


## CASE REPORT

# Arthroscopy-Assisted Treatment of Wear Debris Pseudotumor After Total Knee Arthroplasty: A Case Report

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**Background:** Wear debris pseudotumors are a rare complication after total knee arthroplasty (TKA) and have seldom been reported in the recent literature. There is no consensus on the best therapeutic method, but the high quality curative treatment, safe, low invasive treatments are required for the patients.

**Case presentation:** In this paper, we present the case of a 74-year-old man with a wear debris pseudotumor after TKA with symptoms of severe pain and functional disability of his right knee. X-ray examination showed that the medial compartment of the right knee was narrowing. Magnetic resonance imaging (MRI) and Doppler ultrasound both revealed a polycystic mass at the posteromedial side of the patient's right knee. Considering the bad health condition and the minimally invasive surgery requirement of this senior patient, arthroscopic knee debridement and percutaneous cystic mass suction were carried out simultaneously. Video arthroscopy of the right knee showed visible inflammatory soft tissue, obvious polyethylene fragments, wear of the polyethylene prosthesis, and a broken polyethylene insert. The intraarticular polyethylene wear debris was removed as much as possible, and inflammatory soft tissue was debrided and sent for pathology. Postoperative pathology showed polyethylene debris in the soft tissue with an apparent multinucleated giant cell response, which was consistent with foreign body granuloma. All clinical manifestation was improved and Lysholm scores were significantly better at one year with this treatment, increasing from 32 points to 71 points.

**Conclusion:** After two years of follow-up, the patient's knee joint was significantly relieved from soreness and pain, and walking was not significantly restricted. Our treatment could not address the root cause of the wear debris pseudotumor, which was due to prosthesis failure, but sometimes, such an approach is the safest, most economical, and most effective choice for patients who are intolerant to reoperation.

**Key words:** Arthroscopy; Total knee arthroplasty; Wear debris pseudotumor

## Introduction

Wear debris pseudotumors are a rare complication after joint arthroplasty and were first reported after total hip arthroplasty (TKA)<sup>1</sup>. Initially, the term pseudotumor was used to describe the solid granulomatous mass caused by prosthetic wear debris in metal-on-polyethylene implants<sup>1, 2</sup>. In recent years, with the use of new materials with better

abrasion resistance (ceramic-on-ceramic implants) in total hip arthroplasty (THA), the incidence of wear debris pseudotumors has gradually decreased<sup>3</sup>. However, wear debris pseudotumors have been increasingly reported to occur following primary TKA due to the increasing number of TKA surgeries<sup>4</sup>. In early reports, these cystic masses were always described as popliteal cysts because the location and

