Arthroscopic Synovectomy in Bilateral Lipoma Arborescens

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Abstract

Introduction: Lipoma arborescens (LA) is an uncommon condition that consists of a villous lipomatous proliferation of the synovial membrane. Open synovectomy has been previously selected as a curative treatment option. In recent years, some authors have published good results with arthroscopic interventions. We describe a well-documented case of bilateral LA of the knees treated with staged arthroscopic synovectomy.

Case Report: A 48-year-old North American woman without a history of trauma presented with recurrent effusions and mild pain in both knee joints for many years. Magnetic resonance imaging examinations confirmed the diagnosis of bilateral LA with multiple villous lipomatous synovial proliferations pattern. Degenerative changes of the medial meniscus were detected bilaterally. The patient underwent bilateral arthroscopic anterior synovectomy and partial medial meniscectomy of the knee with three portal techniques. Arthroscopic the knee joint contained a large number or finger-shaped synovial proliferations with yellowish good vascularized diffuse villous masses in the suprapatellar bursa and intercondylar fossa. The cartilage showed degenerative changes with Outerbridge Grade II to III, which was particularly severe in the femoropatellar compartment. Histopathological examination of the villous masses demonstrated papillary hypertrophy, slight hyperplasia, vascular hyperplasia with a slight degree of stromal fibrosis, and interstitial lymphoplasmacytic inflammation. The adipose cells were reduced in number in relation to a normal finding but had a normal aspect without any pathological changes. 25 months after the first operation, the patient reported pain relief with the preserved function. Magnetic resonance examination of both knee joints at the last follow-up showed no relapse of the disease. The Knee injury and Osteoarthritis Outcome Score improved on the right knee joint from 39.3 preoperatively to 85.1 at the last follow-up, and on the left knee joint from 54.2 preoperatively to 86.3 at the last follow-up.

Conclusion: Arthroscopic anterior synovectomy is an efficient method of achieving good results in LA with multiple villous lipomatous synovial proliferations pattern.

Keywords: Lipoma arborescens, villous lipomatous proliferation, synovial membrane, knee arthroscopy.
Introduction

Lipoma arborescens (LA) is an uncommon, poorly understood condition that consists of a villous lipomatous proliferation of the synovial membrane [1]. The term “arborescens” originated from the Latin word arbor meaning tree, describing the macroscopic morphology of the lesion. It usually affects adults with a slight predilection for males [2]. Although typically monoarticular and found in the suprapatellar pouch of knee joints, involvement of other joints and bursae is known [3, 4]. Bilateral disease is extremely rare and has been reported in 20% of cases [5]. LA usually presents with painless swelling and recurrent joint effusion. An increasing number of cases have recently been described, attributable to the increased use and diagnostic sensitivity of magnetic resonance imaging, revealing the pathognomonic findings of LA [6]. Laboratory findings and joint fluid analysis are mostly unremarkable.

The macroscopic aspect is characterized by a large number of finger-shaped synovial proliferations, histologically composed of adipose tissue.

The etiologies most frequently advocated are developmental, traumatic, inflammatory, and neoplastic [7].

Three distinct patterns of LA have been identified; the most common of which is a diffuse villous proliferation, although a frond-like fat synovial mass lesion and a mixed pattern have also been observed [8].

LA has been associated to many comorbidities: Rheumatoid arthritis, osteoarthritis, psoriasis, uveitis, juvenile ankylosing spondylitis [9], gout [8], trauma [9], and hypothyroidism [2].

Open synovectomy was previously selected as curative treatment option [10]. In recent years, many authors have published good results with arthroscopic interventions [11, 12, 13].

We describe and illustrate the clinical, histological and radiological results of a case of bilateral LA of the knees treated with staged arthroscopic synovectomy with 2-year follow-up.

Case Report

The patient, a physically active, otherwise healthy 48-year-old North American woman, presented with recurrent effusions and mild pain for almost 10 years in both knee joints. By increasing her sporting activity (ski mountaineering) pain and swelling worsened. No history of knee trauma was reported. Local examination revealed a swelling of the knee joints with fullness in the suprapatellar region. Tenderness on palpation and medial meniscal tear signs were elicited in both knee joints. Flexion was slightly limited for the right knee and normal on the left knee.

The symptoms on the right knee were more pronounced. Routine laboratory tests were unremarkable, and plain radiographs of both knee joints showed moderate degenerative changes with physiological tibiofemoral axes. With the working diagnosis of bilateral gonarthritis and persistent swelling, the patient was referred for magnetic resonance investigation of both knees to select the appropriate therapy (Fig. 1a, b).

