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SURGERY

Autologous Micro Fragmented Adipose Cell Therapy for End-Stage Ankle Osteoarthritis—Case Report and Review of Literature

Noman Niazi[1] · Amirul Islam[1] · Ahmed Aljawadi[1] · Zeeshan Akbar[1] · Anand Pillai[1]

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Abstract

Ankle osteoarthritis is mostly post-traumatic and in young people. Autologous fat cells have been successfully used to treat hip and knee OA. Aim of this study is to evaluate the efficacy of autologous microfragmented fat cell therapy in ankle osteoarthritis. This paper reports a 39-year-old labourer with post-traumatic advanced osteoarthritis of the ankle who was given Lipogem treatment. After lipoaspiration from the abdomen, processing and injection of microfragmented adipose tissue into the ankle was done. Patient was assessed for visual analogue scale (VAS), Manchester-Oxford Foot Questionnaire (MOXFQ) scores and Foot and Ankle Ability Measure (FAAM) scores preoperatively and at 6 months after treatment. There was considerable improvement in all patient-reported outcome measures at 6 months follow-up with no complications. Microfragmented adipose cell therapy for end-stage ankle arthritis can delay need for ankle fusion or replacement in young patients.

Keywords Ankle osteoarthritis · Lipogem · Microfragmented fat cells · Stem cells

Introduction

Ankle osteoarthritis (OA) is mostly post traumatic and seen in young people [1]. Most nonsurgical treatments for ankle OA give a transient relief. Aim of this case report is to evaluate the efficacy of autologous microfragmented adipose cell transplantation in patients with ankle OA. Literature has shown evidence of using autologous fat cells in hip and knee OA [2]. This is the first report on the use and effect of microfragmented adipose cells in end-stage ankle osteoarthritis.

Case Presentation

A 39-year-old male builder presented with painful left ankle. He had previous history of fracture left ankle for which open reduction and internal fixation was done 5 years ago using plate osteosynthesis on fibula, screw fixation of medial malleolus and syndesmotic repair by synthetic ligament. He was having activity-related pain and stiffness in his ankle which was hindering his daily activities. His VAS pain score was 9 on weight bearing with off and on night pain. He had only transient relief from intraarticular steroid injections. Weight bearing radiographs of ankle confirmed Takakura Stage 4 OA (Fig. 1). After careful consideration, as patient wishes to delay surgical management, Lipogem treatment was commenced. Stem cells were harvested from the

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✉ Noman Niazi
nomanniazi@gmail.com

Amirul Islam
Amirul.islam@mft.nhs.uk

Ahmed Aljawadi
ahmed.aljawadi@mft.nhs.uk

Zeeshan Akbar
Zeeshan.akbar@nhs.net

Anand Pillai
aorthopod@yahoo.co.uk

[1] Wythenshawe Hospital, Manchester University NHS Foundation Trust, Manchester, UK

