

Lipoma arborescens of the knee

Peter Kloen, Suzanne B. Keel, Hugh P. Chandler, Ronald H. Geiger, Bertram Zarins, Andrew E. Rosenberg

From Massachusetts General Hospital, Boston, USA

Lipoma arborescens is a rare intra-articular lesion, characterised by diffuse replacement of the subsynovial tissue by mature fat cells, producing prominent villous transformation of the synovium. The aetiology of this benign condition is unknown.

We describe six cases involving the knee discussing the symptoms, diagnosis and treatment.

J Bone Joint Surg [Br] 1998;80-B:298-301.

Received 4 August 1997; Accepted 1 October 1997

Neoplasms of the synovium are uncommon and occur in the lining of joints, bursae and tendons. Theoretically, any type of tumour can arise in the synovium, but most recapitulate the cell types and tissues of the articular and peri-articular tissues. Most of these lesions are benign.

Lipoma arborescens (treelike) is a very uncommon tumour of the synovium; only 19 cases have been reported.¹⁻¹⁴ We present six cases (Table I) involving the knee, and review the literature on this unusual lesion.

Case Reports

Case 1. A 50-year-old man gave a 14-year history of a painless swelling of the right knee which had started in the posterior aspect and had become more diffuse. Arthroscopy showed a yellow synovium with large villi and folds, but synovial biopsy gave no conclusive diagnosis. Five months later, the pain, swelling and limitation of movement were worse and an open synovectomy was performed. A fatty mass, 14 cm in diameter, with prominent lobules and folds

was found in the suprapatellar pouch and in the medial and lateral gutters. Grade 3 to 4 chondromalacia was present in the trochlea and patella. Histological examination showed mature adipose tissue, which had infiltrated and replaced the collagenous subintima of the synovium, bulging into and attenuating the overlying synovial cells. There was a focal patchy lymphoplasmacytic infiltration beneath the synovial cells. Thirteen days after operation severe limitation of movement required a manipulation under anaesthesia, causing a haemarthrosis which was aspirated. There was no early review, but at 20 years the patient had severe limitation of movement, but no pain or swelling.

Case 2. A 28-year-old woman with Turner's syndrome (45 XO) and psoriatic arthritis had had pain and stiffness in her right knee for seven years, despite a previous arthroscopic synovectomy. There was a palpable mass in the suprapatellar pouch with a large effusion, and movement limited to 10 to 110° of flexion. She had large psoriatic patches on the front of her right shin. Plain radiographs showed a mass, 14 × 11 × 4.5 cm, in the suprapatellar pouch. Arthroscopy, arthrotomy and synovectomy were performed. A large lobulated yellow fibrofatty mass filled the suprapatellar pouch and the medial and lateral gutters, but there was no evidence of arthritis. Histological examination showed mature adipose tissue with focal infiltration by lymphocytes and plasma cells, but normal synovial lining cells. Four years later there is no pain, but occasional swelling.

Cases 3 and 4. A 50-year-old man gave an 18-year history of a mass in the popliteal region of the right knee. This had increased in size and was painful, especially during exercise. There was a moderate effusion and the medial joint line was tender. An open synovectomy through a median parapatellar incision revealed a large mass in the suprapatellar pouch, and a partial medial meniscectomy was also performed. Due to the amount of bleeding a popliteal cyst was not removed. The excised mass, 12 × 9 × 0.5 cm, consisted of synovial tissue. The surface was smooth peripherally but centrally had yellow papillary projections, 5 mm in diameter and up to 5 mm in length. Histological examination showed sheets of mature adipocytes with scattered chronic inflammatory cells in the subintima. The synovial lining cells showed reactive hypertrophy. Ten days later the popliteal cyst

P. Kloen, MD
H. P. Chandler, MD
R. H. Geiger, MD
B. E. Zarins, MD
Department of Orthopaedic Surgery, Gray 6
S. B. Keel, MD
A. E. Rosenberg, MD
Department of Pathology, Warren 2
Massachusetts General Hospital, Fruit Street, Boston, Massachusetts 02114, USA.

Correspondence should be sent to Dr P. Kloen.

