

## Lipoma arborescens; successfully treated by yttrium-90 radiosynovectomy

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Although radiosynovectomy (RS) applications have been carried out for many years, clinical indications of this non-invasive procedure is thought to be limited probably due to the lack of information of clinicians. Clinicians' preferential indication for RS is the treatment-resistant synovitis of individual joints, i.e. despite systemic pharmacotherapy and intra-articular steroid injections. We present here a case of "lipoma arborescens" treated by yttrium-90, which is a rare intra-articular lesion characterized by villous proliferation of the synovial membrane and hyperplasia of subsynovial fat. The results of clinical, biochemical and hematological examinations, magnetic resonance (MR) imaging, arthroscopy and histological analysis have shown that the etiology was lipoma arborescens in a female patient, aged 36 having swelling and sometimes associating pain at her right knee for 4 years. We have applied to our patient's right knee RS with 185 MBq yttrium-90 colloid together with 40 mg of methylprednisolone acetate, although in our literature survey we have not met any similar case being treated with such indication. Even a year after the application, the patient has absolutely benefited from the treatment clinically, and this was also confirmed by comparative MR images (pre- and post-treatment). Consequently, we consider that Y-90 treatment might be applicable in suitable cases with lipoma arborescens.

**Key words:** lipoma arborescens, yttrium-90, radionuclide synovectomy, synoviorthesis

### INTRODUCTION

RADIOSYNOVECTOMY (RS) applications have been carried out for many years. However, clinical indications of this non-invasive procedure are thought to be limited probably due to the lack of information of clinicians. Synovectomy by radioisotopes was first tried in the 1950s.<sup>1</sup> Clinicians' preferential indication for RS is the treatment-resistant synovitis of individual joints, i.e. despite systemic pharmacotherapy and intra-articular steroid injections.<sup>2</sup> On the other hand, many patients with a variety of articular pathology may benefit from RS without losing a time.

We present here a case of lipoma arborescens (LA), successfully treated with yttrium-90 colloid, although we

have not met any similar case being treated with such indication in our literature survey.

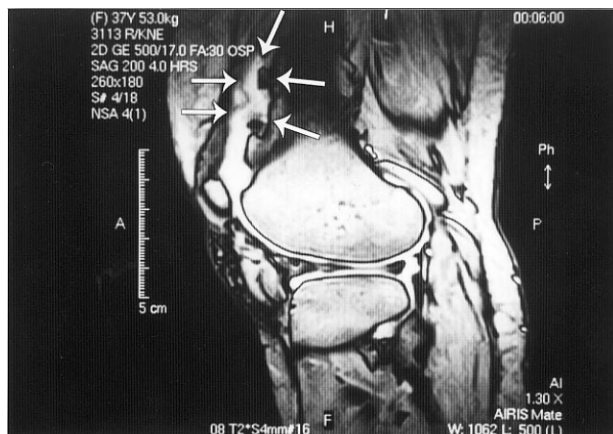
### CASE REPORT

A 36-year-old woman presented the orthopedics outpatient clinic with a history of swelling and sometimes associating pain at her right knee for 4 years. On physical examination, a mild effusion at the right knee was noted together with a 2.5-cm difference between the circumferences of the two knees. There was also atrophy about 1-cm at right lower thigh. The range of the motion of the right knee joint was 5° to 125°. McMurray sign was positive for lateral meniscus. Tests for instability were negative. There was no specific finding in biochemical and hematological examinations, such as sedimentation rate or serum C-reactive protein level. Culture of joint fluid was negative as well. Femoral and tibiofemoral appearance were within normal limits in direct radiographs (antero-posterior,

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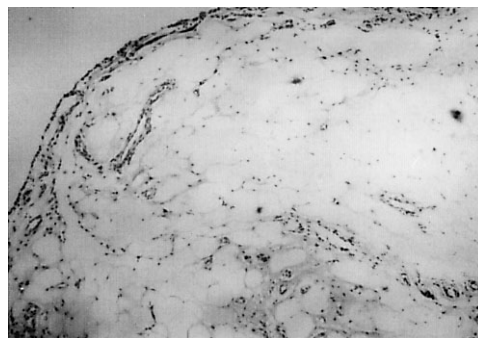
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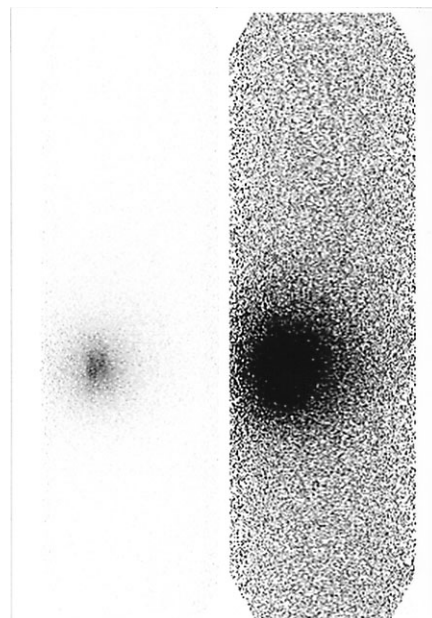
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**Fig. 1** MRI of the right knee. a: Pre-treatment sagittal SE MR image (TR: 500 ms, TE: 17 ms, FA: 30) demonstrates multiple frond-like projections of similar signal intensity to fat in suprapatellar bursae and associated joint effusion. b: Post-treatment sagittal SE MR image (TR: 670 ms, TE: 15 ms, FA: 20) 14 months later. Note disappearance of lipomatous fronds and the decrease in joint effusion.

