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Core Decompression for Post-Arthroscopic Osteonecrosis of the Lateral Tibial Plateau

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Post-arthroscopic osteonecrosis is a rare complication that mostly occurs in the over 50s. It most commonly occurs in the medial femoral condyle, followed by the lateral femoral condyle then medial tibial plateau. We report the first case of lateral tibial plateau osteonecrosis in a young patient after arthroscopic lateral meniscectomy. This patient developed progressively deteriorating symptoms after uncomplicated arthroscopy; with a subsequent magnetic resonance imaging (MRI) showing bone oedema and some overlying cartilage damage. Conservative measures were unsuccessful, so core decompression was undertaken. This has resulted in improved symptoms and subsequent follow-up MRI demonstrates resolution of oedema with no progressive cartilage change. This is a rare condition with a poor outcome, usually resulting in arthroplasty. This technique may work in the younger patient. However, since post-arthroscopic osteonecrosis is so rare in this age group, there is limited evidence for its success, and it should be evaluated with further study.

Keywords: **Knee, Arthroscopy, Meniscectomy, Osteonecrosis**

Osteonecrosis of the knee is a rare complication of arthroscopic surgery. It was first described by Brahme et al.[1] in 1991. There are 76 cases described in the literature in case reports and small case series[1-14]. Of these, almost all are in the femoral condyles and occasionally in the medial tibial plateau. These patients are predominantly middle-aged or elderly, with only 3 described cases in patients under the age of 40. No cases are described with post-arthroscopic changes in the young in the lateral tibial plateau, and none to our knowledge with successful non-arthroplasty surgical intervention.

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Case Report

A 33-year-old reindeer herder presented with left lateral knee pain that had been present for ten months. She had initially sustained a twisting injury running down a steep hill. Despite prolonged physiotherapy and non-surgical treatment, she had no improvement in her symptoms. The patient was struggling with her active job and experiencing clicking but no locking or instability. She had no past medical history, was a non-smoker and had minimal alcohol intake.

The patient had a body mass index of 26 kg/m^2. Her lower limb alignment was clinically and radiographically normal on standing. Physical examination of the knee revealed lateral joint line tenderness, palpable crepitus on movement, pain on stressing the lateral collateral ligament and positive McMurray test. A magnetic resonance imaging (MRI) scan demonstrated a lateral meniscus anterior horn tear (Fig. 1). Following discussion of management options, she opted for arthroscopic meniscectomy.

Arthroscopy of the knee was entirely normal aside from the lateral meniscus tear. The lateral meniscus was surgically debrided using radiofrequency ablation without immediate complication, the tourniquet time was 15 minutes and she was discharged the

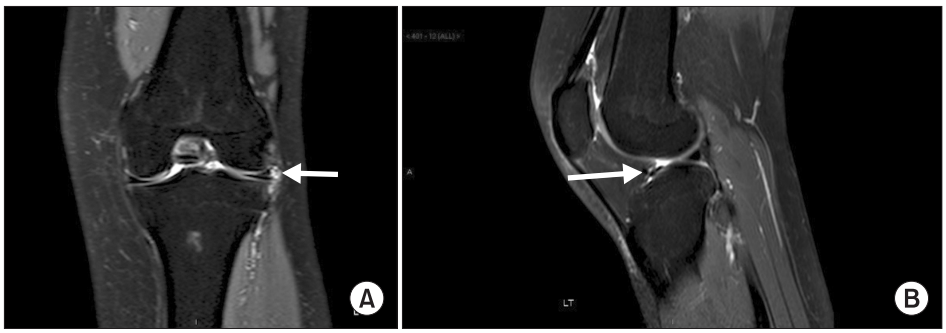

Fig. 1. Pre-arthroscopy coronal magnetic resonance imaging spectral attenuated inversion recovery sequence. (A) Coronal view demonstrating lateral parameniscal cyst (arrow). (B) Sagittal view demonstrating meniscal tear (arrow).

Fig. 2. Post-arthroscopy coronal magnetic resonance imaging spectral attenuated inversion recovery sequence demonstrating significant oedema in lateral tibial plateau and geographic margination of the overlying cartilage with osteochondral fracture.