T1 and T2 weighted images showed high signal intensity of the villous projections similar to subcutaneous fat in the suprapatellar pouch. Fat-suppressed proton density images revealed complete suppression of signal intensity. Degenerative changes of the medial meniscus were present in both knee joints. The diagnosis of LA was made. The patient underwent arthroscopic anterior synovectomy and partial medial meniscectomy of the right knee with the three portal techniques. With the use of punches and graspers, fragments of the proliferating lesion were collected from different compartments of the knee for histopathological examination. All villous projections were then resected under direct visual control using a synovial shaver 5 mm and coagulation device. We first addressed the medial compartment with a craniocaudal resection from the anteromedial portal and afterward the lateral compartment in the same way using the shaver in the anterolateral portal. Following synovectomy, arthroscopic inspection confirmed complete excision of the lesion. The operation was completed with electrosurgical arthroscopic patellar denervation. 2 days postoperatively, after reabsorbing of swelling, early full weight-bearing and functional treatment were implemented. The arthroscopic synovectomy
Osteoarthritis Outcome Score (KOOS) was collected preoperatively and at the last follow-up.

Arthroscopic the knee joint contained a large number or finger-shaped synovial proliferations with yellowish good vascularized diffuse villous masses in the suprapatellar bursa and intercondylar fossa (Fig. 2a). The cartilage showed degenerative changes with Outerbridge Grade II to III which was particularly severe in the femoropatellar compartment. Histopathological examination of the villous masses demonstrated papillary hypertrophy, slight hyperplasia, vascular hyperplasia with a slight degree of stromal fibrosis, and interstitial lymphoplasmacytic inflammation. The adipose cells were reduced in number in relation to a normal finding but had a normal aspect without any pathological changes (Fig. 3). 25 months after the first operation, the patient reported pain relief with preserved function. Magnetic resonance examination of both knee joints at the last follow-up showed no relapse of the disease (Fig. 4a and b). The KOOS improved on the right knee joint from 39.3 preoperatively to 85.1 at the last follow-up, and on the left knee joint from 54.2 preoperatively to 86.3 at the last follow-up.

Discussion

Hoffa was the first author to describe the presented condition, [14] underlining the non-neoplastic nature of the lesion. In 1988, Hallel et al. reporting on five patients, discarded the name of LA in favor of “villous lipomatous proliferation of the synovial membrane” to avoid the misleading concept of neoplasm [7].

In our histological findings, although a few residual fat cells were present, the degree of fatty change of the synovium was actually reduced relative to the normal condition, and certainly did not give the impression of fatty hypertrophy, neoplastic or otherwise.

Sola and Wright, in 1998, were the first authors reporting good results with 2-year follow-up after arthroscopic synovectomy in LA [11]. Due to the rarity of the condition and the few reports in the literature the best arthroscopic approach remains unknown.

Figure 2: (a and b) Arthroscopic appearance of bilateral lipoma arborescens in our patient (left knee). The patient in dorsal decubitus with arthroscopic leg holder. Arthroscope in the recessus suprapatellaris through the anterolateral portal; instrumentation in the anteromedial portal. There are numerous finger-shaped synovial proliferations with yellowish, well vascularized, diffuse villous masses.

Figure 3: Histopathological examination HE (×20), demonstrating vascular hyperplasia with a slight degree of stromal fibrosis, moderate degree of interstitial lymphoplasmacytic inflammation, and mature adipose cells.

