

Diagnosis and Treatment of Postarthroscopic Synovial Knee Fistulae

A Report of Four Cases and Review of the Literature

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ABSTRACT: Development of synovial knee fistulae following arthroscopic knee surgery is a rare but under-reported complication. The diagnosis and treatment of this complication is described in a series of four patients. Synovial knee fistula formation is a benign complication and in the majority of patients

it can be treated conservatively with immobilization until healing occurs. The presence of infection should always be excluded.

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INTRODUCTION

Knee arthroscopy is a minimally invasive surgical procedure performed to diagnose and treat intra-articular knee problems. Most orthopedic surgeons are capable of performing diagnostic and surgical knee arthroscopy. The complication rate of knee arthroscopy ranges from 0.56%²⁴ to 8.2%,² but the absolute number of complications may be high due to the widespread practice of arthroscopy and the high number of arthroscopic procedures performed every year. The risks and complications vary^{2,5,24,27} and are related to the anesthetic procedure, type of surgery, and specific arthroscopic procedure.

Several rare complications have been reported to occur during or after the arthroscopic procedure.^{1,4,6-8,19,21} Wound-healing complications occur in approximately 10% of cases¹² and include local pain, hematoma, bruising, delayed healing, discharge, infection, erythema, scar formation, cosmetic problems, and synovial fistulae.^{1,7,19,21,23} Most wound problems are of minor severity and can be treated conservatively.

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This article describes the diagnostic evaluation and treatment in four patients with postarthroscopic external synovial cutaneous knee fistula and reviews the relevant literature.

CASE REPORTS

Between 1996 and 2003 at IASO General Hospital, four male patients were treated with postarthroscopic synovial cutaneous knee fistulae. In all patients, standard anteromedial, anterolateral, and superomedial portals were used to perform the arthroscopic procedure. All portals were sutured with nonabsorbable 3-0 sutures. The sutures were removed 10-14 days postoperatively. Persistent postoperative synovial fluid drainage from a portal site was noted within the first week in all patients, which increased with knee flexion. All patients ambulated without crutches and reported no night pain, swelling, temperature rise, or pain with activities. The portals involved were the anterolateral (two cases), anteromedial (one case), and posteromedial (one case). Only patient 4 had a significant full-thickness articular surface lesion. Patient 1 was treated surgically due to failure of the conservative treatment, whereas the fistulae in the remaining patients healed with immobilization and antibiotic administration.

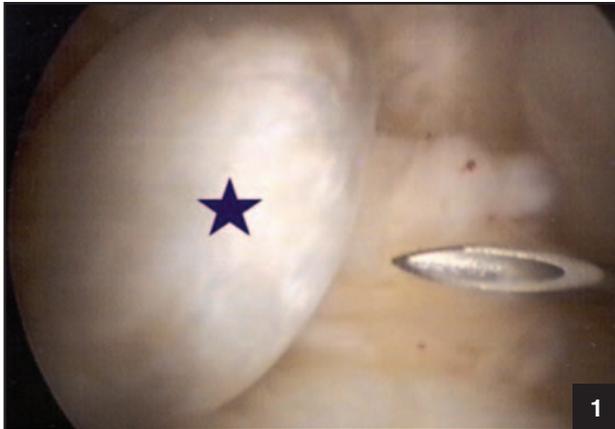
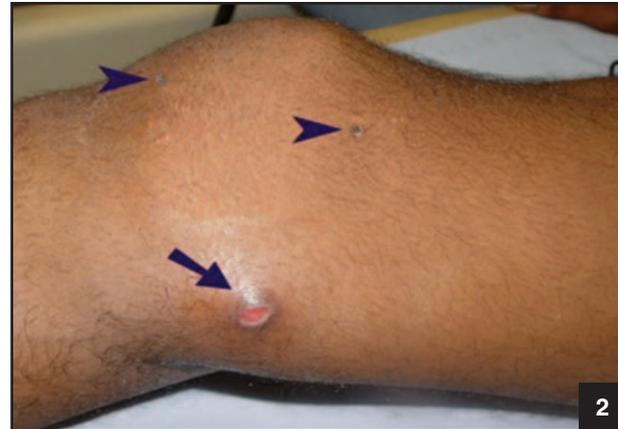


Figure 1. Case 4. A sizeable osteochondral loose body (star) was trapped in the posteromedial compartment of the right knee. It was removed through a 1.5-cm wide posteromedial portal. **Figure 2.** Case 4. The appearance of the posteromedial portal 12 days after the operation. Yellow fluid emerged from the sinus orifice (arrow) on knee flexion. The anteromedial and superomedial portals (arrowheads) had already healed without problems. **Figure 3.** Case 4. The appearance of the posteromedial portal synovial fistula (arrow) after 14 days of immobilization in extension. The wound had dried without evidence of joint infection.