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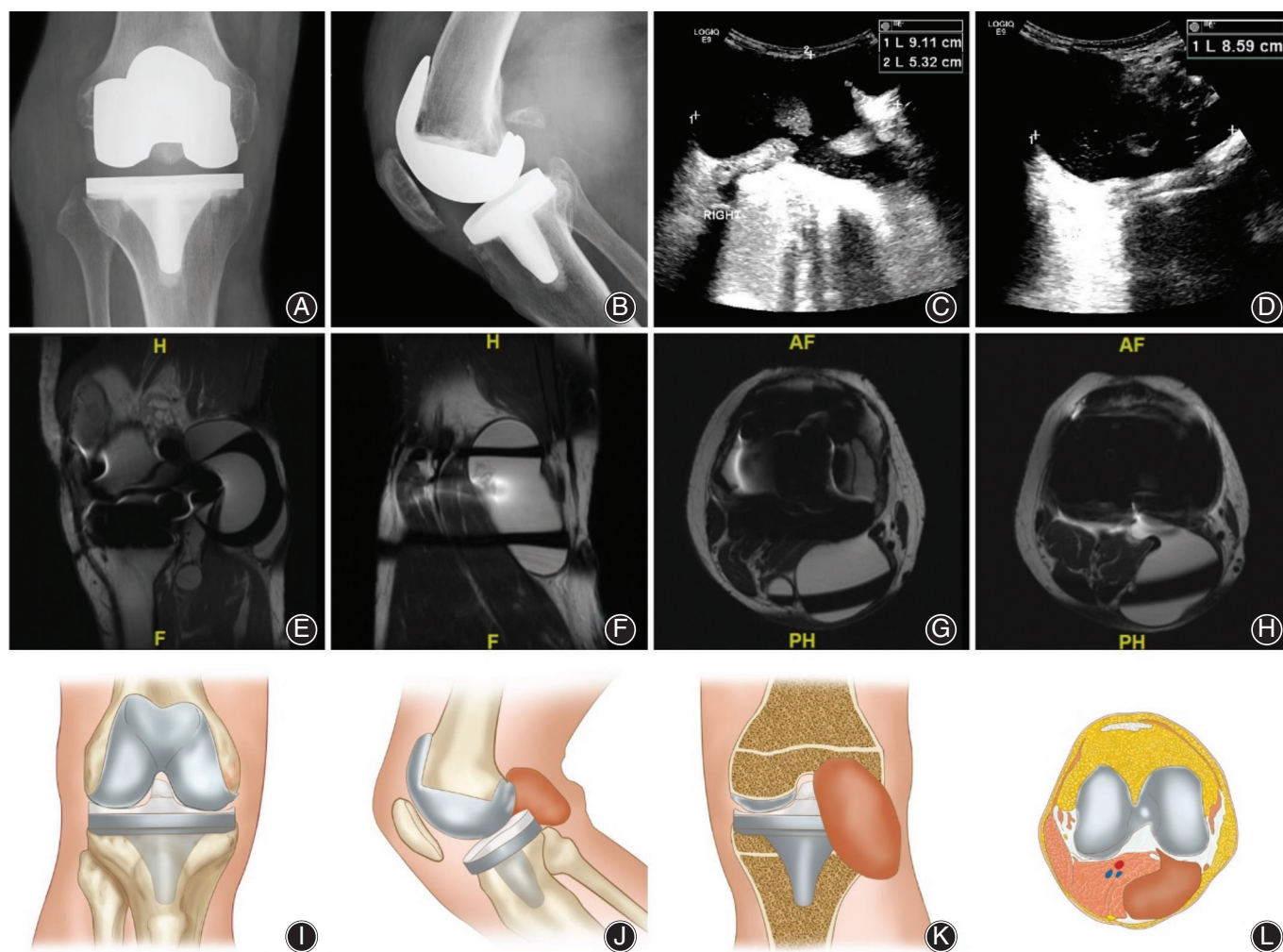
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**TABLE 1 Lysholm knee score**

Section	Preoperative	Postoperative (1 year)
Limp	0	3
Using support for walking	2	5
Locking sensation in the knee	15	15
Giving way sensation from the knee	5	15
Pain	5	15
Swelling	2	6
Climbing stairs	2	6
Squatting	1	6
Aggregate score	32	71

symptoms of these cysts were familiar to those of popliteal cysts. However, the pathogenesis of these cystic masses is different from that of popliteal cysts, including wear debris, metallosis, and aseptic loosening of the joint prostheses. The treatment of these cystic masses is also different from that of popliteal cysts<sup>5-10</sup>. Popliteal cysts rarely manifest alone and are most often found in conjunction with other intra-articular pathologies and inflammatory conditions, such as osteoarthritis, meniscus tears, and rheumatoid arthritis<sup>11</sup>. But, the patients after TKA do not have the conditions of popliteal cysts. Hence, these cystic masses could not be accurately described by the term popliteal cyst. In 2009, a report