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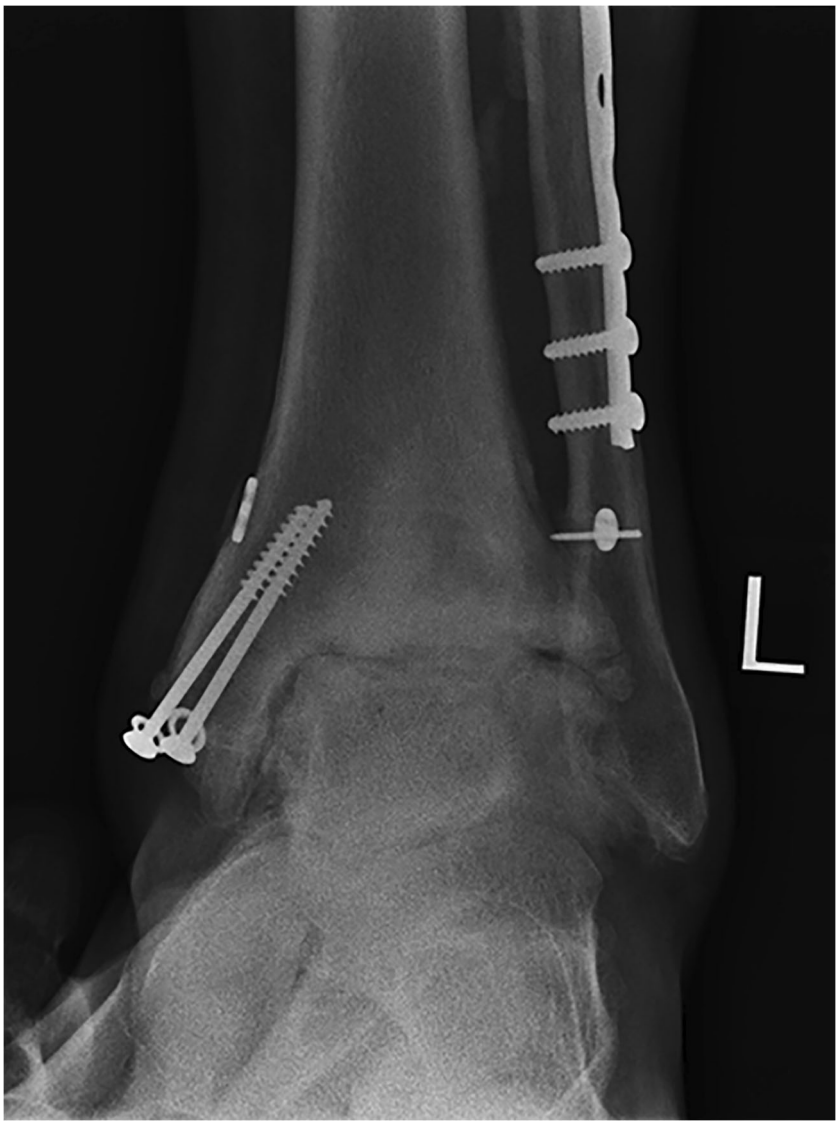

Fig. 1 Anteroposterior radiograph of the ankle showing advanced osteoarthritis

abdominal fat (Fig. 2) under general anaesthetic and, after processing, injected into the ankle joint (Fig. 2). Abdominal binder was applied for 1 week. Patient was allowed partial weight bearing in boot for 2 weeks and no strenuous activities for 6 weeks. Patient was followed at regular intervals. At 6 months follow-up, there was no pain in his ankle, and visual analogue scale (VAS) for pain was reduced from 9 preoperative to 1 in 6 months. There was no rest or nocturnal pain.

Manchester-Oxford Foot Questionnaire (MOXFQ) scores and Foot and Ankle Ability Measure (FAAM) were obtained pre- and post-operatively to assess improvement (Table 1). Statistical analysis was performed using the paired *T* test using Microsoft Excel data analysis pack tool. *P* value of < 0.05 was considered significant. His MOXFQ scores (Table 1, Fig. 3) were reduced from 58 pre-op to 50 at 2 weeks, 33 at 3 months and 28 at 6 months. FAAM ADL score was improved from 59 before procedure to 79.8 at 6 months (Table 2). Likewise FAAM SPORT was improved from 25 to 40.6 at 6 months follow-up (Table 1, Fig. 4). There were no complications noticed during the follow-up period.

Discussion

About 15% of the world's adult population is affected by osteoarthritis out of which approximately 1% has OA of the ankle. Unlike hip and knees, post-traumatic ankle arthritis accounts for over 90% of cases [1]. For management of young people with ankle osteoarthritis,