lateral and tangential patella). However, magnetic resonance imaging (MRI) demonstrated multiple frond-like projections of similar signal intensity to fat in suprapatellar bursae and associated joint effusion (Fig. 1a). Arthroscopic examination revealed an extensive suprapatellar villous formation lining into suprapatellar recess. A small tear of the lateral meniscus also was seen. There was no another notable macroscopic finding except minimal fibrillation (grade II) on cartilage of the patellar joint. After specimens had been obtained for pathological analysis, the lateral meniscus was debrided. Histological examination of the arthroscopic biopsy material revealed mature adipose tissue in the subsynovial layer confirming diagnosis of lipoma arborescens (Fig. 2). With a view that surgical approach might have a risk of relapse in our case showing peripheral lesion extension, two weeks later, we have applied to the right knee of patient 185 MBq yttrium-



**Fig. 2** Microscopic appearance of a cross section of the lesion; mature adipose tissue in the subsynovial layer ( $\times 40$ ).



**Fig. 3** Whole body (anterior) scintigraphy at 24 hours post-injection in leakage monitoring; Y-90 is restricted in the right knee without any near or far contamination in any region of the body. Image at the right is the same of the left with a difference in contrast enhancement in order to better visualizing rest of the body parts.

90 colloid suspension (CIS Bio International, France) together with 40 mg of methylprednisolone acetate. The routine protocol of Y-90 injection was followed in such a way that, first the knee was aspirated for any effusion, thus the point of the needle was assured to be in intraarticular space. Strictly intraarticular injection was maintained and Y-90 colloid suspension was injected. This was followed by methylprednisolone acetate injection by the same route and at the same time the needle was rinsed with corticosteroid solution to avoid reflux and cutaneous radionecrosis. Patient was hospitalized in nuclear medicine clinic for 3 days with a knee-resting splint immobilization. No inguinal or abdominal radionuclide activity

was seen in scintigraphic follow up at 6 and 24 hours post injection (Fig. 3). The complete release of the symptoms was observed from first month of the therapy. The patient was clinically very well one year later and this was confirmed by MR imaging (Fig. 1b). After sixteen months, the patient remained still asymptomatic with a normal examination and knee function.

## DISCUSSION

Lipoma arborescens is said to be a rare intra-articular lesion.<sup>3-6</sup> Some authors have met 20 reported cases of LA involving knee in their literature survey,<sup>7</sup> however some reported 12 cases<sup>8</sup> and some reported 4 cases in two years.<sup>9</sup> Kloen et al. have reported that the youngest LA patient was 9 years old and the oldest one 68 years old.<sup>10</sup> LA is characterized by villous proliferation of the synovial membrane and hyperplasia of subsynovial fat.<sup>8,11</sup> Although it has been described as arising from traumatic, inflammatory, rheumatologic, developmental, and neoplastic causes, its etiology remains unknown.<sup>3</sup> Trauma has long been suspected to be a triggering agent in various types of synovitis.<sup>11</sup> Our patient had a small tear in lateral meniscus.

LA affects usually knee (monoarticular) and found in the suprapatellar bursa, however, involvement of the hip, shoulder, ankle and wrist joints, as well as of the subdeltoid bursa, has been reported.<sup>5</sup> Occasionally, bilateral presentation may be encountered.<sup>5</sup> Symptoms consist of gradual joint swelling, variable pain, motion range restriction, and intermittent joint effusions or bleeding.<sup>6</sup> Based on clinical, radiological, and surgical evaluation, differential diagnosis for this lesion should include other conditions that cause synovial thickening, proliferation, and joint effusion such as, synovial chondromatosis, pigmented villonodular synovitis, synovial hemangiomas, and rheumatoid arthritis.<sup>3</sup> MR imaging is a valuable technique for examining patients with lipoma arborescens of the knee and can support the diagnosis of this rare condition.<sup>8</sup> In addition magnetic resonance imaging is a valuable tool to differentiate the lesion from rheumatoid arthritis, pigmented villonodular synovitis, and synovial chondromatosis in those patients who present with a chronic, swollen, and painful joint.<sup>12</sup> Ryu et al. reported MR imaging findings in LA as villous lipomatous proliferation (in 100% of cases) with signal intensity similar to that of fat on T1- and T2-weighted images, masslike subsynovial fat deposition (38%), joint effusion (100%), erosive bone changes at articular margins (38%), associated synovial cysts (25%), and degenerative changes (13%).<sup>13</sup> Multiple villous lipomatous synovial proliferations and mixed pattern have been found to be usually associated with a history of trauma and/or chronic inflammatory diseases.<sup>8</sup> Soler et al. reported a variety of morphological appearances on MR imaging relating the duration of the disease. The durations of symptoms were

