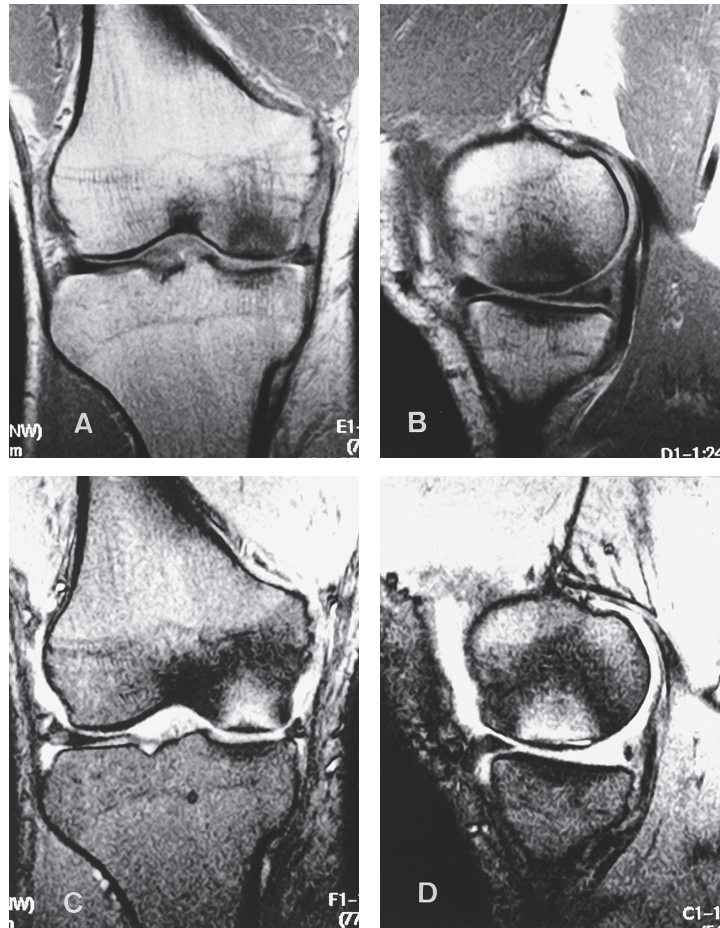


Fig. 4 Sixteen weeks after arthroscopic meniscectomy.

- (A)(B) T1-weighted image demonstrates a focal low-signal-intensity subcortical, subarticular region within the medial femoral condyle.
- (C)(D) T2-weighted image demonstrates a high-signal-intensity area in the center of a wide low-signal-intensity area of the medial femoral condyle.

an uncomfortable feeling in the medial part of the left knee joint for one month and a half. After playing golf, he had a pain in a space in the medial knee joint. A physical examination confirmed pain and tenderness in a space in the medial knee joint, but no limited joint flexibility, swelling or instability was observed. No abnormalities were found in plain radiographs. In MRI examination, an injury considered to be a degenerative horizontal tear was found in the posterior horn of the medial meniscus (Fig. 5). The patient underwent arthroscopy, which showed degenerative tear in the posterior horn of

the medial meniscus, but no abnormality in the articular cartilage. Therefore, a partial meniscectomy was conducted. The pain then diminished and the prognosis appeared to be good. However, 3 months after the operation, the patient had the sensation of the presence of a foreign body in the medial knee joint, and swelling was observed 4 months after the operation. The patient was diagnosed with osteonecrosis in the medial femoral condyle, based on the results of radiography (Fig. 6) and MRI examination (Fig. 7). After that, the patient experienced repeated pain and swelling of the knee joint, and, therefore, he