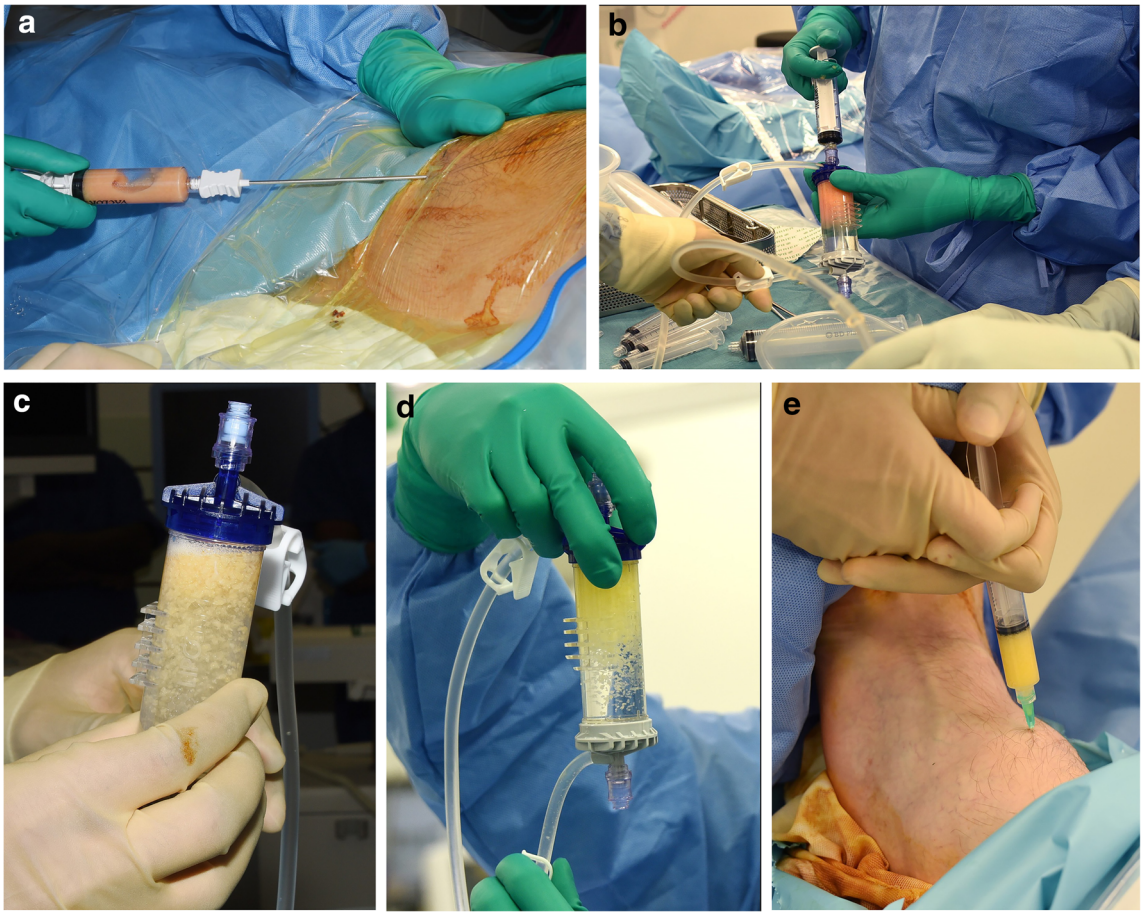

Fig. 2 Different steps of aspiration and processing of fat cells using Lipogem procedure and injection of adipose-derived stem cells. **a** Aspiration of fat cells from abdomen using wide bore needle. **b** Processing of harvested fat. **c** Processing and washing of the fat. **d** Microfragmented adipose-derived fraction. **e** Injection of adipose-derived stem cells into ankle joint

Table 1 MOXFQ score

	Pre-op	2 weeks	*P* value	3 months	*P* Value	6 months	*P* value
Score	58	50	0.055487	33	0.000447	28	0.000216

Fig. 3 MOXFQ scores

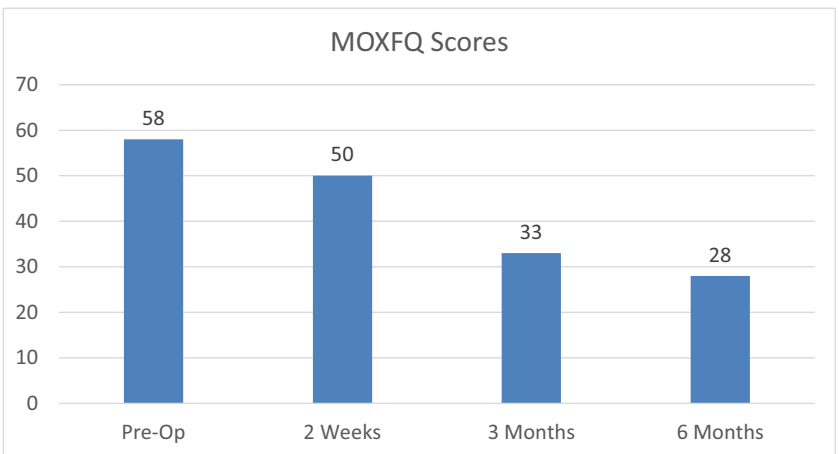

Table 2 FAAM Score

	FAAM ADL			FAAM sport		
	Pre-op	6 months	*P* value	Pre-op	6 months	*P* value
Scores	59	79.8	0.000190356	25	40.6	0.011201