Figure 4: (a and b) Magnetic resonance imaging findings at the last follow-up ([a] right knee I: EPDW_SPIR coronal, II: ET1W_TSE sagittal; III: EPDW_SPAIR axial, and IV: EPDW_SPAIR sagittal; [b] left knee I: EPDW_SPIR coronal, II: ET1W_TSE sagittal; III: EPDW_SPAIR axial, and IV: EPDW_SPAIR sagittal): Post-operative complete ablation of the papillary formations; persistence of bone marrow reconversion.
| Year | First Author | Age (y) | Gender (m/f) | Localization | Treatment | Follow-up | Outcomes |
|------|--------------|---------|--------------|--------------|-----------|-----------|----------|
| 1904 | Hoffa        |         |              |              | Arthrotomy with extirpation of the lesion |           | Positive follow-up with improvement of the symptoms. |
| 1957 | Arzimanoglu  | 19      | f            | bilateral    | OS/capsulectomy with lateral parapatellar approach, Patellar trimming. Same surgical treatment of the right knee two months later with medial parapatellar approach. | 3 years   | Asymptomatic with no recurrence. Both knees had limited flexion to 80°. |
| 1961 | Gäde         |         |              | bilateral    | After conservative treatment and steroid injections, the patient underwent OS and patellectomy with manipulation under anesthesia. | 18 months | Good mobilisation but cracking in the knee. |
| 1965 | Weitzman     | 26      | m            |              | OS. Postoperative stiffness treated | 6 months  | Asymptomatic and activity as before the trauma. |
| 1966 | Coventry     | 9       | f            | polyarticular| Open excision twice after recidive one year after the first operation | 4 years   | Swelling of the thigh and occasional aching in the knee. Normal life with unrestricted activity and full ROM. |
| 1971 | Burgan       | 39      | m            |              | OS | 5 months | Extension deficit |
| 1980 | Hermann      | 49      | m            |              | Diagnostic arthroscopy and OS | ?         | Asymptomatic. |
| 1988 | Hallel       | 39      | m            | bilateral    | Open anterior synovectomy of the right knee and one year later of the left knee. | 10 years  | No swelling. Still slight pain with weather changes. ROM flexion/extension on the right knee 100-0-0° and on the left knee 130-0-0°. Patellar compression with tenderness. |
| 1988 |              | 66      | m            |              | OS with Guepar TKA. Prostesis revision after loosening six years later. No recidive signs | 3 years   | No synovial thickening and no loosening of the prosthesis. |
| 1990 |              | 56      | m            | bilateral    | OS of the left knee | 8.5 years | Pain on both knees (right more than left). No swelling of the left knee. |
| 1990 |              | 56      | m            |              | OS in combination with tibial valgus osteotomy | 5 years   | No pain, no swelling in the right knee. Full ROM. |
| 1993 | Edamitsu     | 55      | f            |              | OS | 1 year | No clinical recurrence with normal working activity and soccer playing. |
| 1993 |              | 37      |              |              | OS | 4 year | No clinical recurrence with normal working activity and soccer playing. |
| 1995 | Blais        | 48      | f            |              | Diagnostic arthroscopy and open anterior synovectomy/capsulectomy and hoffectomy with medial parapatellar approach | 1 year | Asymptomatic |
| 1996 | Bouraoui     | 41      | m            |              | Treatment with steroidal injection; diagnostic arthroscopy with biopsy followed by OS | 6 months  | Clear reduction of the pain and ROM for flexion/extension 110-0-0°' |
| 1996 | Mestiri      | 41      | m            |              | Diagnostic arthroscopy and OS | 16 months | Positive follow-up with improvement of the symptoms. |
| 1997 | Ikushima     | 44      | m            |              | OS with medial parapatellar approach. | ?         | Positive follow-up with improvement of the symptoms but only partial improvement of the flexion to 90°. |

