

# Hypertrophy of the Synovium in the Anteromedial Aspect of the Knee Joint Following Trauma: An Unusual Cause of Knee Pain

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**Purpose:** The purpose of this study was to describe the arthroscopic clinical findings and treatment in patients with pathologic hypertrophy of the synovium in the anteromedial joint compartment in conjunction with anteromedial knee pain. **Type of Study:** Case series. **Methods:** A group of 21 patients, ranging in age from 11 to 68 years (mean, 29 years) with pathologic hypertrophic changes of the synovium in the anteromedial joint compartment were studied. Pathologic changes included inflammation, polyp-type appearances, or hypertrophic string forming a loop. The most significant clinical finding was pain in the anteromedial aspect of the knee joint. Of the 21 cases, 20 (95%) had a history of trauma to the involved knee. Assessments performed included Lysholm knee scores with a special emphasis on knee pain. The duration of symptoms ranged from 2 to 32 months (mean, 13 months). Treatment consisted of an arthroscopic evaluation followed by debridement of the hypertrophic synovium using a laser, shaver, or thermal debrider. **Results:** The mean follow-up was 5.1 years (1.2 to 10 years). Mean Lysholm score improved from 64.1 to 96.4 ( $P < .05$ ). Specifically, the pain score improved from 4.3 to 23 ( $P < .05$ ). All patients were free of pain within 3 weeks following arthroscopic debridement. Return to normal function, including sports, was achieved for all patients within 2 months. Arthroscopic evaluation revealed that 18 of 21 (86%) knees had mild chondral damage on the medial femoral condyle, grade I or II according to Outerbridge grading. **Conclusions:** Based on the clinical and arthroscopic findings, we concluded that pathologic hypertrophy of the synovium in the anteromedial joint compartment may result following trauma, causing mild chondromalacia changes in the medial femoral condyle and knee pain. Arthroscopic debridement of this pathologic tissue significantly improves symptoms. **Key Words:** Knee—Hypertrophic synovium—Knee pain—Arthroscopy.

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**P**ain in the anteromedial aspect of the knee joint has many potential origins. A rare cause of anteromedial knee pain is the pathologic plicae. The plicae are recognized as normal structures that represent remnants of synovial membranes in the embryonic development of the knee.<sup>1</sup> However, these normal structures may sometimes become symptomatic.<sup>2-4</sup> Some authors believe that plicae become symptomatic after repetitive mechanical injury to the

knee such as may occur in cycling, fast walking, or from a direct blow.<sup>5,6</sup>

We have observed a specific group of patients who have isolated synovial hypertrophy in the anteromedial compartment of the knee joint but in different anatomic regions than normal plicae. In these patients, the synovial hypertrophy is accompanied by knee pain. The aim of this retrospective study was to describe the clinical findings and treatment of this unusual condition. To our knowledge, isolated synovial hypertrophy in the anteromedial compartment of the knee joint in different anatomic regions than the normal plicae, causing knee problems, has not been reported in the literature.

## METHODS

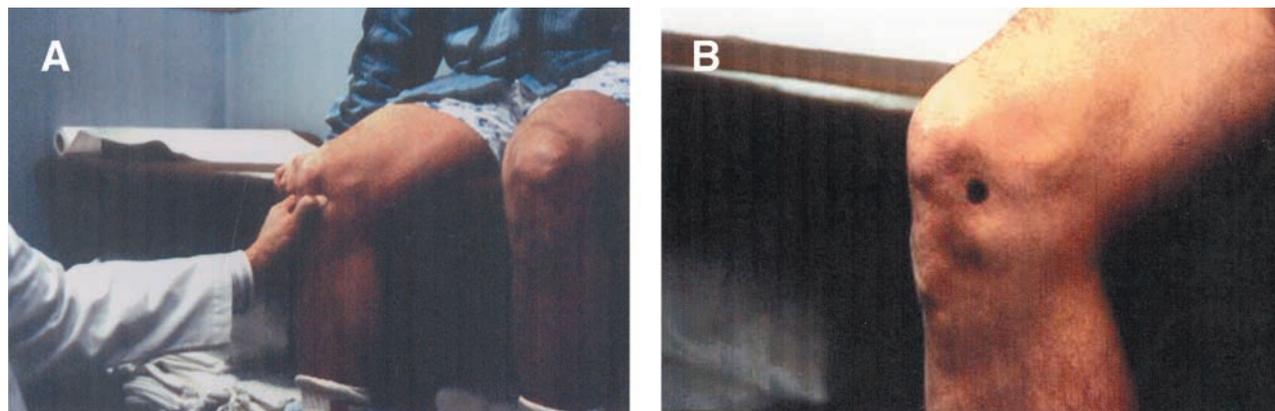
In the course of performing more than 2,500 knee arthroscopies between 1990 and 1999 the senior au-

