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Case Report

Adipose mesenchymal stem cells in ankle osteoarthritis: a case report

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Abstract

Ankle osteoarthritis, mostly of traumatic origin, compromises the mobility and quality of life of patients. Conventional treatment includes physical therapy and infiltrations, while advanced cases require arthrodesis or arthroplasty. In this context, mesenchymal cells from adipose tissue emerge as a promising alternative. We report the case of a 43-year-old patient with advanced ankle osteoarthritis treated with micro-fragmented adipose tissue (MFAT) infiltration using Lipogems® technology. The procedure resulted in significant improvement in pain and joint function in the first three months, followed by partial regression at six months. The findings corroborate previous studies, suggesting transient efficacy and indicating that more advanced cases may have a limited response. Further research with larger samples and longer follow-up is needed to elucidate the therapeutic potential of this approach.

Level of evidence V; Case report.

Keywords: Osteoarthritis; Ankle; Mesenchymal stem cells; Arthritis; Bone fracture.

Introduction

Ankle osteoarthritis causes significant pain and dysfunction. The main etiology is traumatic, in up to 70% of cases, and conservative treatment involves a series of diverse treatments, ranging from completely conservative options, such as lifestyle modification, physical therapy, physiotherapy, and rehabilitation, to interventional treatments such as joint infiltrations with corticosteroids or orthobiologics. When the progression is severe, surgeries such as arthrodesis or arthroplasty become necessary, with impacts on the patient's mobility[1,2].

Facing the need for less invasive alternatives, joint micro-fragmented adipose tissue (MFAT) infiltration has been studied. The Lipogems® system uses autologous adipose tissue, allowing a minimally invasive procedure with local trophic potential, in addition to a paracrine effect in modulating the inflammatory environment of osteoarthritis. The literature presents studies with a high level of evidence, mainly for knee osteoarthritis, but there is a lack of data on its application to the ankle. We report a case of ankle osteoarthritis treated with this therapy[1,2].

Case report

The study was approved by the Institutional Review Board under the number 52440821.5.0000.0068.

We report the case of a 43-year-old female patient on the date of the procedure performed in March 2023. Her body mass index at the time was 29.01 kg/m^2.

The patient suffered torsional trauma of the right ankle in 2013, with a trimalleolar fracture. She had surgery to malleolar osteosynthesis without fixation of the posterior malleolus. She evolved with pain in the late postoperative period, and in 2015, two years later, she had the material removed, due to medical advice.

Study performed at the Instituto de Ortopedia e Traumatologia do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, São Paulo, SP, Brazil.

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After these procedures, she started experiencing chronic pain with progressive worsening in the region, associated with symptoms of disproportionate pain and allodynia (painful symptoms in the affected region even with stimuli that commonly do not cause pain). The patient was submitted to five sessions of joint infiltration with hyaluronic acid for pain control, with minimal partial response. Due to the unsatisfactory response, she underwent ankle arthroscopy for synovectomy and exostectomy in 2020, with no improvement in the clinical status.

On physical examination, she presented with great restriction of movement, compatible with advanced tibiotalar osteoarthritis, as verified in imaging exams. A severe degenerative arthropathy of the tibiotalar joint was found, classified by Kellgren and Lawrence as type 4 (Figures 1-3).

First, we advised a new application of hyaluronic acid, this time with high-density solution (2 MegaDaltons) associated with sorbitol, performed in two sessions. During this period, the patient reported improvement and regression of up to 70% of the pain symptoms. Afterwards, due to the condition of allodynia and complex regional pain, diagnosed according to the Budapest criteria[3], desensitization treatment was initiated with radial shockwave, in six sessions, with complete regression of the allodynia condition.

After six months, new treatment possibilities were discussed with the patient, since the partial result of pain control was achieved. An MFAT infiltration was performed in the operating room on March 15, 2023.

Surgical procedure

Adipose tissue was collected from the abdomen under local anesthesia and sedation, using the technique proposed by the Lipogems® material. Approximately 100 mL of subcutaneous fat tissue from the abdominal region, below the umbilical scar, was processed, generating 10 mL of MFAT, of which 6 mL was infiltrated into the tibiotalar joint under ultrasound guidance. The procedure was performed in a surgical environment, with discharge of the patient on the same day and postoperative guidelines including analgesia and restriction of physical activities for one week (Figures 4-8).