©1998 British Editorial Society of Bone and Joint Surgery
0301-620X/98/28244 \$2.00

Table I. Details of six patients with lipoma arborescens of the knee

Case	Age (yr)	Gender	Symptoms/duration (yr)	Physical findings	Additional conditions	Treatment	Follow-up (yr)	Results
1	50	M	Pain Stiffness Swelling (14)	Large effusion	None	OS*	12	Pain-free No swelling
2	28	F	Pain Stiffness (7)	Mass in SPP†	Psoriasis Turner's syndrome	OS	4	Pain-free Occasional swelling
3	50	M	Pain Swelling (18)	Moderate effusion	Baker's cyst	OS	22	Mild pain Occasional swelling
4‡	52	M	Pain Swelling (2)	Small effusion Patellofemoral crepitus	None	OS	20	Mild pain Occasional swelling
5	19	F	Pain Swelling (5)	Large mass in SPP	Baker's cyst	OS	1	Pain-free Small effusion
6	68	F	Pain	Large effusion	Psoriasis Hypothyroidism Breast cancer Baker's cyst	OS	1	Pain-free Small effusion

* open synovectomy

† suprapatellar pouch

‡ representing contralateral involvement of case 3



Fig. 1

Case 5. MRI showing villous-like projections in the suprapatellar pouch with a signal density characteristic of fat.

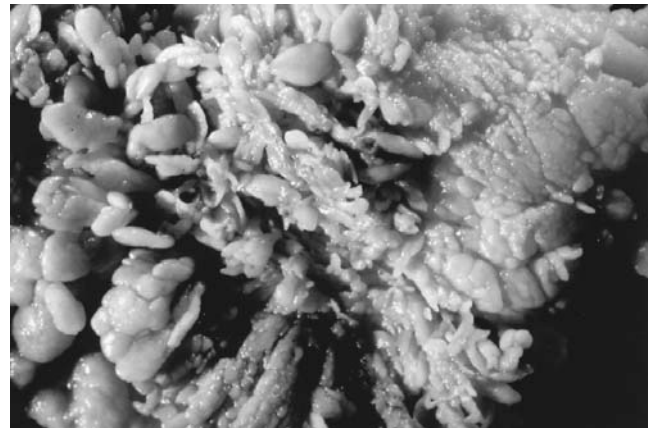


Fig. 2

Case 5. Photograph showing the villous architecture of the synovium.

was excised and was shown to be a Baker's cyst.

Two years later he complained of intermittent swelling and pain in the left knee. There was a small effusion, restriction of movement, mild patellar crepitus, and laxity of the medial collateral ligament. At open synovectomy a large mass containing villous fronds of adipose tissue and an inflammatory cell infiltrate was excised. He had occasional swelling and mild pain in both knees until he died of malignant lymphoma at the age of 72 years.

Case 5. A 19-year-old woman gave a five-year history of swelling in the right knee with occasional pain. She was thought to have rheumatoid arthritis, but MRI showed villous-like projections in the synovium with fat density (Fig. 1), and a large Baker's cyst. Arthroscopy revealed a large frond-like yellow mass, 11 × 8 × 3 cm in size, in the

suprapatellar pouch which did not extend into the popliteal area. An open anterior synovectomy was undertaken to remove it (Fig. 2). Histological examination showed the villi to be composed of fibrous tissue and mature adipose tissue within the subintima of the synovium (Fig. 3). A moderately dense, follicular, diffuse lymphoplasmacytic infiltrate was present focally within the fat (Fig. 4). One year after operation the patient still had a small effusion, but she was free from pain and her range of movement was 0 to 125°.

Case 6. A 68-year-old woman gave a history of swelling and pain in the left knee after a fall five years previously. Arthroscopy four years ago had shown chondromalacia in all three compartments, and the swelling had gradually increased. She now had a large effusion, tenderness in the

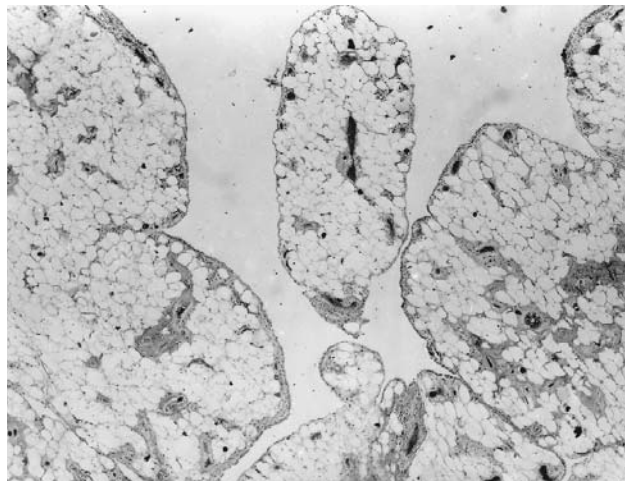


Fig. 3

Case 5. Sheets of adipocytes are present in the subsynovium, causing villous expansion of the synovium (haematoxylin and eosin $\times 30$).