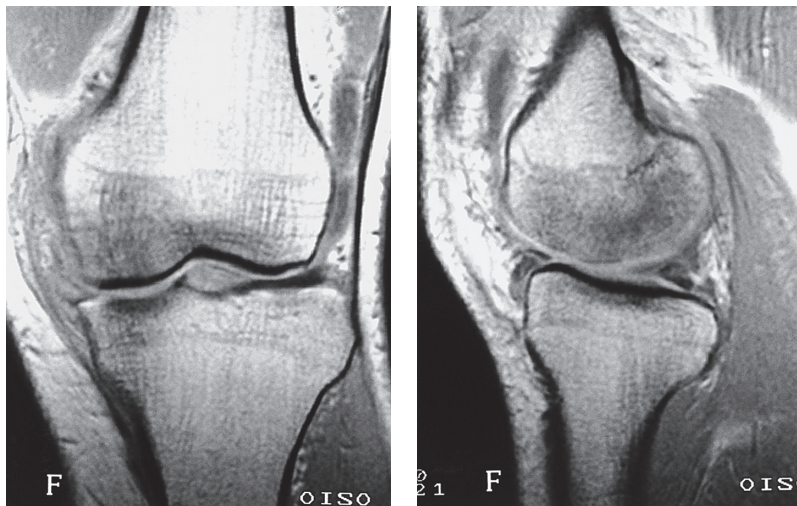


Fig. 5 T1-weighted MRI shows a horizontal tear in the posterior horn of the medial meniscus. The medial femoral condyle indicates the integrity.

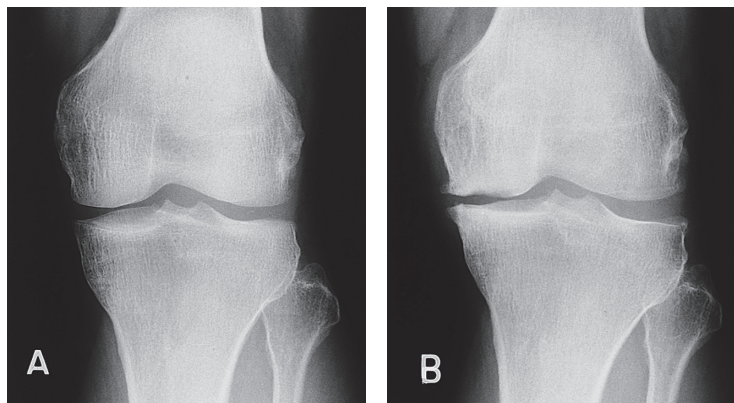


Fig. 6 (A) Initial radiograph is normal.
(B) Seven months after onset of symptoms; radiograph showed subchondral collapse and a hollow surface with a sclerotic rim in the medial femoral condyle.

underwent a high tibial osteotomy one year after meniscectomy. The patient's ROM again returned to normal, the pain disappeared 2 months after the operation, and the patient played golf 8 months after the operation.

DISCUSSION

Operations for meniscal injury using an arthroscope are frequently conducted and the postoperative course is usually good. However, some patients suffer from recurrences of joint pain in the knee, even if there were indications of postoperative recovery.

Even amongst these patients, only rare cases have osteonecrosis in the medial femoral condyle after an arthroscopic meniscectomy. However, once this condition has occurred, the patient suffers from a stitch, they are considerably limited in their daily life, and they occasionally need to undergo an osteotomy [4]. It is difficult to distinguish between symptoms that remain due to an insufficient meniscectomy and those that were caused by new osteonecrosis in the condyle after the meniscectomy. Common symptoms are a pain in the medial compartment and hydar-

