

Case report

Traumatic Subcutaneous Rupture of the Plantar Fascia after Steroid Injections in 22-Year-Old Olympic Athlete. Implantation of Mesenchymal Cells Taken From Adipose Tissue over the Fascia at Rupture Insertion (Adipose Tissue-Derived Mesenchymal Stem Cells Admscs).

Dr. Annarita Piccinato*¹, Dr. Antonio Barberi²

¹UOC Orthopaedics' and Traumatology Hospital S.M. Goretti, Latina (Lazio, Italy)

²Interventional Radiology and Diagnostic Imaging Unit S.M. Goretti Hospital, Latina (Lazio, Italy)

Email Address: pccnrt@gmail.com

Abstract:

Summary

This study examined We discuss about the case of a professional athlete with an acute lesion of the proximal plantar fascia after injections with corticosteroids; and the subsequent treatment with mesenchymal cells derived from adipose tissue. Is also discussed.

Keywords: plantar fascia rupture, corticosteroids, regenerative medicine, mesenchymal cells from adipose tissue

Introduction:

Painful foot, caused by pathology of the plantar fascia is often encountered by orthopedic specialists. In some cases there is an acute tear of the plantar fascia, and not always related to maximum effort, causing acute pain and temporary disability.

Often due to multiple etiology (biomechanical imbalances, obesity, tendinopathies associated with autoimmune diseases, etc.) and caused by a functional overload, plantar fascia break is not a rare event. It can even occur as a complication from corticosteroids injections¹⁻²⁻³, though the correct right evaluation of the patient (BMI and functional requirements) makes this procedure rather safe if performed under ultrasound guidance, with a reclining fascia and without penetraingpenetrating fascial fibers.

In this paper we report a case of plantar fasciitis in an Olympic athlete, treated with corticosteroid injections which it followed by an acute fascia rupture while training and the subsequent treatment with administratio of mesenchymal cells taken from adipose tissue (ADMSC)

Presentation of the case:

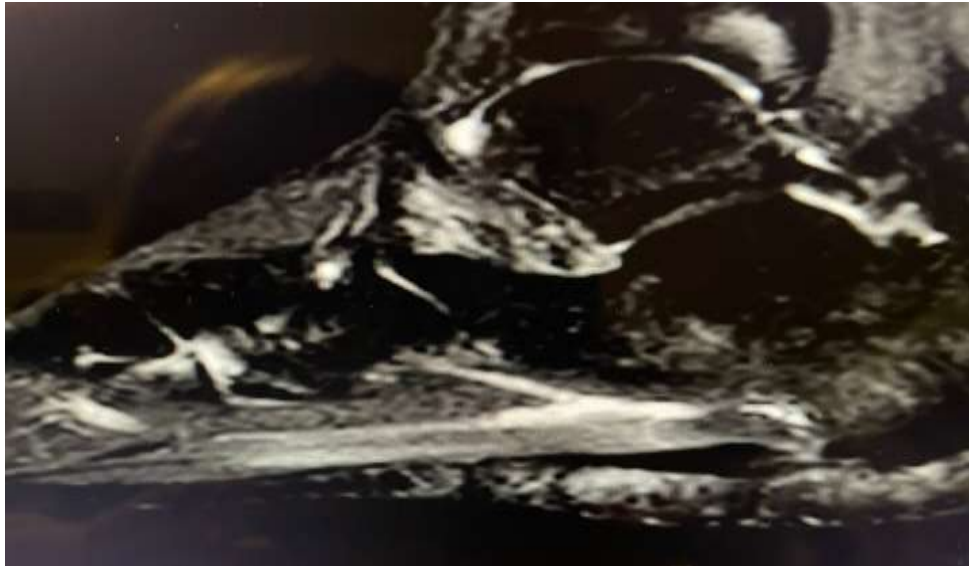
The patient was a 22- year old Olympic athlete in excellent health with a 2 month history of pain at the insertion of the plantar fascia. The pain was disabling and impeded training and the specific movements in her sport (fencing). The patient followed all the primary indications come ad esempioie. changing footwear and scrupulously carried out the appropriate physiokinesitherapy, consististing of manipulations of the fascia and Achilles tendon, tecar therapy and laser therapy both for the Achilles complex and plantar fascia. She was also administered 2 injections of corticosteroid at a 10 day interval as she neared performance benchmarks with improvement of symptoms.