Results

Initially, the patient presented with strong pain in the first postoperative days, requiring analgesics such as tramadol and non-steroidal anti-inflammatory drugs, in addition to the use of crutches in the first three days. After the fifth postoperative day, the patient was able to resume her daily living activities. In the immediate postoperative period, there was also a complaint of a moderate amount of serous fluid leaving the donor region, which was resolved within 48 hours with daily dressing changes. The patient did not present any aesthetic complaint in the donor region.

The patient was re-evaluated at six weeks, three months, and six months. After the first two weeks, she reported a great improvement in symptoms, which was verified objectively using the visual analog pain scale (VAS) and the

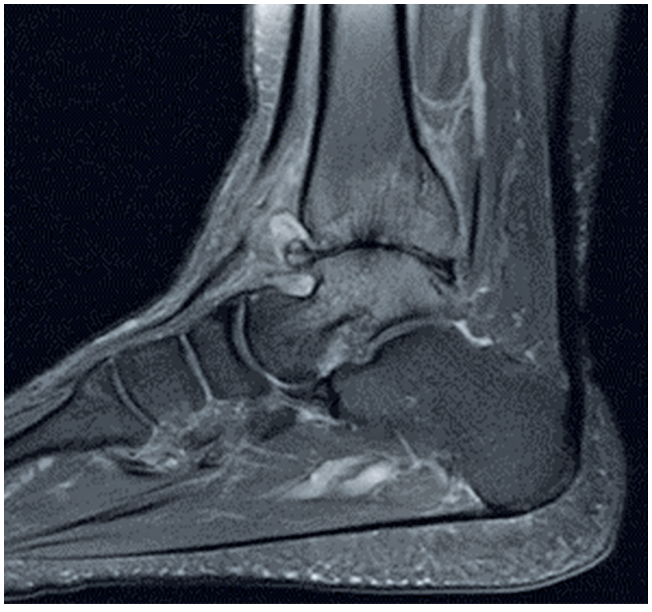

Figure 1. T2-weighted resonance image with signs of bone edema in the tibiotalar joint and degenerative joint clamping. Examination of August 2022.

Figure 2. T1-weighted resonance image. In the red arrow, a hypointensity signal in the region of the posterior malleolus is observed, sequelae of a posterior malleolus fracture not previously fixed. Examination of August 2022.

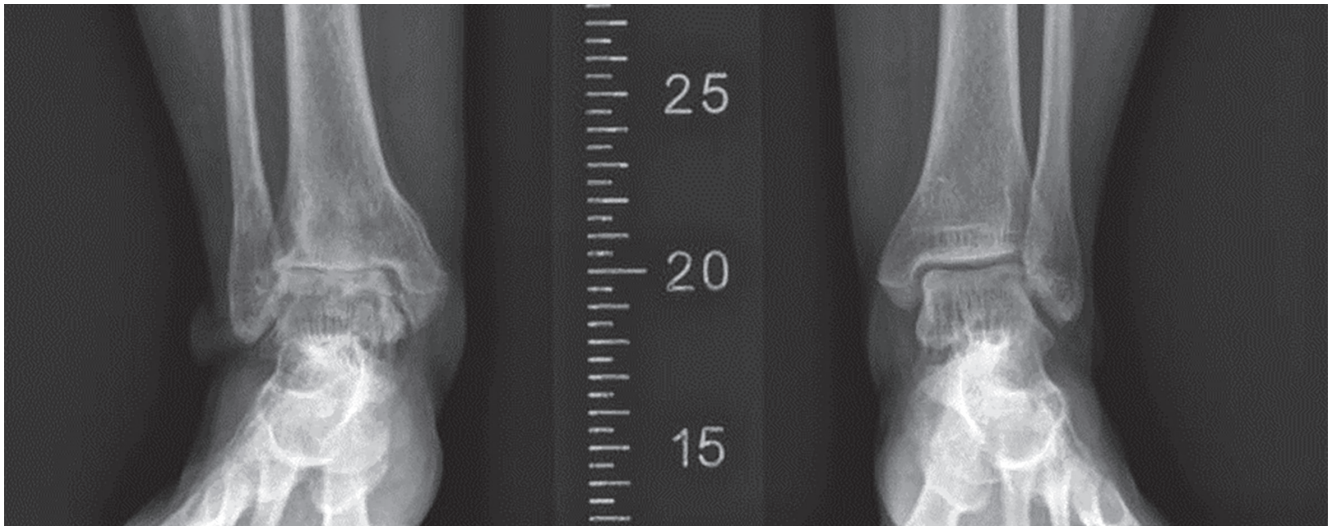

Figure 3. Radiographs showing the asymmetry of the tibiotarsal joints and degenerative osteoarthritis in the right joint.