Case 1

A 32-year-old Caucasian military officer underwent medial meniscectomy in another hospital and presented for treatment 6 weeks later with an external synovial fistula at the anterolateral arthroscopic portal without signs of infection. The knee was initially immobilized for 2 weeks, but the portal failed to heal. Subsequently, the fistula was excised and the knee synovium and capsule were repaired. The surgical wound healed without further complications.

Case 2

A 25-year-old Caucasian soldier who underwent previous diagnostic knee arthroscopy due to anterior knee pain secondary to patellar malalignment presented with chondromalacia grade II after Outerbridge of the lateral patellar facet. No meniscal or ligament injuries were noted. Postoperatively, the anteromedial portal failed to heal and persistent synovial fluid discharge was noted. The knee was immobilized in extension for 14 days and eventually the wound healed.

Case 3

A 20-year-old Caucasian laborer presented with acute anterior cruciate ligament (ACL) tear associated with a bucket handle tear of the medial meniscus, which was excised arthroscopically. The anteromedial portal failed to heal and immobilization for 10 days solved the problem.

Case 4

A 22-year-old African-Caribbean lifeguard presented with long-standing osteochondritis dissecans of the medial femoral condyle with a 2×1-cm osteochondral loose body trapped in the posterior compartment of the knee. Arthroscopic examination revealed the presence of a grade IV after Outerbridge articular cartilage lesion of the medial femoral condyle. The osteochondral loose body was located at the posteromedial compartment of the knee and was removed through a 1.5-cm long posteromedial portal (Figure 1). The patient was mobilized immediately after the operation, but the posteromedial wound failed to heal (Figure 2). The patient returned for evaluation 5 days later due to persistent discharge from the posteromedial portal. On clinical examination, yellow synovial fluid emerged from the portal, especially during knee flexion but not following quadriceps contraction. The viscous fluid from the fistula was cultured, yielding negative results. It was also examined biochemically, confirming the clinical assumption of synovial fluid. The knee was immobilized in extension for 14 days and antibiotics were administered. The fistula eventually healed (Figure 3).

DISCUSSION

In the past 20 years, arthroscopy has become a widely used tool for diagnostic evaluation and treatment of intra-articular knee disorders. Knee arthroscopy is safe and successful with a low complication rate,^{1,21-24} but unfor-

Unfortunately no surgical intervention is complication-free. Although some complications are common to both open and arthroscopic techniques, some are unique to arthroscopy. Complications associated with knee arthroscopy may be minor or major, preventable or not, and include infection, vascular and nerve injuries, synovitis, effusions, hemarthrosis, deep venous thrombosis, wound healing problems, and complex regional pain syndrome.^{1,4,6-8,19,21} The reported complication rate ranges between 0.56%²⁴ and 8.2%²³ and depends on the procedure, age of the patient, and use of a tourniquet.^{1,21,23,24} The most common complication is hemarthrosis (60.1%,⁶ incidence 1%⁵) and the operation more susceptible to it is lateral retinacular release.^{1,2,5,23}

The factors associated with complications need to be identified and practicing orthopedic surgeons should be made aware. Wound healing problems, discomfort, and nodular enlargement of the arthroscopic portals are common.¹² The method chosen for wound management following knee arthroscopy seems to be of less importance and unobstructed healing is the rule. Suturing of the wounds is not necessary and use of a sterile adhesive tape or leaving the wounds open is adequate.¹² The portal wound complication rate was approximately 10% using either method.¹² Persistent discharge and bleeding from the arthroscopic portals may be self-inflicted in emotionally unstable patients. Brown et al⁴ described three cases of persistent wound drainage in young females who underwent arthroscopy for chronic anterior knee pain. Immobilization ceased drainage, which recurred when the patients came off the plaster.