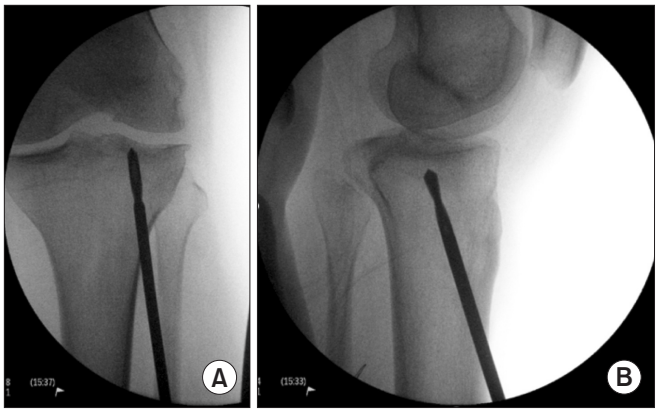

Fig. 3. Core decompression radiographs: anteroposterior (A) and lateral (B).

same day.

After two weeks, her knee became increasingly sore and swollen, and she continued to struggle with walking long distances. Physiotherapy did not improve her symptoms. Further examination revealed a moderate effusion, range of movement from 5 to 100 degrees and tenderness in the lateral joint line.

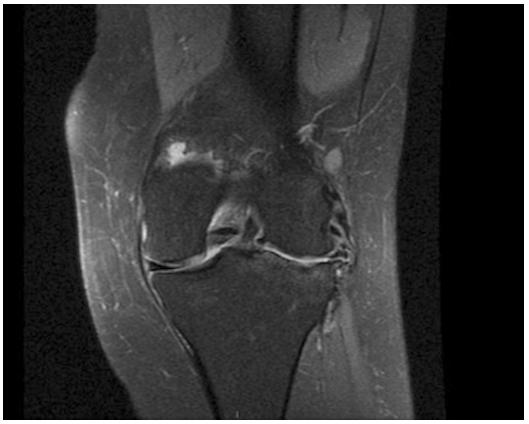

Fig. 4. Post-decompression coronal magnetic resonance imaging proton density fat suppressed sequence demonstrating resolution of oedema and no progressive change in articular cartilage.

Repeat MRI was performed four months after the surgical procedure. This demonstrated signs of previous lateral meniscectomy and significant oedema within the lateral tibial plateau, geographic margination of the articular surface, osteochondral fracture and signs of osteonecrosis of the lateral tibial plateau (Fig. 2). At this stage, non-weight bearing was advised. The symptoms continued, and after discussion with the patient and our orthopaedic department, it was felt core decompression could be offered.

The surgical procedure was undertaken seven months following the initial arthroscopy.

Two stab wounds were made and a 6 mm drill was used to decompress the lateral tibial plateau under fluoroscopic guidance (Fig. 3). The drill was passed into the lesion five times in total. Non-weight bearing was advised for a further six weeks. This was followed by a six-week period of progressive touch then partial weight bearing with isometric quadriceps movements and training in a swimming pool.

The patient improved symptomatically and was back walking and working with an improvement in swelling of the knee.

Repeat MRI scan demonstrated a resolution of the bone oedema and no progressive change in articular cartilage (Fig. 4). The patient remains asymptomatic after 24 months.

Discussion

Osteonecrosis of the knee can be considered in three separate entities: spontaneous, secondary and post-arthroscopic. The latter is considered the rarest of these and commonly results in arthroplasty of the knee. In routine postoperative MRI scanning after arthroscopy, the rate of osteonecrosis has been shown to be 4%[15]. Post-arthroscopic osteonecrosis has been described, firstly in 1991, and subsequently in a number of case reports and series (Table 1)[1-14]. Age at presentation is commonly 4th or 5th decade or older, and symptoms start from 6–8 weeks following the arthroscopic procedure. The compartment where the initial lesion and the arthroscopic work has occurred seems to correlate with the location of osteonecrosis. Almost all patients described had osteonecrosis in their medial femoral condyle. There is a spectrum of radiological terminology which includes bone marrow oedema, bone marrow lesion and other terms such as osteonecrosis and avascular necrosis. A bone marrow lesion alone does not constitute post-arthroscopic osteonecrosis; diagnosis requires a pattern of radiological and clinical features. Typically osteonecrosis present on MRI is characterised by a large area of bone marrow oedema and overlying subchondral collapse or damage, both of which were present in this case[16].