However, during a workout the athlete felt what she described as the sensation of "tearing," with very acute pain and immediate swelling, causing her to discontinue training for over 2 weeks. An MRI exam revealed

Dr. Annarita Piccinato.et.al/ Traumatic subcutaneous rupture of the plantar fascia after steroid injections in 22-year-old Olympic athlete. Implantation of mesenchymal cells taken from adipose tissue over the fascia at rupture insertion (Adipose tissue-derived mesenchymal stem cells ADMSCs).

an acute rupture of the plantar fascia insertion. After resting for 2 weeks, the patient nevertheless needed something that would help her with rapid functional recovery and allow her to train, return to competition and race in qualifications for the Paris Olympics in 2024.

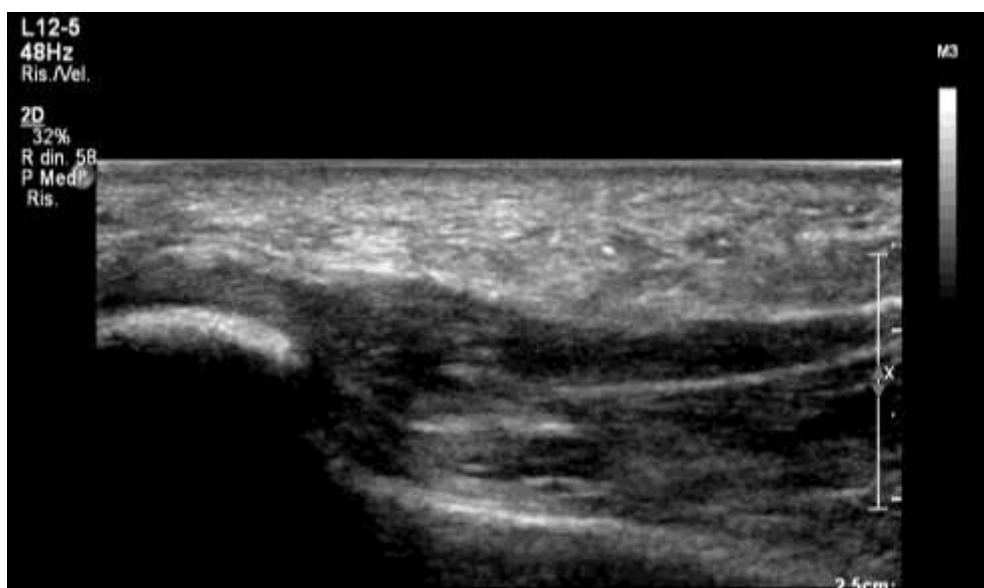
Observation of the MRI image of the partial lesion shows thickening of the plantar aponeurosis prior to heel insertion with edema of the plantar fascia and with edema of the surrounding soft tissues, in the absence of signal alterations affecting the district skeletal elements (photo 1).



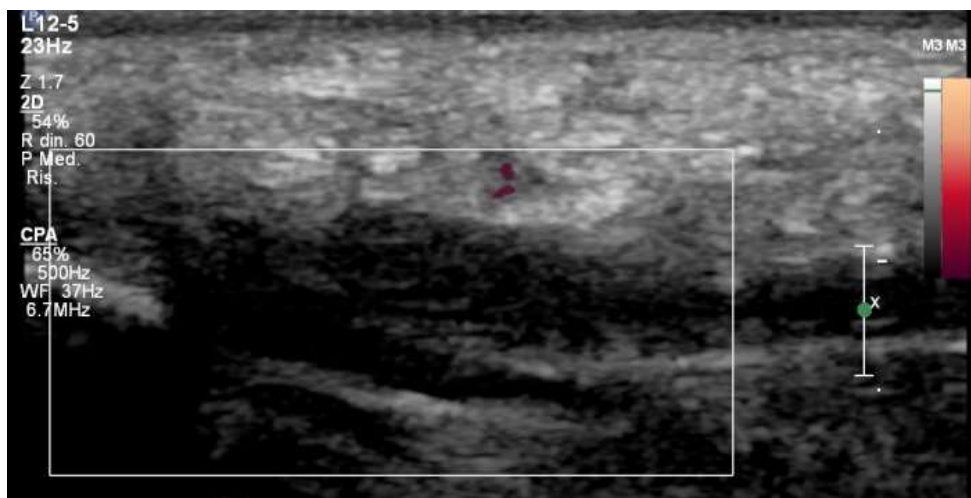
Pic.1 Examination RM: Sagittal fat-suppressed T2-weighted Image

