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Implantation of an Actifit® Polyurethane Meniscal Scaffold 18 Months After Subtotal Lateral Meniscectomy in a 13-Year-Old Male Adolescent

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Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Conflict of interest: None declared

Patient: Male, 13-year-old
Final Diagnosis: Meniscectomy
Symptoms: Knee joint pain
Medication: —
Clinical Procedure: Arthroscopy
Specialty: Orthopedics and Traumatology

Objective: Unusual setting of medical care

Background: Implantation of the Actifit® polyurethane meniscal scaffold is indicated for knee pain after partial meniscectomy in adults who are skeletally mature. This report is of a case of implantation of an Actifit® polyurethane meniscal scaffold 18 months after subtotal lateral meniscectomy in a 13-year-old male adolescent.

Case Report: A 13-year-old male presented with right knee pain, localized to the lateral joint, 18 months after undergoing subtotal lateral meniscectomy. Magnetic resonance imaging (MRI) of the knee showed a complete amputation of the lateral meniscal middle segment with subchondral bone damage. Arthroscopic exploration of the knee joint showed a subtotal posterior and middle lateral meniscectomy and a 4 cm^2 area of International Cartilage Repair Society (ICRS) grade 3 cartilage damage on the posterior aspect of the lateral tibial plateau. The anterolateral portal was enlarged to introduce the Actifit® scaffold. The implant was secured using three all-inside Fast-Fix® sutures and three outside-in vertical sutures, which rapidly reduced the pain symptoms. At five-year follow-up, the patient reported no pain, and he had resumed sporting activities and recovered a full knee range of motion at 0/0/145°. MRI showed a type 2 meniscal implant shape and size, according to the Genovese MRI score. The ICRS MRI score was stable at grade 3b.

Conclusions: This case showed that the use of the Actifit® polyurethane meniscal scaffold is an option for the treatment of knee pain after partial or subtotal meniscectomy in skeletally immature patients, resulting in a stable functional outcome at five-year follow-up.

MeSH Keywords: Adolescent • Arthroscopy • Menisci, Tibial

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/920688

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Background

Partial meniscectomy for irreparable meniscal tears is known to predispose to long-term degenerative changes and early osteoarthritis [1]. Meniscal implants were introduced to treat patients with knee pain after partial meniscectomy to prevent degenerative changes. Short-term and mid-term studies in adult populations have demonstrated the safety of implantation of the Actifit® polyurethane meniscal scaffold and its efficacy at improving the functional status [2–6]. This report is of a case of implantation of an Actifit® polyurethane meniscal scaffold 18 months after subtotal lateral meniscectomy in a 13-year-old male adolescent.

Case Report

Presentation and investigations

An otherwise healthy male 13-year-old presented to our department with a two-year history of right knee pain. No history of trauma was noted, but six months previously, he had undergone subtotal lateral meniscectomy by a lateral arthrotomy for a meniscal tear. On the initial presentation to our institution, he was walking with crutches. On palpation, the pain was localized to the lateral joint line, but the knee was stable without effusion. The right knee range of motion was 0/0/140°, and was 0/0/150° on the contralateral side. Magnetic resonance imaging (MRI) showed a complete amputation of the lateral meniscal middle segment with subchondral bone damage beneath the lateral meniscus (Figure 1).

Initial conservative management

Conservative treatment was initiated that included rest, pain medication, and gentle physiotherapy that included continuous passive motion and muscle strengthening. After one year of failed conservative treatment, a meniscal reconstruction with the Actifit® polyurethane meniscal scaffold was performed. Preoperative MRI identified the known meniscal defect and a bone lesion with a collapse of the lateral tibial plateau beneath the lateral meniscal defect. The International Cartilage Repair Society (ICRS) MRI score was grade 3b [7]. No osteochondral lesion on the lateral femoral condyle was found on imaging (Figure 2).