Figure 4. Patient positioning and gowning for a surgical procedure.

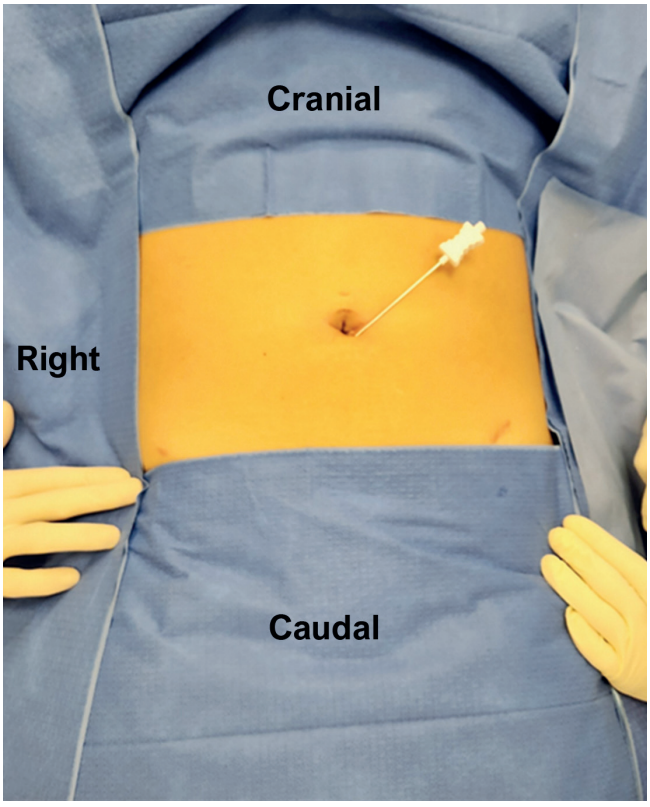

Figure 5. Entry point for preparation and collection of micro-fragmented material.

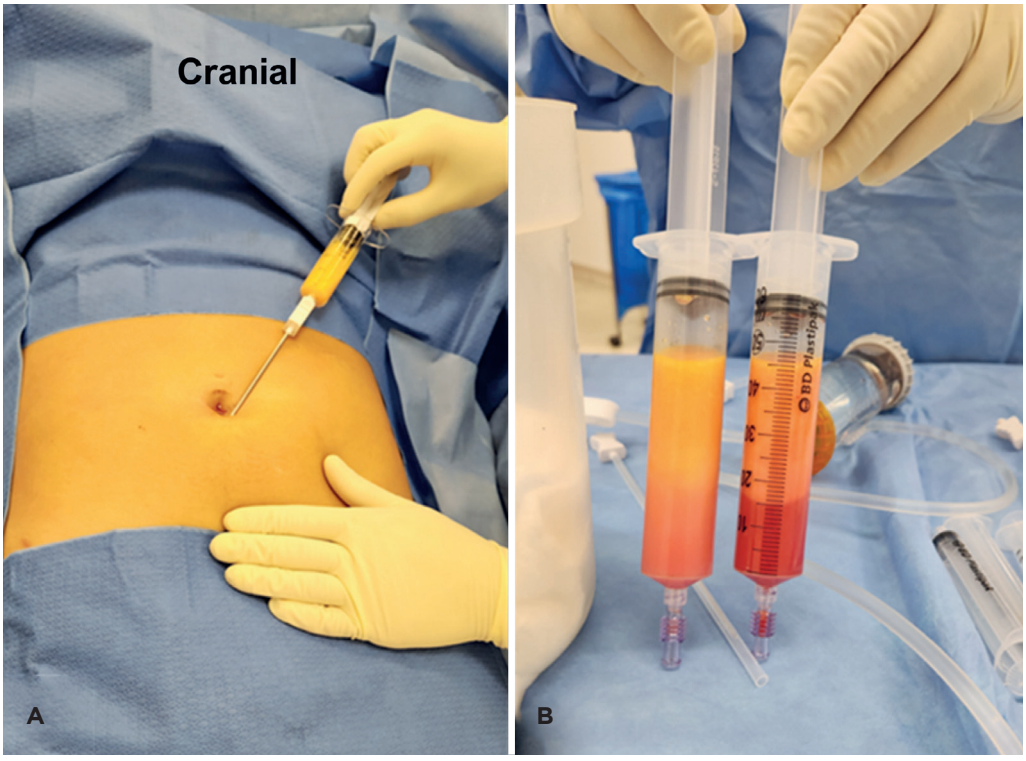

Figure 6. (A) Collection of micro-fragmented adipose tissue with a "vaclock" syringe (B) Total content collected without filtering.