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**FIGURE 1.** Examination of the knee joint. (A) Palpation of area of tenderness at 90° of flexion. (B) The location of maximum sensitivity is marked on the skin, medial to the patellar tendon and above joint line (right knee).

thor (J.C.Y.C) observed a pathologic hypertrophy of the synovium in the anteromedial aspect of the knee joint in different anatomic regions than the normal plicae. The major complaint of these patients was pain unresolved after conservative therapy. In most cases, the patients as well as the examiner were able to locate the painful area exactly. This area was located medial to the patellar tendon and just above the joint line (Fig 1). The authors began collecting data on this condition.

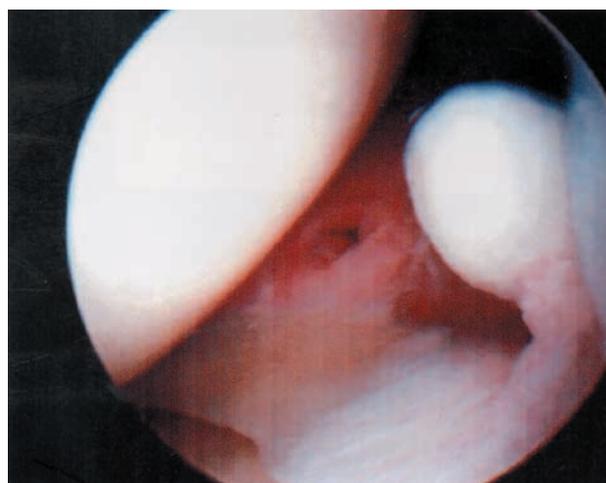
The inclusion criteria for the study were based on arthroscopic findings and included intact menisci and cruciate ligaments, a normal soft and elastic mediopatellar plica (when present), and a hypertrophic synovium in the anterior medial joint compartment. Cartilage lesions of the medial femoral condyle, if present, were classified according to Outerbridge.<sup>7</sup> Exclusion criteria were associated tibial cartilage defects, patellar defects, and generalized arthritic changes. Twenty-one patients met the inclusion criteria. All procedures were performed by the senior author.

Demographic and preoperative and postoperative objective and subjective data (including preoperative Lysholm knee score, time for pain relief, return to activities of daily living, and return to sports) were collected on all patients based on chart review. In addition, patients were asked to return to the clinic for a final follow-up visit. A Lysholm knee score (0 to 100 points) was also obtained at the final visit. The Lysholm knee score<sup>8</sup> analyzes pain (25 points), limp (5 points), support (5 points), instability (25 points), swelling (10 points), stair-climbing ability (10 points), locking (15 points), and squatting (5 points). Specifically, the pain parameter (0 to 25 points) was analyzed separately, because this was the main problem in our

patient population. Seven of the 21 (33.3%) patients underwent magnetic resonance imaging (MRI) preoperatively because their history and physical examination suggested additional knee pathology. Statistical evaluation was performed using paired *t* test.

### Surgical Procedure

Standard anterolateral and anteromedial parapatellar portals were used with the arthroscope viewing from the lateral portal. Because the area of hypertrophic synovium was previously identified, the medial portal was created medial to the pathologic tissue to facilitate easy access to this (Fig 2). Examination of the knee joint with a probe can also be performed



**FIGURE 2.** Arthroscopic image of the hypertrophied synovium. The arthroscope is in the lateral parapatellar portal, and the working portal was established medial to the hypertrophied synovium.