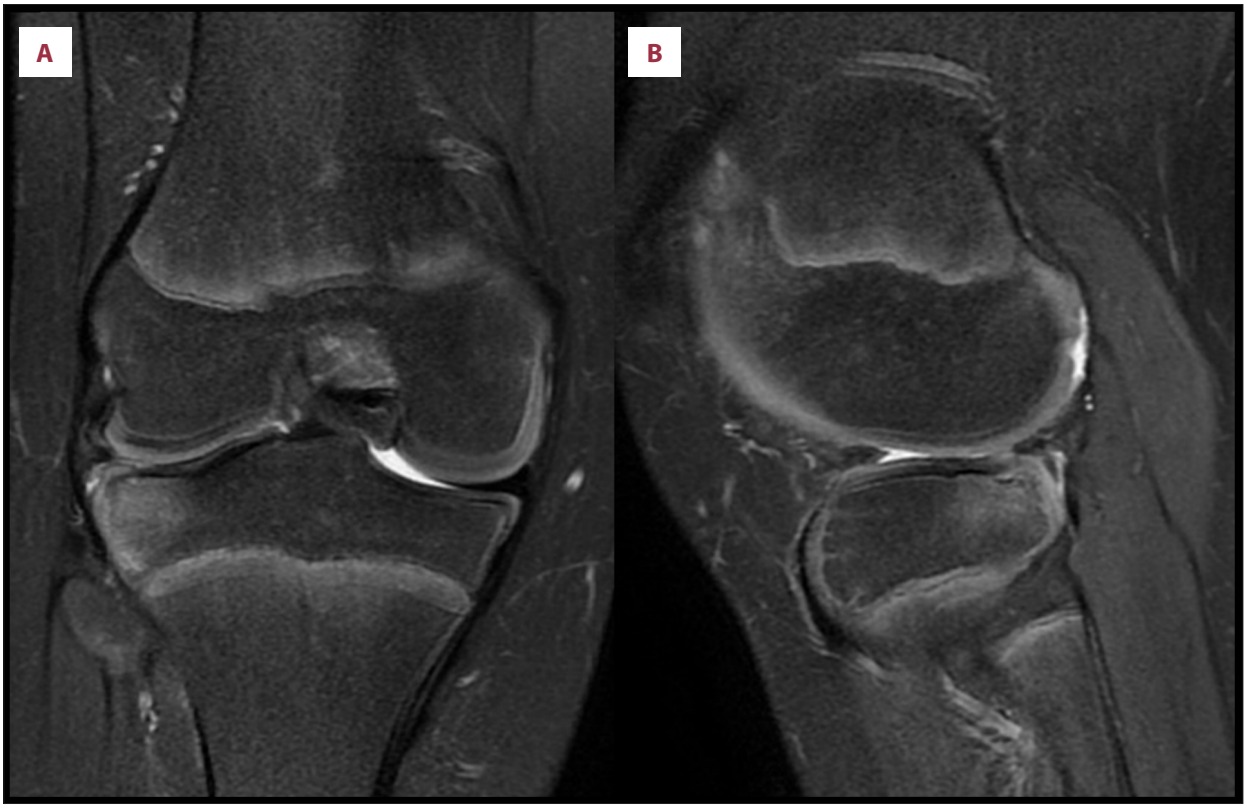

Figure 1. A case of implantation of an Actifit® polyurethane meniscal scaffold 18 months after subtotal lateral meniscectomy in a 13-year-old male adolescent. Coronal (**A**) and sagittal (**B**) T2-weighted magnetic resonance imaging (MRI) sequence shows a defect of the lateral meniscal middle segment with subchondral bone damage beneath the lateral meniscus.