Figure 7. Micro-fragmented tissue processing system and syringe filled with the final filtered and fragmented contents.

Figure 8. Tibiotalar intrarticular injection of micro-fragmented adipose tissue under direct visualization with ultrasound.

functional questionnaire of the American Society of Foot and Ankle Orthopedics (AOFAS). Also, gait, mobility, and range of motion (ROM) of the ankle were evaluated. The test results were entered in Table 1.

Throughout the follow-up, the patient was very satisfied with the results. When asked, at the end of six months, she reported 80% improvement in pain compared to the pre-procedure.

Discussion

Niazi et al.[4], performed MFAT infiltration in a 39-year-old male patient with Takakura grade 4 tibiotalar osteoarthritis—obliteration of the joint space with full tibiotalar contact. The volume infiltrated in the procedure is not reported. The patient was instructed to wear an orthopedic boot and a partial weight-bearing with crutches for two weeks. The authors found pain improvement on VAS from 9 to 1 at the end of six months of follow-up, in addition to complete improvement in nocturnal pain and at rest. There was also a statistically significant improvement in functional scores, and there was no report of any complications.

These findings differ from our study. Our patient similarly presented with osteoarthritis secondary to the trauma sequelae, with less severe evolution than the case reported by Niazi et al[4]. The patient was not instructed to immobilize or remove weight-bearing. This was only instructed in the first three days due to strong disproportionate pain. We consider that this pain was due to the capsular distension performed during the procedure, since approximately 6 mL was infiltrated into a joint with severe synovial constriction. Draeger et al.[5], reported that intrarticular infiltration in the ankle should not exceed 16-30 mL. In our case, we did not reach this volume, but perhaps due to the surgical history and previous involvement, even a smaller volume was not initially tolerated by our patient.

Table 1. Data collected on the day of surgery and at six weeks, three months, and six months.

	Day of surgery	Six weeks postoperative	Three months postoperative	Six months postoperative
VAS at the moment of interview	0	3	2	1
VAS at the moment of crises	7	5	4	7
AOFAS	68/100	78/100	70/100	67/100
ROM right ankle	19	23	21	36
ROM left ankle	70	66	63	64

VAS: Visual analog scale; AOFAS: The American Society of Foot and Ankle Orthopedics; ROM: Range of motion.

Natali et al.[6] performed infiltration with Lipogems® in 31 patients with moderate ankle osteoarthritis, with a total of 5 mL of infiltrated volume and 24 months of follow-up. The authors found good results, with no serious adverse events, but with the return of symptoms after 12 months of follow-up. This also differs from the findings in our study, as after about three months, our patient already had a partial return of symptoms. We consider that the patient with more advanced joint osteoarthritis could present less lasting results.

In our study, we found in the collected data that the patient presented an improvement in the AOFAS and VAS score, especially in the short-term follow-up, up to three months, including a significant clinical difference, as reported by Chen et al[7]. At the six-month follow-up, these scores returned to a similar level as at baseline. Still, the patient was subjectively better compared to before the procedure, with up to 80% improvement in symptoms in her routine. These findings also differ from Niazi et al.[4], who found sustained improvement in his patient with more advanced degenerative disease even after six months of the procedure.

In another study, Shimozono et al.[8], performed an infiltration with 5 mL of Lipogems® into the ankle of patients after arthroscopic debridement. Similar to our findings, the authors found an improvement in symptomatology and decreased pain in functional scores, but not sustained after six months. This suggests that MFAT may show a decrease in its benefits over time. In addition, patients with less severe osteoarthritis had better results, suggesting that advanced cases are not good candidates for the procedure.