**Fig. 1** A 74-year-old man with a wear debris pseudotumor after TKA. (A) Anterior film of the right knee showing varus deformity of the prosthetic joint and narrowing of the medial joint compartment. (B) Lateral film showing a soft tissue mass in the posterior region of the right knee. (C, D) Doppler ultrasound showing a cystic mass of approximately 91 × 86 × 53 mm, without signals of blood flow, located in the popliteal region. (E, F) Sagittal and coronal T2-weighted MRI showing a high-intensity-signal fluid-filled polycystic cyst. (G, H) Transverse T2-weighted MRI showing a cystic fluid-filled lesion in the posteromedial region of the knee joint that was connected to the articular cavity. (I–L) Schematic illustrations of the patient's right knee obviously showing the broken polyethylene prosthetic and varus deformity of the prosthetic joint and narrowing of the medial joint compartment. The fluid-filled cyst, located in the posteromedial region of the knee joint, was connected to the articular cavity.

first used the term wear debris pseudotumor to describe a painful cyst in the popliteal fossa after TKA. In this report, they expressed that the wear debris pseudotumor was associated with wear debris and metallosis<sup>12</sup>.

In this study, we present the case of a 74-year-old man who had undergone TKA 8 years previously and presented with a painful and progressively enlarging cystic mass in the popliteal fossa associated with wear debris. Instead of traditional knee revision, arthroscopic knee debridement and percutaneous cyst suction were carried out simultaneously.

## Case Presentation

### History

A 74-year-old man was hospitalized for a 4-year history of a painful and progressively enlarging cystic mass in the popliteal fossa of the right knee. The patient underwent right TKA 8 years previously because of primary knee osteoarthritis. About 4 years ago, under no obvious predisposing causes, the patient felt mild knee pain with activity. The patient then found a lump in his right popliteal fossa. In the 4-year span, there was pain with activity progressing to pain at rest. Finally, because of the severe knee pain, the patient could not walk by himself and was able to walk about 300 meters with the help of a rollator walker (or walking frame). Aside

from pain of the knee, when the patient arrived at the hospital, he had mild cardiovascular disease and hypertension.