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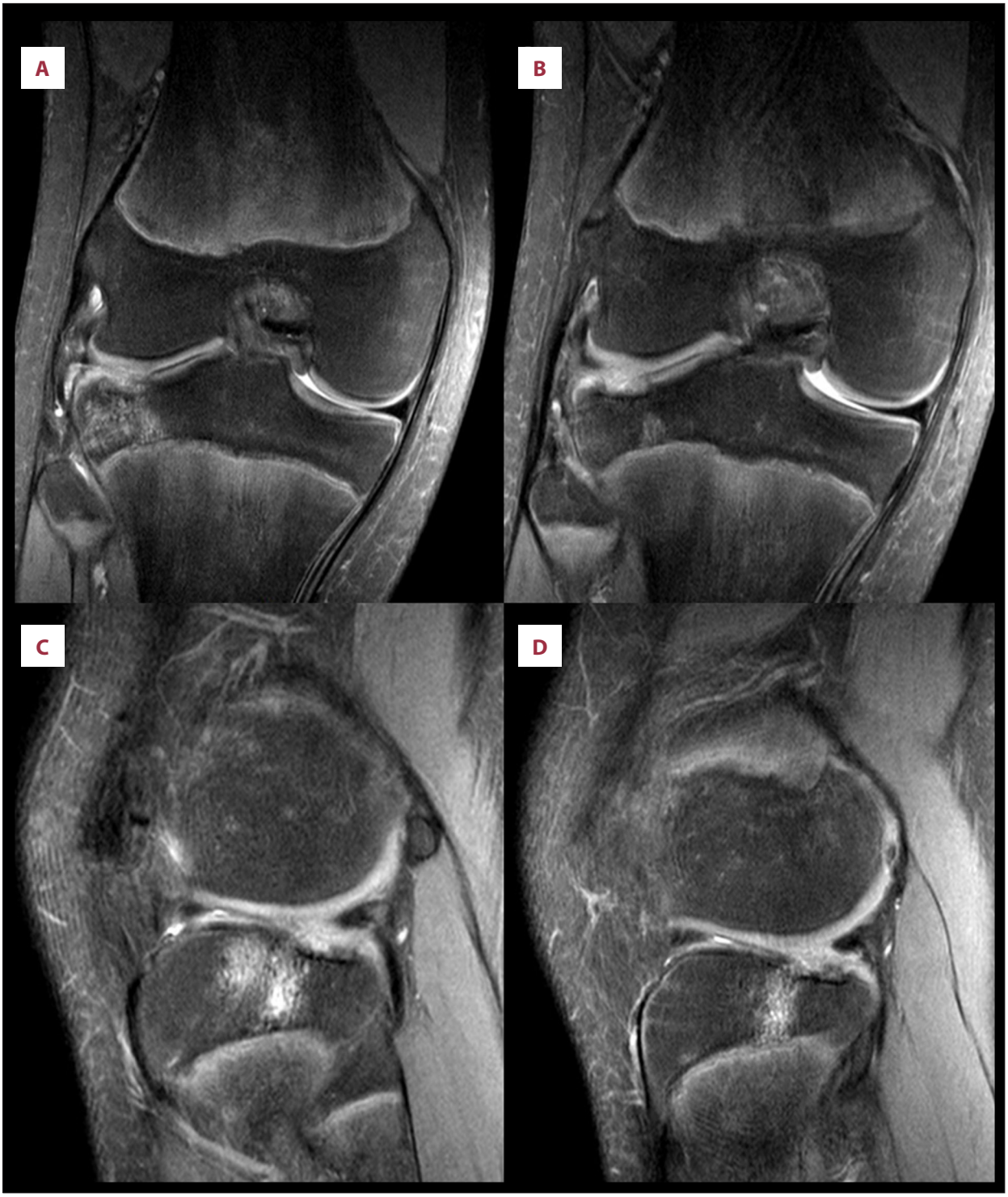

Figure 2. A case of implantation of an Actifit® polyurethane meniscal scaffold 18 months after subtotal lateral meniscectomy in a 13-year-old male adolescent. Preoperative coronal (**A, B**) and sagittal (**C, D**) T2-weighted magnetic resonance imaging (MRI) sequence shows an increased bone hyper signal with a subchondral fracture and collapse of the lateral tibial plateau beneath the lateral meniscal defect.