(Contd...)
| Year  | First Author | Age (y) | Gender (m/f ) | Localization | Treatment                                                                 | Follow-up | Outcomes                               |
|-------|--------------|---------|---------------|--------------|----------------------------------------------------------------------------|-----------|----------------------------------------|
| 1998  | Sola         | 58      | m             | bilateral    | Conservative treatment with steroidal injection; Clinical recurrence treated with arthroscopic meniscectomy and synovectomy of both knee joints. | 2 years   | Asymptomatic                           |
| 1998  | Haasbeek     | 10      | m             | bilateral    | Bilateral arthroscopic synovectomies                                      | >1 year   | Asymptomatic with no recurrence.       |
| 1998  | Kloen        | 50      | m             | bilateral    | Diagnostic arthroscopy; five months later OS; postoperative stiffness treated with manipulation under anesthesia. | 20 years  | Severe movement limitations but neither pain nor swelling. |
|       |              | 28      | f             |              | Diagnostic arthroscopy and open synovectomy                               | 4 years   | No pain but occasionally swelling.     |
|       |              | 50      | m             | bilateral    | OS with median parapatellar incision of the right knee. Two years later OS of the left knee. | ?         | Persistent swelling and pain of both knees after the operation. The patient died few time later of malignant lymphome. |
|       |              | 19      | f             |              | Diagnostic arthroscopy and open synovectomy                               | 1 year    | Painfree but slight swelling and ROM for flexion/extension 125-0-0'. |
| 1998  | Nisolle      | 13      | m             |              | Diagnostic arthroscopy with biopsy; Treatment with osmic acid injection.  | 1 year    | Asymptomatic                           |
| 2002  | Franco       | 48      | f             |              | Diagnostic arthroscopy and open anterior synovectomy                      | 2 years   | Asymptomatic                           |
| 2003  | Erselcan     | 36      | f             |              | Diagnostic arthroscopy with biopsy; 185MBq Yttrium 90 with 40mg of Methylprednisolone | 16 months | Asymptomatic                           |
| 2003  | Yildiz       | 47      | m             |              | AS                                                                         | 3 years   | Asymptomatic                           |
|       |              | 16      | m             |              | AS                                                                         | 2 years   | Asymptomatic                           |
| 2004  | Kim          | 44      | f             |              | AS                                                                         | 1 year    | Asymptomatic                           |
| 2005  | Çil          | 13      | f             | bilateral    | AS with mini-transquadricipital incision as described by Doral et al.     | 3 years   | Asymptomatic                           |
| 2005  | Davies       | 32      | f             | bilateral    | Right knee treated with OS; left knee treated after the left knee with 200 MBq of Yttrium 90, 40 mg Triamcinolone and 5 ml 1% lignocaine (improvement of symptoms for two years); relapse treated with intra-articular steroidal injections; and at the end with OS. | ?         | Positive follow-up with improvement of the symptoms after surgery. |
| 2008  | Arzouz       | 37      | m             |              | OS                                                                         | 1 year    | Asymptomatic                           |
| 2008  | Yan          | 45      | m             | bilateral    | AS of the right knee joint; associated treatment for gout.                | 7 years   | Asymptomatic                           |
| 2009  | Santiago     | 29      | f             | bilateral    | AS of one side.                                                           | ?         | Positive follow-up with improvement of the symptoms. |
| 2010  | Checa        | 69      | f             | (polyarticular) | Conservative treatment with steroidal injection and physiotherapy; Clinical recurrence treated with AS. | 14 months | Asymptomatic                           |
| 2010  | Ji           | 60      | f             |              | AS                                                                         | 1 year    | Symptoms improved with normal ROM but beginning clinical and radiological osteoarthritis of the knee joint. |
| 2010  | Utkan        | 56      | f             |              | AS                                                                         | 1 year    | Asymptomatic                           |
| 2011  | Sailhan      | 37      | m             | bilateral    | AS                                                                         | 3 years   | Asymptomatic                           |
| 2011  | Xiao         | 13      | m             | bilateral    | AS of the left knee joint.                                                | 1 year    | Asymptomatic                           |
| 2011  | Xiao         | 66      | f             | bilateral    | Total knee arthroplasty with synovectomy of the left knee joint           | 18 months | Pain free                              |

(Contd...)
About 73 articles on LA of the knee have been found after research in PubMed and references of the articles. Articles in English, German, French, Italian, and Portuguese languages have been selected. 34 articles describing treatment and clinical follow-up are reported in Table 1 [14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 11, 27, 2, 1, 28, 29, 30, 31, 32, 33, 10, 12, 34, 13, 35, 36, 37, 38, 39].

Davies and Blewitt reported a case was radiosynoviorthesis with yttrium 90 was used with relapse after 2 years [33]. Nisolle et al. described one juvenile treated with osmic acid with good results but with a limited follow-up time of 1-year [1]. From the analysis of this table can be sustained that the arthroscopic synovectomy gets good long lasting results with less cases of flexion deficit than open synovectomy.

The pathological villous projections are usually strictly localized in the anterior compartments not affecting the posterior joint [17], justifying a treatment with sole employment of arthroscopy with anterior portals. The massive involvement of the patellofemoral joint represents a good reason to address this compartment with additional patellar denervation.

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## Clinical Message

LA should be included in the differential diagnosis of patients with recurrent knee joint effusions. In respect of the literature, arthroscopic synovectomy gives the good long lasting results compared to other techniques. A thorough analysis of the MRI is decisive to optimize the portals localization during knee arthroscopy.

## Conclusions

The arthroscopic treatment, if performed thoroughly in all knee compartments, has the same efficacy as the open surgery but with less cases of post-operative flexion deficit. Arthroscopy is less aggressive and permits early mobilization. We consider arthroscopic anterior synovectomy an efficient method of achieving lasting results in LA with diffuse villous proliferation pattern.
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