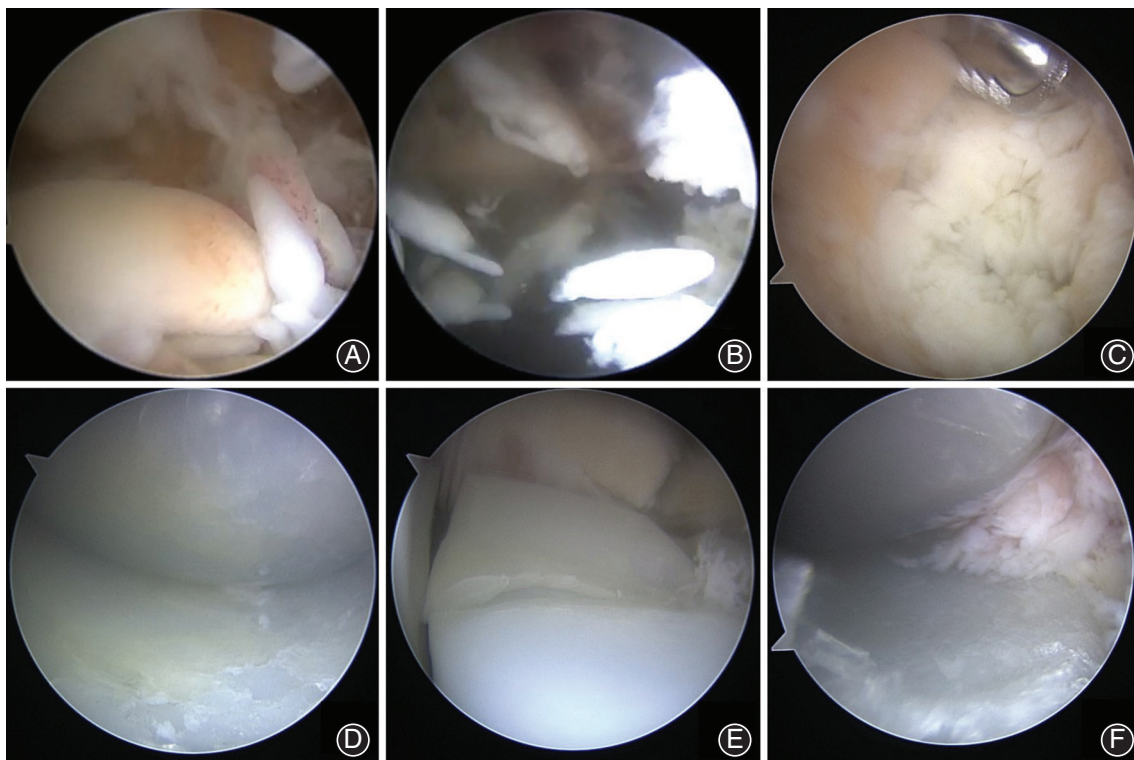
### Clinical Manifestation

Physical examination revealed cystic mass, swelling, fluctuation, tension, and local tenderness in the popliteal fossa. The enlarging cyst had severely restricted range of knee movement, so his right knee joint could not be fully flexed or extended. The VAS pain score of the patient was 5 points and the Lysholm score was 32 points (Table 1).

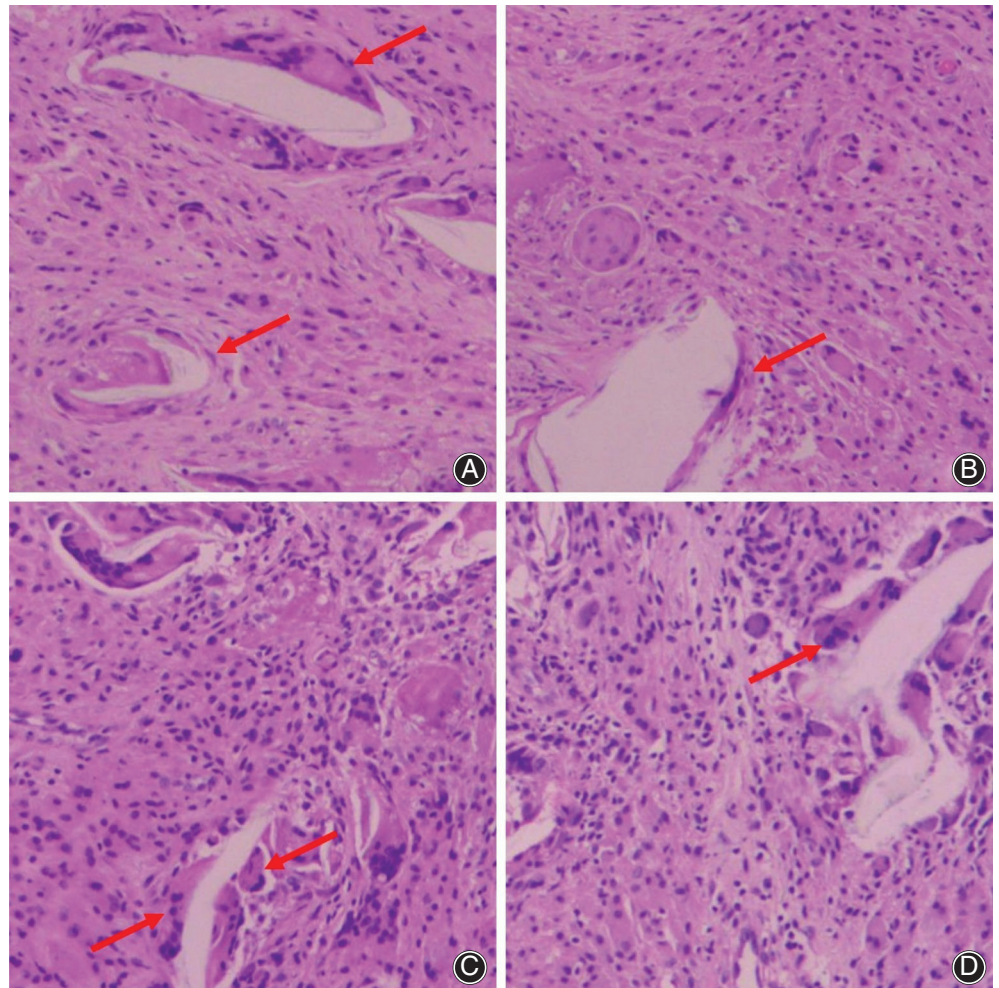
The results of regular laboratory tests, including those of routine blood parameters, blood biochemistry, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) level, and coagulation parameters (prothrombin time, activated partial thromboplastin time, fibrinogen and D-dimer), were within normal ranges. Cytological examination of the joint fluid showed that the fluid was yellow and slightly mixed, and the count of nucleated cells was  $90 \times 10^6$ , including 6% lymphocytes, 1% neutrophils, and 93% monocytes.