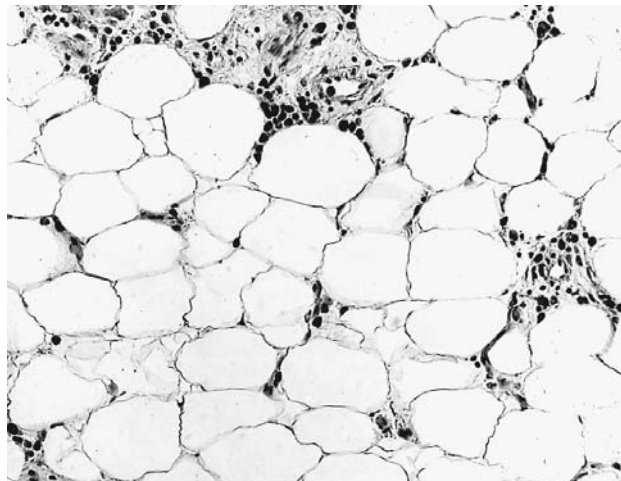


Fig. 4

Case 5. The synovial lining cells overlying the fat are reactive. A mild mononuclear inflammatory cell infiltrate is present between the adipocytes (haematoxylin and eosin $\times 130$).

suprapatellar pouch and a limited range of movement. MRI showed a large joint effusion, arborescent fat lobules, a multiloculated popliteal cyst, and erosions along the tibial plateau. At open synovectomy, a large frond-like mass was excised from the suprapatellar pouch. Half of the resected specimen was covered with yellow polypoid structures averaging 0.3×0.3 cm in size. Histological examination showed synovium thickened by adipose tissue which contained a predominantly follicular, lymphoplasmacytic inflammatory infiltrate deep to the reactive synovial lining cells. Twelve months after operation she is free from symptoms.

Discussion

Lipoma arborescens is a rare, benign intra-articular lesion of unknown aetiology in which there is diffuse replacement of the subsynovial tissue by mature fat cells, with prominent villous transformation of the synovium. Associated conditions have included osteoarthritis,^{1,2,4,10} joint trauma,^{11,14} diabetes mellitus,^{1,4,12} in 20% of the cases popliteal cysts were noted.^{1,4} Some patients presented without any other musculoskeletal disorder. The knee is most commonly involved, but the condition has also been described in the wrist,¹⁵ shoulder,^{16,17} and hip.¹¹ The mean age of the patients reported with lipoma arborescens of the knee is 43 years (9 to 68); 16 were male and 9 female.

Apart from the five patients described by Hallel et al¹⁰ all have been the subject of single case reports,^{1,3-9,12-14} some of which lacked pathological confirmation and clinical follow-up.^{1,4,6,8,9,11-13} Although Placeo and Tassi¹⁸ presented a large series of cases and suggested a traumatic origin for this lesion, their series has not been accepted as lipoma arborescens because it showed reactive synovial hyperplasia overlying normal deposits of fat.^{10,11}

Patients with lipoma arborescens usually have long-

standing, slowly progressive swelling of the involved joint, which may be associated with effusion, decreased range of movement and pain. There is a soft, painful, boggy swelling in the suprapatellar pouch, and laboratory tests are usually normal.

Plain radiographs may show tissue density in the suprapatellar pouch; ultrasound,^{9,12} CT,^{1,12} and arthrography^{1,3} have been used in diagnosis. The appearances on MRI are diagnostic and include a synovial mass with a frond-like architecture and a fat-signal intensity on all pulse sequences, which is suppressed using fat-selective presaturation. There is no evidence of magnetic susceptibility effects from haemosiderin; there is an associated effusion and a potential chemical shift artifact.^{4,6,8,9,13}

Macroscopically, lipoma arborescens has a frond-like appearance with numerous broad-based polypoid or thin papillary villi composed of fatty yellow tissue. Histologically, the villi are filled with mature adipose cells, and enlarged or congested hyperaemic capillaries may be present. The overlying synovial membrane may contain mononuclear chronic inflammatory cells and the synovial cells may appear to be enlarged and reactive, with abundant eosinophilic cytoplasm.