An uncommon complication of knee arthroscopy is the formation of a synovial cutaneous fistula. During the past 10 years at IASO General Hospital, 4 cases of synovial fistula formation have been encountered in approximately 2300 arthroscopic operations. Based on this experience, the incidence of this complication is 0.17%. The incidence in the literature varies between 0.0117% and 0.61%.^{1,2,6,14,17,21,23,24} It is likely that this complication is under-reported. Synovial fistulae may occur post-traumatically or secondary to an operation, arthroscopic and open. Development of synovial cysts following ACL reconstruction has also been reported.⁸ A synovial fistula may be internal (herniation of the fat pad or of the synovium through a capsular breach) or external, draining to the skin. Synovial fluid leaks out through the fistula with direction from the joint to the skin, causing local irritation. Fluid flow is unidirectional and centrifugal. The sinus is covered with synovial tissue and the usual clinical presentation is an arthroscopic portal or skin incision that fails to heal.^{1,4,7,13} This complication is likely under-reported because of its benign clinical course.

The incidence of synovial fistulae occurrence and the methods of treatment vary significantly (Table). Bamford et al² reported 1 case in 8500 arthroscopies performed be-

tween 1978 and 1991 (incidence 0.0117%), whereas Dandy and O'Carroll⁵ reported 1 case in 1000 arthroscopies (0.1%). DeLee et al⁶ reviewed retrospectively 118,590 arthroscopies and reported only 30 cases of synovial fistulae (incidence 0.025%), 70% of which were treated conservatively with success. Sherman et al²³ analyzed the complications in 2640 arthroscopies and reported that the complication rate of all types of wound healing problems, including transient synovial fistulae, was approximately 3.3%. Proffer et al¹⁹ reported 6 cases with synovial fistulae following 976 knee arthroscopies performed between 1985 and 1988 (incidence 0.61%). All cases were treated conservatively. These authors stated that posterior compartment portals and degenerative joint disease may predispose to the development of fistulae, although the number of their cases does not justify this conclusion. In a series of 117 patients where the posteromedial portal was used, no fistula occurrence was reported.³ Rheumatoid arthritis and scleroderma have also been implicated as possible predisposing factors¹⁸ but in a series of knee arthroscopies in 92 patients with inflammatory arthritides, there was no case of synovial fistula.²⁷

Synovial knee fistulae occasionally are associated with joint space infections and may appear many years after the injury.^{13,14,16,17} Knee infection should always be ruled out before definite treatment is undertaken. The presence of a sinus represents a potential path for retrograde infection, and prolonged drainage should be avoided. The knee is the largest synovial cavity in the body and infections may represent a catastrophe.

Synovial fistulae may also form when artificial prosthetic material is implanted into the knee. Li et al¹⁴ reported the treatment of a synovial fistula following diagnostic knee arthroscopy and synovial biopsy in a 66-year-old patient with total knee replacement wear and titanium synovitis. The medial parapatellar portal failed to heal giving rise to a synovial fistula draining sterile black-stained synovial fluid. Three months later staphylococcal infection ensued complicating the treatment. Good et al¹⁰ described 3 cases of synovial fistulae in 14 patients with knee instability due to ACL tear treated with a bovine xenograft. Allergic reaction was ascertained histologically and the graft had to be removed. Gillquist and Odensten⁹ reported their results on the use of a Dacron prosthesis to reconstruct the ACL in 70 patients. In 1 patient, a synovial fistula was formed 8 months after the operation and the graft had to be removed.

Synovial fistulae may also form secondary to radical excision and prosthetic replacement of high-grade bone sarcomas. In one relevant study¹⁵ involving 82 patients with limb-sparing procedures, 4 synovial fistulae were recorded. The proximal tibia was excised in 2 patients, the distal femur in 1 patient, and the proximal humerus in 1 patient. Three fistulae were treated with local excision and closure of