The mechanism by which post-arthroscopic osteonecrosis occurs is not fully understood. Heat-related chondrolysis has been implicated in the use of laser-assisted arthroscopy[14]. In the case reports across the literature, the arthroscopic procedure has been predominantly laser-assisted or radiofrequency ablation (Table 1).

Table 1. Summary of Post-arthroscopic Osteonecrosis

Study	No. of cases	Age (yr)	Location					Time to diagnosis (mo)	Management
			MFC	LFC	MTP	LTP	Patella		
Brahme et al.[1]	7								N/A
Faletti et al.[2]	1	66	1						N/A
Muscolo et al.[3]	8	65 (54–75)	8					4.4 (1.5–9)	Not specified
Johnson et al.[4]	7	60 (41–79)	4	1	1	1		4 (3–6)	3 Arthroplasty, 2 HTO, 1 non-operative, 1 lost to F/U
al-Kaar et al.[5]	10		9	1					3 Arthroplasty, 7 non-operative
DeFalco et al.[6]	1	48	1						Drilling
Kusayama[7]	2		2						N/A
Pruès-Latour et al.[8]	9	69.4 (58–82)	8	1				6 (1.5–12)	3 Arthroplasty, 6 non-operative
Santorini et al.[9]	2	34.5 (21–48)	2					1, 1	45 Days NWB
Son et al.[10]	1	50	1					3	UKA
Janzen et al.[11]	2	38, 32	1[a]	1[a]				5, 6	Osteotomy and bone graft, TKR, patellectomy
Encalada and Richmond[12]	1	53	1[a]		1[a]			18	Non-operative
Bonutti et al.[13]	19	69 (48–86)	14[a]	3[a]	5[a]	1		7 (1–23)	19 Arthroplasty
Garino et al.[14]	6	44, 44, 30[b], 30[c], 50	1	1	1		3	9, 2.5, 7, 9, 6	2 Drilling and graft, 4 non-operative

Values are presented as number only or mean (range).

MFC: medial femoral condyle, LFC: lateral femoral condyle, MTP: medial tibial plateau, LTP: lateral tibial plateau, HTO: high tibial osteotomy, F/U: follow-up, N/A: not applicable, NWB: non-weight bearing, UKA: unicompartmental knee replacement, TKR: total knee replacement, JIA: juvenile idiopathic arthritis, ON: osteonecrosis.

[a]Both medial tibial and femoral components affected.

[b]Patient had JIA.

[c]Patient had bilateral patella ON.

Animal studies have demonstrated that radiofrequency ablation can lead to high enough temperature within the cartilage matrix to cause cell death[17]. Other theories include secondary vascular insult from radiofrequency ablation, a link to the initial injury, or a result of the altered biomechanics following debridement of the meniscus or cartilage[16,17]. This case, however, lends further evidence that osteonecrosis may be caused by radiofrequency ablation. This was used in the debridement of the meniscal lesion and chondral damage with underlying osteonecrosis was present on MRI following this.

Arthroplasty was the most frequent outcome in those cases reported; however, this may not be surprising given that the majority of patients were over the age of 50 and had pre-existing arthritis. Modern evidence would now suggest avoiding arthroscopy in this age group[18]. As this complication is very rare in the young, there is little evidence for non-arthroplasty intervention. Core decompression for spontaneous osteonecrosis is more commonly described with good outcomes. Post-arthroscopic osteonecrosis does not seem to have the same positive outcome after decompression, with persisting symptoms resulting in arthroplasty. The lack of younger patients, and the rarity in which it occurs may account for this.

We can suggest that this technique may be successful in the young, but long-term follow-up and larger studies are needed to confirm this, and these patients must be advised that this complication is severe and commonly leads to joint replacement surgery.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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