**FIGURE 3.** Arthroscopic image during debridement of the lesion using a thermal debrider.

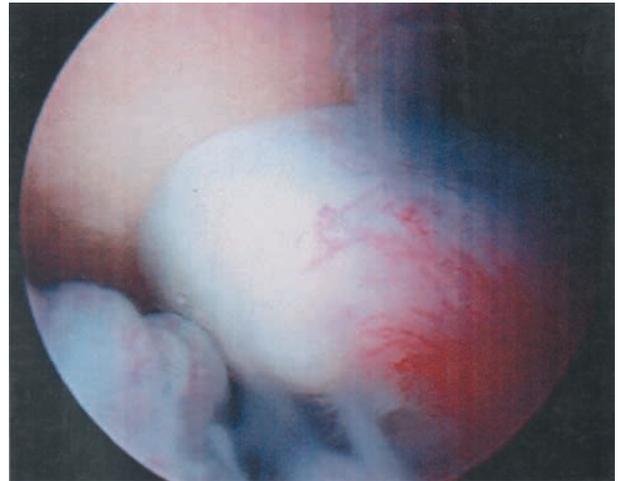
through this portal. Debridement of the hypertrophic synovium was carried out using a laser, shaver, or thermal debrider (Fig 3). After debridement, a thorough evaluation of the cartilage of the medial femoral condyle was performed. We used the Outerbridge system<sup>7</sup> to classify articular cartilage damage. According to this system, a grade I lesion is softening and swelling of the articular cartilage; grade II is fragmentation and fissuring in an area less than 1 cm; grade III lesions occupy an area more than 1 cm with cartilage fragmentation and fissuring; and grade IV shows exposure of the subchondral bone. Full weight-bearing and full range of motion were permitted postoperatively. Return to normal activities, including sports, was allowed when the knee pain was resolved.

## RESULTS

### Arthroscopic Findings

Arthroscopically, the pathologic hypertrophic synovium in 13 of 21 cases (62%) had a polyp-type appearance (Fig 4). The next most common pattern was an abundant, prominent, inflamed synovium in contact with the medial femoral condyle (Fig 5). Six knees (28.5%) were included in this category. A hypertrophic string forming a loop was observed in 2 knees (9.5%) (Fig 6). In all cases, the hypertrophic synovium impinged against the medial femoral condyle during knee motion (Fig 7).

According to Outerbridge,<sup>7</sup> 12 of 21 patients (57%) had grade II cartilage damage and 6 patients (28.5%) had grade I cartilage damage. Only 1 patient had a

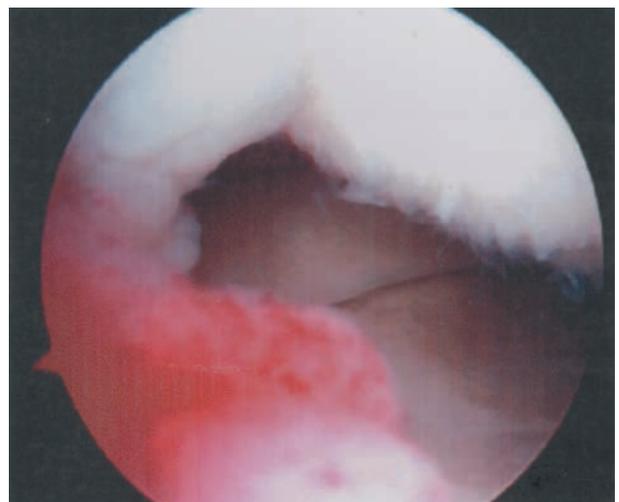


**FIGURE 4.** Arthroscopic image of a polyp-type appearance of the hypertrophic synovium.

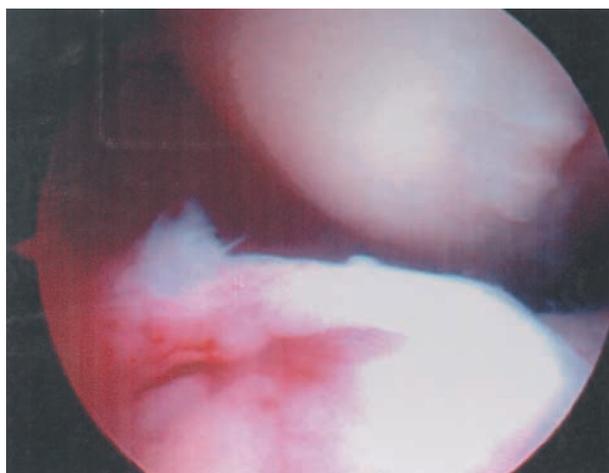
grade III lesion. This patient had an injury 19 months before arthroscopic evaluation. Two patients had no cartilage damage. No specific treatment was undertaken for these patients' lesions.