TABLE

OVERVIEW OF THE INCIDENCE, LOCATION, AND MANAGEMENT OF SYNOVIAL KNEE FISTULAE

Study	Incidence (%)	Location	Infection	Treatment
Bamford et al ²	0.0117	1 anteromedial portal, 2 months postoperatively	Yes (TB)	Surgical excision and Anti TB therapy
Brown et al ⁴	—	Anterolateral portal	No	Conservative
DeLee ⁶	0.032 (30 cases in 930 AS)	Various portals	No	70% conservative
Deshmukh & Hui ⁷	—	Lateral parapatellar arthrotomy	No	Fulminant synovitis with carbon fiber deposits, surgical excision
Proffer et al ¹⁹	0.61 (6 cases in 976 AS)	3 posteromedial portal, 1 superomedial portal, 2 posterolateral portal	No	Conservative
Raunest & Lohnert ²¹	0.14 (1 case in 700 AS)	Central portal and prepatellar bursa	No	Conservative
Dandy & O'Carroll ⁵	0.1 (1 case in 1000 AS)	—	No	Conservative
Jain & Varma ¹³	One case 12 years post-injury	—	Yes	Free radial artery fascio-cutaneous flap
Li et al ¹⁴	—	1 anteromedial portal	Yes	Surgical excision
Mendez-Fernandez ¹⁶	—	2 cases, posttraumatic	Yes	Regional myofascial flaps
Odumala et al ¹⁷	—	Anteromedial portal	Yes	Surgical excision
Good et al ¹⁰	3 in 14 cases	Xenograft ACL reconstruction	Allergic reaction	Graft removal
Gillquist & Odensten ⁹	1 in 70 cases	ACL reconstruction using Dacron prosthesis	No	Surgical
Malawer & Chou ¹⁵	4 in 82 cases	Limb sparing operation due to high-grade bone sarcoma	No	Local excision (3 cases) and gastrocnemius flap (1 case)
Hadied ¹¹	—	Prepatellar bursa-knee joint	No	Surgical excision
Smason ²⁵	—	Prepatellar bursa-knee joint	Yes	Surgical excision
Shaw et al ²²	—	—	No	Sural artery flap

Abbreviations: ACL = anterior cruciate ligament, AS = arthroscopy, TB = tuberculosis

the wound, and in the patient with distal femoral excision, a medial gastrocnemius flap was raised to cover the fistula.

Synovial fistulae in other joints are rare, under-reported, or both. Torres and Wright²⁶ reported three synovial fistulae following open rotator cuff repair associated with a documented infection. All patients presented late with a draining sinus and were treated with surgical drainage and intravenous antibiotic administration.

The formation of synovial fistulae following ankle arthroscopy has been also reported. In a series of 105 patients with ankle impingement who underwent arthroscopic treatment, only 1 case of synovial fistula was reported.²⁰

No universal treatment method applicable to all sy-

novial knee fistulae exists. In septic cases, surgical treatment and intravenous antibiotic administration is mandatory, whereas in aseptic cases conservative treatment is recommended. Conservative treatment usually is effective and involves immobilization with the knee in extension for 1-2 weeks. If immobilization fails to promote healing, surgical excision of the fistula is recommended. Suturing or neglect of the fistula should be avoided to evade development of knee infection. In our patients, second generation cephalosporins were given as chemoprophylaxis for approximately 1 week. The type and duration of antibiotic administration were empirically chosen. The portals are created with a No. 11 blade incising the skin, whereas the

deeper layers are perforated with an obturator. In patient 4, a large posteromedial portal was created to facilitate loose body removal. In cases when a large capsular portal is created, physical therapy is delayed for a few days, anticipating improved capsular healing. In all patients, immediate partial weight bearing with crutches was initiated and 0°-90° knee flexion was allowed. All patients were followed for at least 2 years postoperatively to exclude presence of a low-grade infection.

The treatment of chronic, neglected, and postinfectious cases can be demanding, although the relevant literature is limited. Excision and direct closure of the fistula are rarely successful and the fistula recurs frequently. Internal knee fistulae, extending between the joint cavity and the prepatellar bursa, have been successfully treated with open excision.^{11,25} In chronic cases when conservative treatment and local excision fails, excision and coverage with a regional myofascial or a free flap is indicated.^{13,16,22} Shaw et al²² described a patient who developed a 3×2-cm synovial fistula at an arthroscopic portal at the middle of the patella, which recurred despite two attempts at excision and direct suture. Subsequently, the defect was covered with a tailored sural artery flap. Jain and Varma¹³ reported a patient with posttraumatic synovial knee fistula who presented 12 years after the initial trauma (open fracture of the tibia and chronic osteomyelitis). Direct closure of the fistula failed and coverage with a free radial artery fasciocutaneous flap was deemed necessary. Similarly in another report, two cases of external synovial fistulae had to be covered with a local myofascial gastrocnemius flap due to failure of local excision and suturing.¹⁶

In conclusion, synovial fistulae arising at arthroscopic portals are relatively benign complications and when recognized early, conservative treatment is successful. The presence of occult or manifested infection should always be excluded. Failure to treat this condition appropriately may cause a major complication such as knee infection, profoundly increasing morbidity. Early diagnosis and appropriate, evidence-based treatment is the key for uneventful treatment of synovial fistulae.

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