The differential diagnosis of a soft boggy swelling in the suprapatellar pouch includes pigmented villonodular synovitis, synovial lipoma, synovial chondromatosis, rheumatoid arthritis, synovial haemangioma, amyloid arthropathy, xanthomata, and lipoma arborescens. CT and MRI should narrow down the possible diagnoses. Pigmented villonodular synovitis has a low intensity on T1- and T2-weighted images due to haemosiderin accumulation, and on CT shows enhancement of the mass after administration of intravenous contrast. Rheumatoid arthritis can be differentiated from lipoma arborescens by the intermediate signal on T1-weighted and the decreased signal on T2-weighted

images. Low to intermediate signal intensities on T1- and T2-weighted images are characteristic of synovial chondromatosis and haemangiomas. Lipoma arborescens usually arises in the suprapatellar pouch, whereas synovial haemangioma and synovial lipoma are mainly found in the infrapatellar fat pad.¹⁹

Two of our five patients had a history of psoriatic arthritis, and this has also been documented in another recent case report.¹³ It is not clear whether diseases such as osteoarthritis, rheumatoid arthritis, and psoriatic arthritis cause lipoma arborescens, or are merely coincidental.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References

1. **Armstrong SJ, Watt I.** Lipoma arborescens of the knee. *Br J Radiol* 1989;62:178-80.
2. **Arzimanoglu A.** Bilateral arborescent lipoma of the knee. *J Bone Joint Surg [Am]* 1957;39-A:976-9.
3. **Burgan DW.** Lipoma arborescens of the knee: another cause of filling defects on a knee arthrogram. *Radiology* 1971;101:583-4.
4. **Chaljub G, Johnson PR.** In vivo MRI characteristics of lipoma arborescens utilizing fat suppression and contrast administration. *J Comput Assist Tomogr* 1996;20:85-7.
5. **Coventry MB, Harrison GE, Martin JF.** Benign synovial tumors of the knee: a diagnostic problem. *J Bone Joint Surg [Am]* 1966; 48-A:1350-8.
6. **Donnelly LF, Bisset GS III, Passo MH.** MRI findings of lipoma arborescens of the knee in a child: case report. *Pediatr Radiol* 1994; 24:258-9.
7. **Edamitsu S, Mizuta H, Kubota K, Matsukawa A, Takagi K.** Lipoma arborescens with hemarthrosis of the knee. *Acta Orthop Scand* 1993;64:601-2.
8. **Feller JF, Rishi M, Hughes EC.** Lipoma arborescens of the knee: MR demonstration. *Am J Roentgenol* 1994;163:162-4.
9. **Grieten M, Buckwalter KA, Cardinal E, Rougraff B.** Case report 873: lipoma arborescens (villous lipomatous proliferation of the synovial membrane). *Skeletal Radiol* 1994;23:652-5.
10. **Hallel T, Lew S, Saba K, Bansal M.** Villous lipomatous proliferation of the synovial membrane (lipoma arborescens). *J Bone Joint Surg [Am]* 1988;70-A:264-70.
11. **Hubscher O, Costanza E, Elsner B.** Chronic monoarthritis due to lipoma arborescens. *J Rheumatol* 1990;17:861-2.
12. **Martinez D, Millner PA, Coral A, et al.** Case report 745: synovial lipoma arborescens. *Skeletal Radiol* 1992;21:393-5.
13. **Roberts WN, Hayes CW, Breitbach SA, Owen DS.** Dry taps and what to do about them: a pictorial essay on failed arthrocentesis of the knee. *Am J Med* 1996;100:461-4.
14. **Weitzman G.** Lipoma arborescens of the knee: report of a case. *J Bone Joint Surg [Am]* 1965;47-A:1030-3.
15. **Napolitano A.** Lipoma arborescens of the synovial fluid: clinical contribution to a case located at the synovia of the wrist. *Progresso Medico* 1957;13:109-18.
16. **Dawson JS, Dowling F, Preston BJ, Neumann L.** Case report: lipoma arborescens of the sub-deltoid bursa. *Br J Radiol* 1995; 68:197-9.
17. **Laorr A, Peterfy CG, Tirman PF, Rabassa AE.** Lipoma arborescens of the shoulder: magnetic resonance imaging findings. *Can Assoc Radiol J* 1995;46:311-3.
18. **Placeo F, Tassi D.** Considerazioni cliniche su 62 osservazioni di lipoma arborescente posttraumatico del ginocchio come entita patologica a se stante ed associata a lesione meniscale. *Minerva Chir* 1953; 8:316-22.
19. **Mink JH, Reicher M, Crues J, Deutsch A.** *Magnetic resonance imaging of the knee.* 2nd Ed. New York: Raven Press, 1993:344-53.