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Table 1. Functional scores at five-year follow-up.

Functional score	Results at five years
IKDC subjective	83.9
IKDC objective	B
KOOS symptoms	82.1
KOOS pain	88.9
KOOS ADL	98.6
KOOS sport	75.0
KOOS quality of life	81.2

IKDC – International Knee Documentation Committee;
KOOS – Knee Injury and Ostearthritis Outcome Score;
ADL – activity of daily living.

Arthroscopy and implantation of the Actifit® polyurethane meniscal scaffold

The patient was in the supine position with a knee clamp around the tourniquet. Arthroscopy was performed using two standard anteromedial and anterolateral portals. Knee exploration showed a subtotal posterior and middle lateral meniscectomy, a 4 cm^2 area of ICRS grade 3 cartilage damage on the posterior aspect of the lateral tibial plateau, and a 1 cm^2 chondral flap, which was excised. The remaining meniscal tissue was debrided until healthy tissue was reached. The meniscal defect was measured using a flexible ruler. The anterolateral portal was enlarged to introduce the Actifit® polyurethane meniscal scaffold (Orteq® Sports Medicine Ltd., London, UK). The implant was secured using three all-inside Fast-Fix® sutures (Smith & Nephew, Andover, MA, USA) and three outside-in 2.0 PDS II vertical sutures (Ethicon, Johnson & Johnson, New Brunswick, NJ, USA).

Postoperative recovery

Postoperatively, the patient was immobilized in a knee extension brace, with no weight-bearing for six weeks. Isometric quadriceps exercises commenced two days after the surgical procedure. The pain rapidly decreased after the procedure, and weaning of pain medication occurred after two months. At nine-month follow-up, the patient complained of a locking sensation in the knee. A second arthroscopy was performed 12 months postoperatively that identified a radial tear on the inner part of the middle of the meniscal implant, which was resected. The implant was otherwise intact and stable when probed.

At the latest five-year follow-up, the patient reported no pain with 0/10 on the visual analog scale (VAS) for pain, and he had resumed his favorite sports activities (soccer and boxing). He recovered a full and symmetrical knee range of motion at 0/0/145°. Functional scores at the latest follow-up are summarized in Table 1. MRI showed meniscus extrusion, and the meniscal implant shape and size were type 2 according to the Genovese MRI score [8]. The ICRS MRI score was stable, and grade 3b (Figure 3) [7].

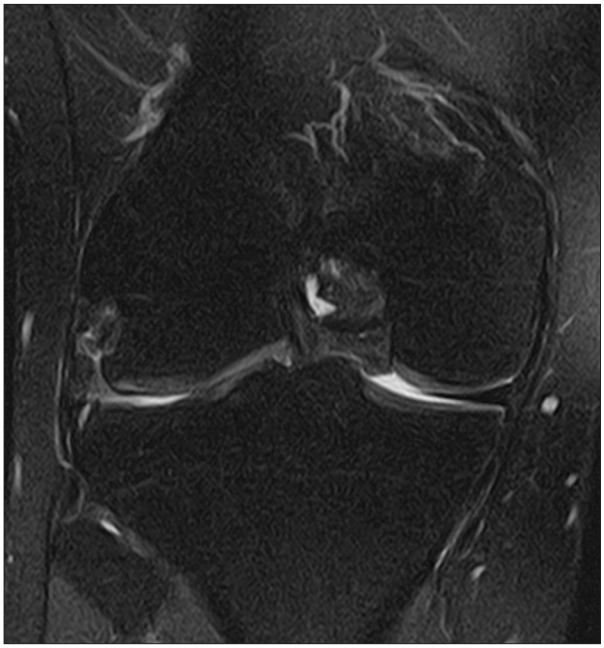

Figure 3. A case of implantation of an Actifit® polyurethane meniscal scaffold 18 months after subtotal lateral meniscectomy in a 13-year-old male adolescent. Coronal T2-weighted magnetic resonance imaging (MRI) sequence at five-year follow-up shows a meniscal extrusion with altered morphology.