Most previous studies focused on harvesting bone marrow material to consolidate corrective osteotomies in the case of advanced osteoarthritis with angular deviation. However, these collections typically involve multiple surgical procedures and extended treatments[8-10]. This can become a bias, as outcomes may reflect the combined effects of several interventions rather than the results of a single procedure[6]. In our case, a single surgical procedure was performed.

In our study, we verified the use of MFAT, collected through the Lipogems® kit. The product has a good safety profile for use in patients. Abdominal collection is safe and has not brought any aesthetic damage in our case. Objectively, symptoms and pain improvement was maintained for three months. After this initial period, the scores returned to a level similar to the preoperative period. As future perspectives, we consider that new studies using larger samples, interventions using a control group, and randomization are important to verify the real potential of these therapies and the best treatment options before a radical surgical intervention.

Conclusion

There was a favorable initial response from our patient in the initial postoperative period, but it was not sustained at the end of three and six months of follow-up. Our findings showed the failure of this therapy to control symptoms in the medium and long term.

Authors' contributions: Each author contributed individually and significantly to the development of this article: LVR *(https://orcid.org/0000-0002-6503-5963) Conceived and planned the activities that led to the study, interpreted the results of the study, performed the surgeries, data collection, formatting of the article, clinical examination; BBV *(https://orcid.org/0000-0002-3953-2712) Conceived and planned the activities that led to the study, interpreted the results of the study, performed the surgeries, formatting of the article; CCO *(https://orcid.org/0000-0002-9502-0797) Participated in the review process, bibliographic review; RRS *(https://orcid.org/0000-0003-1085-0917) Interpreted the results of the study, participated in the review process; MKD *(https://orcid.org/0000-0003-1999-9478) Participated in the review process, approved the final version; ALGS *(https://orcid.org/0000-0002-6672-1869) Participated in the review process. All authors read and approved the final manuscript. *ORCID (Open Researcher and Contributor ID).

References

1. Godoy-Santos AL, Ranzoni L, Teodoro WR, Capelozzi V, Giglio P, Fernandes TD, et al. Increased cytokine levels and histological changes in cartilage, synovial cells and synovial fluid after malleolar fractures. Injury. 2017;48 Suppl 4:S27-S33.
2. Godoy-Santos AL, Fonseca LF, de Cesar Netto C, Giordano V, Valderrabano V, Rammelt S. Ankle osteoarthritis. Ver Bras Ortop. 2021;56(6):689-96.
3. Bullen M, Lang C, Tran P. Incidence of Complex Regional Pain Syndrome I Following Foot and Ankle Fractures Using the Budapest Criteria. Pain Med. 2016;17(12):2353-9.
4. Niazi NS, Niazi NS, Wong J, Pillai A. Autologous Micro Fragmented Adipose Cells Therapy for Subtalar Joint Osteoarthritis – Case Report and Review of Literature. SN Compr Clin Med. 2021;1-3.
5. Draeger RW, Singh B, Parekh SG. Quantifying normal ankle joint volume: An anatomic study. Indian J Orthop. 2009;43(1):72-5.
6. Natali S, Screpis D, Farinelli L, Iacono V, Vacca V, Gigante A, et al. The use of intra-articular injection of autologous micro-fragmented adipose tissue as pain treatment for ankle osteoarthritis: a prospective not randomized clinical study. Int Orthop. 2021;45(9):2239-44.
7. Chen C, Li Z, Zhang Y, Zhou H, Li Y, He W, et al. What's the clinical significance of VAS, AOFAS, and SF-36 in progressive collapsing foot deformity. Foot Ankle Surg. 2024;30(2):103-9.
8. Shimozono Y, Dankert JF, Kennedy JG. Arthroscopic Debridement and Autologous Micronized Adipose Tissue Injection in the Treatment of Advanced-Stage Posttraumatic Osteoarthritis of the Ankle. Cartilage. 2021;13(1_suppl):1337S-43S.
9. Hernigou P, Guissou I, Homma Y, Poignard A, Chevallier N, Rouard H, et al. Percutaneous injection of bone marrow mesenchymal stem cells for ankle non-unions decreases complications in patients with diabetes. Int Orthop. 2015;39(8):1639-43.
10. Angthong C, Kunkanjanawan H. Ankle synovium-derived mesenchymal stem cells for the treatment of osteochondral lesion of the talus: a novel cell harvesting technique and clinical applications. Eur Rev Med Pharmacol Sci. 2020;24(16):8273-80.