the development of efficacious non-operative management would be particularly relevant. Currently, there is no gold standard surgical option for young patient with ankle osteoarthritis, and there is no effective therapy that can reverse the progressive nature of OA.

With the advance in regenerative medicine, intraarticular injections of mesenchymal stem cells (MSCs) have emerged as an alternative cellular therapy for the treatment of OA. Majority of the current stem cell therapies involve using mesenchymal stem cells (MSCs) due to their ability to differentiate into adipocytes, chondrocytes, osteoblasts, myocytes, hepatocytes, and endothelial cells and their immunoregulatory function to reduce inflammation in OA and make them promising candidate to regenerate damaged tissues [3]. In addition, MSCs secrete a variety of bioactive molecules that act in a paracrine fashion to prime and sustain angiogenic, antifibrotic, antiapoptotic, and immunomodulatory responses in target tissue. Different studies in literature have shown satisfactory therapeutic results of mesenchymal stem cells (MSC) from different sources including bone marrow, adipose tissues and umbilical cord, but the definitive conclusion has not been made about the superiority of one tissue source over another [4].

Adipose tissue, like bone marrow, is derived from the mesenchyme and contains a supportive stroma that is easily isolated. The concept that adipose tissue is an optimal source for MSCs is now well established mostly because of their abundance compared to other tissues and ease of access [3]. In recent randomized clinical trial, autologous adipose-derived stem cell therapy was associated with clinically significant improvement in pain and function in symptomatic knee OA [2].

In our case, Lipogem technique using microfragmented fat tissue [5] in ankle osteoarthritis was used. It involves simple self-contained mechanical technique through an enzyme-free technology, able to convert fat aspirate into a microfragmented adipose-derived fraction. This technique reduces the size of the adipose tissue clusters by means of mild mechanical forces and eliminates oil and blood residue. This process provides microfragmented fat [5] in 15–20 min without expansion and/or enzymatic treatment. No complications were noted during surgery till last follow-up, and significant improvement in patient-related outcome measures was noted.

Conclusion

Autologous microfragmented adipose cell therapy has not been mentioned in literature for the treatment of ankle osteoarthritis. Our early results suggest that autologous microfragmented adipose cell therapy for end-stage ankle arthritis in young patients in particular can delay the need for ankle fusion or replacement. Further studies are needed to withdraw definite conclusion and long-term efficacy of this unique method to treat advanced ankle OA.

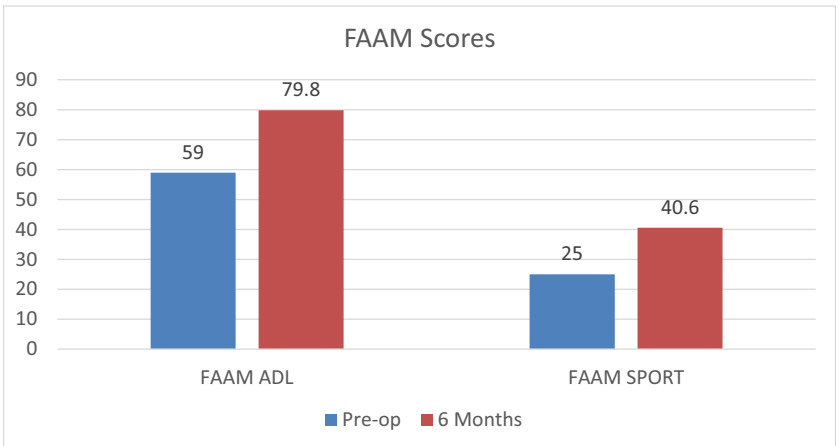

Fig. 4 FAAM scores

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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