Discussion

Two meniscal scaffolds are currently available to replace the loss of meniscal tissue in patients with chronic pain due to a previous partial or subtotal meniscectomy. The CMI® collagen meniscus implant (Ivy Sports Medicine, Gräfelfing, Germany) has shown good long-term clinical results [9,10]. In July 2008, a biodegradable polyurethane acellular meniscal implant was approved for clinical use in Europe, the Actifit® polyurethane meniscal scaffold (Orteq® Sports Medicine Ltd., London, UK) [11]. Short-term comparative studies between the CMI® meniscal scaffold and the Actifit® meniscal scaffold showed no differences in terms of functional improvement and complications [12,13]. Bulgheroni et al. showed that both meniscal implants were effective in improving the symptoms and joint function in the short-term of two years [12]. They also showed a lack of progression of degeneration of the knee joint, suggesting a possible protective effect on articular cartilage [12].

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Few studies have assessed the outcomes of the Actifit® polyurethane meniscal scaffold after years of follow-up, and the studies undertaken in adult populations have reported stable functional improvement over time [5,14,15]. Leroy et al. studied 15 adult patients who had implantation of the Actifit® meniscal scaffold who showed stable functional scores and cartilage status on magnetic resonance imaging (MRI) at an average six-year follow-up [5]. To our knowledge, no case of meniscal substitution has ever been reported in skeletally immature patients. Only three cases of meniscus implantation at a mean age of 13 years were reported in the literature [16]. The clinical outcome at a 31-month follow-up was similar to adult patients, with improvement in function and reduction in function [16]. These short-term data could not evaluate the chondroprotection following meniscal transplantation for patients with skeletal immaturity [16].

The patient in this report had a preoperative severe chondral lesion, which was grade 3b, according to the International Cartilage Repair Society (ICRS) MRI score, which remained stable with time. Although the duration of follow-up in this adolescent patient was not long enough to determine the preventive effect on the progression of osteoarthritis, the latest MRI at a five-year follow-up was encouraging. Previous studies have shown that the preoperative status of the articular cartilage negatively influenced the results of meniscal implantation, indicating that cartilage damage should not exceed ICRS grade 2 to obtain good results [3,6,17–19]. Gerber et al. previously reported that patients without chondral injuries showed improved MRI from the polyurethane scaffold in terms of size and morphology [17].

Filardo et al., in a study of 18 patients treated with arthroscopic implantation of the Actifit® polyurethane meniscal scaffold, showed the presence of abnormal MRI findings in terms of morphology, signal intensity, and changes in the interface between the implant and the native meniscus [15]. Implant extrusion and contralateral bone damage were also found in most of the cases, despite no correlation between the imaging findings and clinical outcome [15]. In a meta-analysis that compared the postoperative clinical and MRI outcomes in patients with partial meniscal defects treated with a polyurethane meniscal scaffold, Shin et al. found that articular cartilage and meniscal extrusion worsened between baseline presentation and final follow-up, even though there was significant functional improvement and pain relief [20]. In the case presented in this report, MRI of the knee at the latest follow-up showed meniscal extrusion, and the meniscal implant shape and size were type 2, according to the Genovese MRI score. Despite these altered MRI changes, the clinical outcome remained satisfactory at a five-year follow-up.

Conclusions

A case of implantation of an Actifit® polyurethane meniscal scaffold 18 months after subtotal lateral meniscectomy in a 13-year-old male adolescent was reported. This case showed that the use of the Actifit® polyurethane meniscal scaffold is an option for the treatment of knee pain after partial or subtotal meniscectomy in skeletally immature patients, resulting in a stable functional outcome at a five-year follow-up.

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