### Imaging Finding

X-ray examination showed varus deformity at the site of arthroplasty and narrowing of the medial compartment (Fig. 1A,B). Doppler ultrasound showed a cystic mass of approximately  $91 \times 86 \times 53$  mm, without signals of blood flow, located in the popliteal region (Fig. 1C,D). Magnetic



**Fig. 2** Video arthroscopy of the right knee. (A–C) Video arthroscopy of the right knee showing soft tissue inflammation and a foreign body reaction in the knee joint. (D–F) Severely worn polyethylene prosthesis, with free polyethylene debris evident in the joint and a broken polyethylene insert.



**Fig. 3** Postoperative pathology. (A–D) Postoperative pathological examination with hematoxylin and eosin staining of the inflammatory soft tissue in the right knee showing polyethylene debris in the inflamed synovium, with an apparent multinucleated giant cell response (arrows).

resonance imaging (MRI) revealed a polycystic mass located in the posteromedial region of the right knee joint (Fig. 1E–H). The schematic illustrations could illustrate the pathogenesis in more detail (Fig. 1I–L).

#### **Treatment Method**

Considering the minimally invasive surgery requirement of the patient, arthroscopic knee debridement and percutaneous cystic mass suction were carried out simultaneously. Video arthroscopy of the right knee showed visible inflammatory soft tissue, obvious polyethylene fragments (Fig. 2A–C), wear of the polyethylene prosthesis, and a broken polyethylene insert (Fig. 2D–F). The intra-articular polyethylene wear debris was removed as much as possible, and inflammatory soft tissue was debrided and sent for pathology.

Postoperative pathology showed polyethylene debris in the soft tissue with an apparent multinucleated giant cell response, which was consistent with foreign body granuloma (Fig. 3A–D).

#### **Result**

All clinical manifestation was improved and Lysholm score were significantly better at 1 year with this treatment, increasing from 32 points to 71 points (Table 1). After 2 years of follow-up, the patient's knee joint was significantly relieved from soreness and pain, and walking was not significantly restricted.

#### **Discussion**

In this case, as in previous reports, it is believed that the wear debris pseudotumor was caused by the accumulation of wear debris and metallosis<sup>10</sup>. However, there is no consensus on the treatment of wear debris pseudotumors. Due to the requirement of the patient, we selected arthroscopy-assisted treatment over revision surgery. The cystic fluid was suctioned percutaneously to relieve the pain and increase the range of motion of the knee. The inflammatory tissues and polyethylene debris were removed through arthroscopic knee debridement to reduce the likelihood of wear debris pseudotumor recurrence. During the 2-year follow-up