### Clinical Results

The study group consisted of 18 women and 3 men ranging in age from 11 to 68 years, with an average of 29 years. There were 8 right knees and 13 left knees. Preoperatively, all patients complained of aching pain in the anteromedial aspect of the knee joint, exacerbated by activity. Five patients had a "catching" sen-



**FIGURE 5.** Arthroscopic image of a diffuse inflamed synovium (abundant, prominent type).



**FIGURE 6.** Arthroscopic image of a loop-shaped hypertrophic synovium.

sation but no true locking and no patients had a sense of instability. Six patients had repeated swelling in their knees. The time from the onset of symptoms until arthroscopy ranged from 2 to 32 months (mean, 13 months). All patients had full range of motion preoperatively.

Interestingly, 20 of 21 patients (95%) had a history of injury. The mechanism of injury was fall in 13 cases (62%) and a twisting injury in 6 cases (28.5%). One patient was involved in a car accident and hit her left knee against the dashboard, resulting in a nondisplaced patellar fracture that was treated conservatively. Although the fracture healed, the patient continued to have pain 14 months after the accident. No specific injury was identified in 1 patient. Conserva-

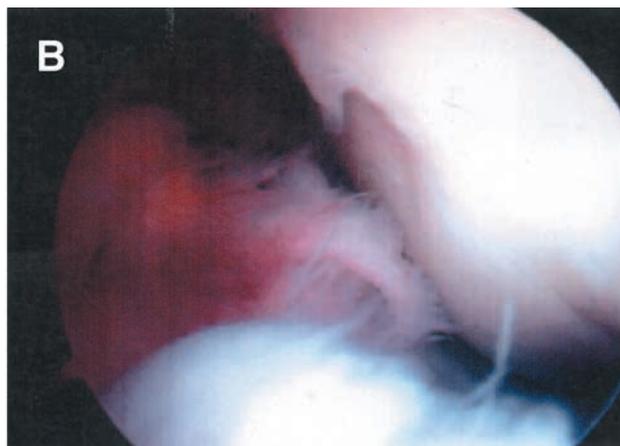
tive treatment consisting of anti-inflammatory medication, rest, and physical therapy for at least 1 month was tried in all patients without significant improvement.

The time of follow-up examination ranged from 1.2 to 10 years (average, 5.1 years). The average Lysholm score preoperatively was  $64.1 \pm 4.54$  and postoperatively was  $96.4 \pm 2.30$ ; this was statistically significant ( $P = .01$ ). Arthroscopic debridement of the hypertrophic synovium was especially effective for pain relief; this parameter increased from  $4.3 \pm 3.70$  to  $23 \pm 2.58$  points ( $P = .009$ ). Of the 21 patients, 17 (81%) were pain free within 1 week after arthroscopic debridement; 19 (90%) were pain free within 2 weeks; and all patients were free of pain within 3 weeks. Return to normal function, including sports, was achieved for all patients in 2 to 8 weeks, with 14 of 21 (67%) returning to normal function and sports within 1 month.

Magnetic resonance imaging evaluation showed a grade II lesion (increased signal within the meniscus: tear unlikely, according to the classification of Reicher et al.<sup>9</sup>) of the posterior horn of the medial meniscus in 5 knees. A grade III lesion (increased density within the meniscus reaching cartilage surface: probable tear) of the posterior horn of the medial meniscus was found in 2 knees. However, all these knees had intact menisci at the time of arthroscopic evaluation.

## DISCUSSION

Anterior medial knee pain is a common presenting complaint to the orthopaedist and has many potential



**FIGURE 7.** Intraoperative view during knee motion. (A) Impingement of the hypertrophied synovium against the medial femoral condyle with the knee in extension is shown. (B) Same knee in flexion. The chondromalacia changes are visible in the medial femoral condyle.

origins. The differential diagnosis includes a wide variety of entities, such as meniscal tears, chondromalacia of the medial femoral condyle, plica syndrome,<sup>2-4</sup> and meniscal impingement syndrome.<sup>10</sup> The last two entities are less common causes of anterior medial knee pain.