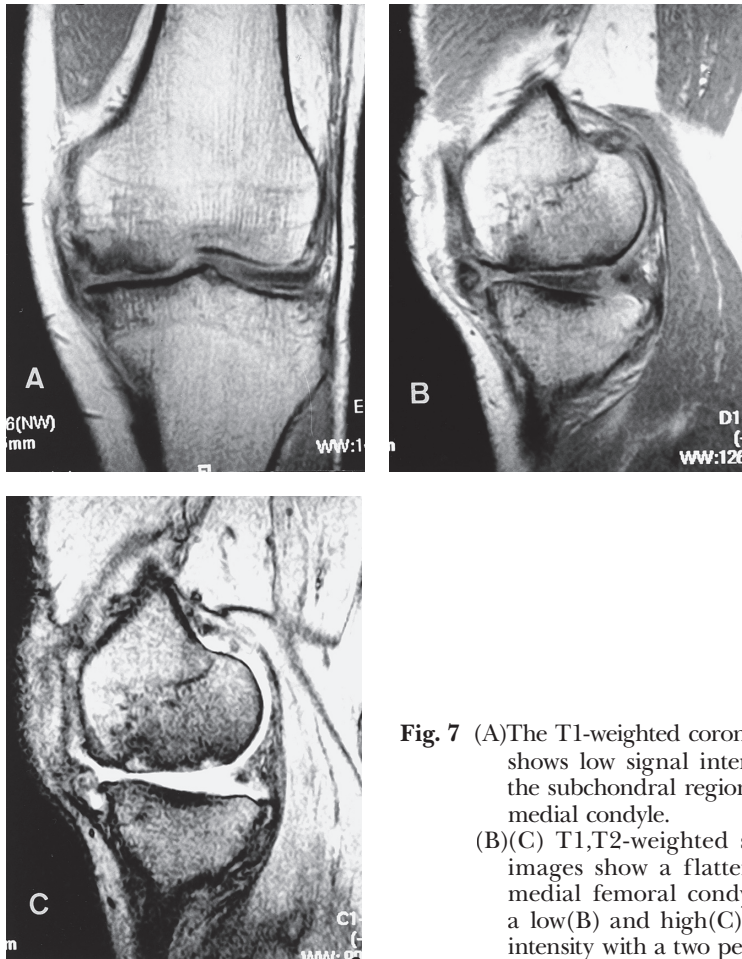


Fig. 7 (A)The T1-weighted coronal MRI shows low signal intensity in the subchondral region of the medial condyle. (B)(C) T1,T2-weighted sagittal images show a flattening of medial femoral condyle and a low(B) and high(C) signal-intensity with a two peak.

thrititis. Generally, symptoms of osteonecrosis suddenly appear, and they are accompanied by stitch and night pain that are comparable to those of meniscal injury and arthrosis. The final discrimination depends on bone scintigraphy and diagnostic imaging using a method such as MRI [2]. In the above two cases, the results of an MRI examination before the meniscectomy showed only meniscal injury, and not osteonecrosis, which was newly confirmed by the results of a postoperative MRI examination. In case two, diagnosis of osteonecrosis was made from early manifestation of clinical symptoms postmeniscectomy plus a hollow surface of the femoral condyle in radiography and signal intensity of deep medullary region in MRI examination.

We have conducted 250 meniscectomies over a period of three years, and only two of these cases were diagnosed with osteonecrosis

after operation. Nicola *et al.* [6] reported only 2 cases of typical osteonecrosis after meniscectomy in 2000 arthroscopic cases. Brahme [11] reported 7 cases of osteonecrosis in 611 patients aged 40 or more who underwent a meniscectomy, which suggests that the disease is extremely rare.

The pathogenesis has not been completely clarified at present, but vascular insufficiency and microfracture are considered to be possible causes [5, 6, 8]. In the femoral condyle, edema and inflammation develop for a particular reason and then damage the microcirculation in the subchondral bone. This results in ischemia in the bone marrow and finally causes osteonecrosis. The following mechanism is hypothesized for another pathosis associated with trauma: a local stress causes microfracture in the subchondral bone and the intraosseous pressure is increased by swelling and bleeding in the

surrounding area, which lead to microcirculatory damage and finally to osteonecrosis.

The possible factors that cause local damage to the microcirculation and microfracture are age, varus deformation, etc., as well as meniscectomy. The major function of the meniscus is to disperse the body weight from the femoral condyle to the tibia [3, 9, 10]. However, after meniscectomy, the mechanical transmission from the femur to the tibia does not work well and the spherical femoral condyle increases the local stress on the flat tibia [13], resulting in the onset of osteonecrosis. In particular, varus deformation increases the local stress, and one of our patients showed an FTA of 183°. Regarding the onset age, the mean indicated by Norman *et al.* [7], Johnson *et al.* [12], Brahme *et al.* [11] and Muscolo *et al.* [5] was 60, 60, 60.5, and 65 years old, respectively. The disease appears in the middle-aged and elderly because the articular cartilage and subchondral bone tend to become fragile with age and the microcirculation can be affected by an external force. In addition, varus deformation may be another factor exaggerating the mechanical change.

After arthroscopic surgery, middle-aged and elderly patients and those with severe varus deformation should avoid excessive exercise in the early postoperative period. Furthermore, patients with a poor prognosis should be given an MRI examination without hesitation, in order to prevent the onset complications.

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