**TABLE 2** Wear debris pseudotumors based on clinical presentation, diagnosis, treatment

Author/year	Gender/age (years)	Chief complaint	History after TKA	Diagnosis	Treatment	Prognosis
Pavlov/1983 <sup>5</sup>	F/66	2-week history of severe pain behind the left knee	21 years	Clinical, X-ray and arthrography	Cyst suction	Good
	F/83	1-month history of pain and swelling along the lateral aspect of the right knee	14 years	Clinical, X-ray and arthrography	Cyst suction	Good
Dirschl/1992 <sup>6</sup>	F/60	2-week history of swelling and pain in the left calf	29 months	Clinical, X-ray and Doppler ultrasound	Joint revision	Good
	M/73	3-month history of intermittent but worsening swelling and pain in his left proximal calf	4 years	Clinical, X-ray and CT	Joint revision	Good
	M/68	2-month history of increasing severe pain and swelling in the left calf and behind the left knee	30 months	Clinical, X-ray and CT	Conservative treatment	Lost follow-up
	M/72	4-month history of severe left calf and leg pain	10 years	Clinical, X-ray and Doppler ultrasound	Joint revision	Good
Chan/2000 <sup>7</sup>	F/70	2-year history of progressive pain on weight bearing and recurrent joint effusion of the right knee	7 years	Clinical, X-ray, and Doppler ultrasound	First-stage: cyst resection Second-stage: joint revision	Good
Hsu/2002 <sup>8</sup>	F/65	5-year history of an audible click with no giving-way sensation when squatting or climbing stairs 2-month history of a progressively enlarging mass at the posterior popliteal fossa	7 years	Clinical and X-ray	First-stage: joint revision Second-stage: cyst resection	Good
Niki/2003 <sup>9</sup>	F/69	1-year history of bilateral persistent joint effusion of the knees and a gigantic synovial cyst of the right knee	8 years	Clinical and X-ray	Cyst resection and joint revision at the same time	Good
Moretti/2007 <sup>10</sup>	F/72	96-month history of a progressive posterior joint effusion, associated with rest and exertional pain, as well as limp and crepitus during knee motion	8 years	Clinical, X-ray, CT and Doppler ultrasound	First-stage surgery: cyst resection Second-stage surgery: joint revision	Good
Mavrogenis/2009 <sup>12</sup>	M/81	5-month history of a painful enlarging mass at the right popliteal fossa and calf	7 years	Clinical, X-ray and MRI	Cyst resection and joint revision at the same time	Good

CT, computerized tomography; F, female; M, male; MRI, Magnetic resonance imaging.

period, the patient was satisfied with the treatment effect, he walked with no cane, and there was no obvious limitation on the range of motion of the knee.

According to previous studies, wear debris, including bone cement, metal, and polyethylene particles, diffuses into the soft tissues around the joints through the synovial fluid and leads to fibroblast proliferation, macrophage phagocytosis, and tumor necrosis factor secretion. Finally, this process leads to the formation of cysts and even sarcomas<sup>12</sup>. The treatment of wear debris pseudotumors consists of the following different methods (Table 2): (i) cyst suction alone<sup>5</sup>;

(ii) joint revision alone<sup>6</sup>; and (iii) cyst resection and joint revision<sup>4, 7-10, 12</sup>. Method (iii) can also be divided into two methods. The first involves performing cyst resection and joint revision surgery at the same time<sup>4, 8, 9</sup>. The second involves complete excision of the cystic mass in a first-stage operation, followed by a second-stage TKA revision surgery to correct the severe wear<sup>7, 10, 12</sup>.

Although the treatment consisting of knee revision and cyst resection has been more popular in recent years, considering the minimally invasive surgery requirement of the patient, we decided to perform arthroscopy-assisted

treatment to enhance recovery after surgery. First, the major reason for the symptoms of pain and restricted range of motion was the large cystic mass in the posteromedial region of the patient's right knee. Therefore, we carried out cyst fluid suction as described in a previous report<sup>5</sup>. However, cyst suction alone could not address the wear debris widely present in the joint cavity, which might lead to wear debris pseudotumor recurrence. Therefore, we performed arthroscopic joint debridement to remove the wear debris and smooth the polyethylene prosthesis. Although it was impossible to address the varus deformity of the patient's knee prosthesis, the removal of the inflammatory soft tissue of the wear debris would help reduce the patient's pain and

decrease the likelihood of the wear debris pseudotumor recurrence. Finally, during the 2-year follow-up period, the patient was satisfied with the treatment effect, and there was no recurrence.

### Conclusion

In summary, implant failure after TKA is the main cause of the wear debris pseudotumor, and revision surgery is a fundamental treatment. Although our treatment could not address the root cause of the wear debris pseudotumor, sometimes such an approach is the safest, most economical, and most effective choice for patients who are intolerant to revision arthroplasty.

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