Meniscal impingement syndrome has been described by McGuire et al.<sup>10</sup> The elements of this condition are knee hyperextension of at least 5°, articular cartilage injury of the medial femoral condyle of at least Outerbridge grade III, and impingement by the leading edge of the anterior horn of the medial meniscus.<sup>10</sup> This abnormal contact between the femoral condyle and the meniscal rim results in articular cartilage injury and pain. Despite severe cartilage injury, the authors report good results at final follow-up, after arthroscopic debridement of the articular cartilage damage and fat pad at the anterior edge of the medial meniscus.<sup>10</sup>

Synovial plicae of the knee are normal structures. Some authors have tried to investigate their classification and incidences.<sup>11-13</sup> However sometimes the mediopatellar plica<sup>2,14,15</sup> and commonly the infrapatellar plica<sup>4</sup> cause symptoms and are responsible for so-called plica syndrome. It has been hypothesized that repetitive trauma of the knee causes a plica to become symptomatic.<sup>5,6</sup> The result is fibrosis of the plica, irritation of the medial femoral condyle with subsequent changes of chondromalacia, and knee pain.<sup>5,6</sup>

In our patients, the hypertrophic synovium was believed to be the cause of the chondromalacia changes. However, in contrast to plica syndrome, in which hypertrophy and fibrosis occur in the plica itself, these patients developed hypertrophy of the synovium in different anatomic regions than the normal mediopatellar plica, usually above the anterior horn of the medial meniscus. Except for this, the changes of chondromalacia of the medial femoral condyle in our group were mild. This was despite the severe grade III cartilage damage that has been reported in the meniscal impingement syndrome.<sup>10</sup>

All but 1 of the patients in our series had a history of low-energy knee trauma. A direct blow, such as a fall or hitting against a hard surface, was the mechanism of injury in 14 of these 20 (70%) patients, and a twisting injury was the mechanism in 6 cases (30%). Only 1 patient had high-energy trauma that caused a patellar fracture. It seems that knee injury is the causal factor that leads to this condition. Other authors have proposed that trauma of the knee causes inflammation of the synovium with subsequent histological

changes.<sup>5,6</sup> Cyclops syndrome formation as a result of trauma in a knee not treated with anterior cruciate ligament reconstruction was also reported in the literature.<sup>16</sup>

The hypertrophic synovium had a polyp-type or an abundant, prominent appearance in most cases (19 of 21). It originated from the synovium above the anterior horn of the medial meniscus with a wide base. In the majority of cases, this pathologic tissue does not cause severe cartilage lesions. Mild or no cartilage injury was observed in 20 of 21 patients. Only 1 of the 21 patients had a grade III lesion according to the Outerbridge classification.<sup>7</sup> Additionally, no relationship was found between the chronicity of the symptoms and the cartilage lesions. No specific treatment was undertaken for the cartilage lesions. Because the pain resolved with arthroscopic removal of the hypertrophic synovium, we believe that the cartilage lesions do not contribute significantly to the symptoms. Furthermore, it is difficult to determine whether the pathologic tissue results in cartilage lesions or whether the lesions resulted from the trauma. In all cases, the inflamed tissue was in close contact with the area of cartilage lesions. Therefore, we conclude that, at least in some degree, it causes the cartilage damage.

Clinically, pain in the anteromedial aspect of the knee joint, medial to the patellar tendon and just above the joint line, was the main finding. The combination of changes of chondromalacia and local synovitis is a possible explanation for the pain. A "catching" sensation was noted by some patients. Probably, the interposition of the "pseudotumor" between the capsule and the medial femoral condyle caused this symptom. Arthroscopic debridement of this "pseudotumor" resulted in pain relief in all patients in a very short period of time. Because cartilage lesions of the medial femoral condyle are not severe, no special treatment is needed.

Preoperatively, MRI in 7 patients revealed only a grade II or III lesion of the posterior horn of the medial meniscus and no evidence of hypertrophic synovium. Therefore, MRI is not a reliable examination to detect this condition.

In conclusion, hypertrophy of the synovium in the anteromedial joint compartment may result following minor trauma. This entity is an unusual cause of anterior medial knee pain. Diagnosis is based on clinical and arthroscopic findings. The impingement of the hypertrophic synovium causes mild chondromalacia changes of the medial femoral condyle. Arthroscopic debridement is the proposed method of treatment, with excellent results.

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