relatively short in multiple villous lipomatous synovial proliferation (1–7 months), while 1–20 years in mixed pattern and 6–7 years in isolated frond-like subsynovial fat mass.<sup>8</sup> Arthroscopically, the lesion appears as a synovial lesion with numerous fatty-appearing globules and villous projections.<sup>12</sup> Histological studies show hyperplastic villi with mature adipose cells in the subsynovial layer.<sup>7,11</sup>

The known treatment for lipoma arborescens today is surgical, which is in the form of open synovectomy and/or arthroscopic synovectomy. We have not met RS application in LA in our literature survey. However, with a view that surgical approach might have a risk of relapse in our case showing peripheral lesion extension, and that it was small in size and seems appropriate for RS, we have applied Y-90 treatment. Indeed Sola et al. reported a need for a second arthroscopic synovectomy 6 weeks apart in their case due to another lesion presented itself in another location of the affected knee.<sup>7</sup>

Synovectomy by radioisotopes was first tried in the 1950s and Delbarre introduced the term synoviorthesis for this treatment in 1968.<sup>1</sup> Synoviorthesis literally means the restoration (orthesis) of the synovia. The technique requires a radionuclide with the appropriate characteristics. Yttrium-90 (Y-90) became preferentially used in the 1970s because of improved  $\beta$  radiation.<sup>2</sup> The selection criteria of the radiopharmaceutical agent depend on the joint size, for which beta particle range of the applied isotope is taken into consideration. The radiopharmaceutical agent used for RS of knee joints is Y-90 silicate/citrate colloid. The mean ranges of its beta particle in soft tissue and in cartilage are 3.6 mm, and 11 mm, respectively.<sup>14</sup> Re-186 sulphide colloid is used for medium-sized joints (such as elbow). The mean range of its beta particle is 1.2 mm in soft tissue and 3.7 mm in cartilage. For small-sized joints (such as digital joints) the agent of choice is Er-169 sulphide colloid. The mean range of its beta particle is 0.3 mm in soft tissue and 1 mm in cartilage. In any case a particle size of about 5–10 nm is essential to avoid leakage. Radiation necrosis in the injection canal or the adjacent soft tissue is a rare side effect if the proper precautions are not taken.<sup>14</sup> We did not meet such a side effect in the presented case.

RS (or radiosynoviorthesis) is mainly used in patients suffering from rheumatoid arthritis, other inflammatory arthropathy, osteoarthritis and hemophilic arthropathy. Clinicians' preferential indication for RS is the treatment-resistant synovitis of individual joints, i.e. despite systemic pharmacotherapy and intra-articular steroid injections.<sup>2</sup> In fact, internationally, RS is not extensively performed and large differences in its use exist between countries for instance, it is regularly practiced in some countries (e.g. Australia and Canada) but virtually nonexistent in the United States.<sup>1</sup> However, in 1998, in 13 European countries, about 3000 patients were treated by RS.<sup>14</sup> The clinical effectiveness of yttrium-90 RS

has been much debated, and conflicting data have been published.

After intra-articular administration the superficial cells of the synovium absorb the radioactive particles. Beta radiation leads to coagulation necrosis and sloughing of these cells.<sup>14</sup> Some authors recommend a combination therapy of corticosteroid and radionuclide instillation to reduce local inflammation and to prolong residence time of the radiopharmaceutical agent in the joint. Response rate reported in the literature ranges from about 60 to 80%.<sup>14</sup>

The electrons of Y-90 are totally absorbed within the surrounding tissue and produce bremsstrahlung with a maximum intensity at about 110 keV.<sup>15</sup> We have benefited from those X-rays for scintigraphic imaging to detect any leakage from the injection site and monitored inguinal lymph nodes and abdominal uptake, which were negative.

Histological studies after yttrium synovectomy have shown reduction of the number and size of the synovial villi with decreased hyperemia in the early phase, though thickening of the synovium often occurs.<sup>14</sup> Later on, sclerosing and fibrosing processes of the synovial villous stroma predominate, together with minimum diffuse damage of the articular cartilage. Both filtration and resorption of the synovial fluid are reduced. A few months after treatment with the radioisotope, mononuclear cell infiltration in the synovia disappears and if the treatment is effective the synovium is fibrosed.<sup>14</sup>

In summary, this is probably the first reported case of LA that was successfully treated with yttrium-90 colloid. We consider that yttrium-90 treatment might be applicable in suitable cases of LA.

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