Partial lesion with thickening of the plantar aponeurosis at the anterior insertion with edema both of the plantar fascia and the surrounding soft tissues.

AtIn our Institute, an ultrasound examination was carried out (Ultrasound Philips Affiniti 50; Linear Probe L 12-5 50 [5 – 12 MHz; 256 elements, 50mm, fine pitch]) confirming the partial lesion of the plantar aponeurosis, in addition to the edematous thickening of the fascia, the edema of the district soft tissues in which some vascular signals are appreciated with the Color-Doppler evaluation (Pic. 2)



Pic 2a



Pic 2b

Pic2: Examination US; Longitudinal scan: partial lesion of the plantar aponeurosis anterior to the heel insertion with focal interruption of the fibrillar structure (arrow); the plantar fascia is thickened and hypoechoic (arrowhead) in Fig. 2a; hyperechogenicityhyper echogenicity of the district loose tissue due to edematous imbibition is also highlighted with some scattered vascular spots at the ECD (Pic. 2b).

Treatment:

At the request of the patient, who required needs for a therapy to accelerate healing, the administration on site of mesenchymal stem cells taken from adipose tissue (Adipose tissue-derived mesenchymal stem cells ADMSCs) was proposed. The procedure was performed by introducing the ultrafiltrate with a dermal filler cannula (PPI technique)⁴ with about 4 ml of the finished product (Fig. 3 and 4). The preparation was diffused at the insertion of the fascia and along its fibers towards the arch, without penetrating them. This was possible thanks to the blunt tip of the filler cannula allowing it to slide on the fibers.



Pic 3: Adipose tissue rich in mesenchymal cells

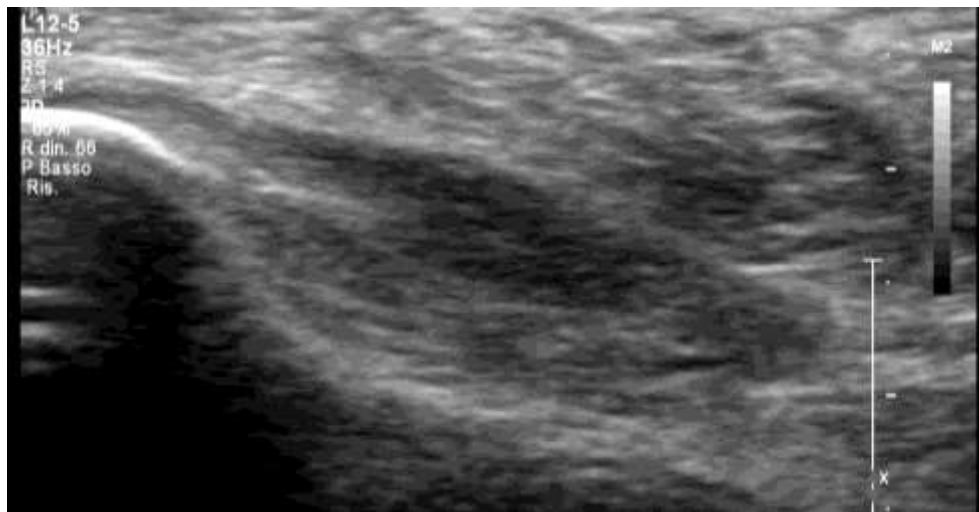


Pic 4: implant with dermal filler cannula PPI (Piccinato's Peritendinous Injection)

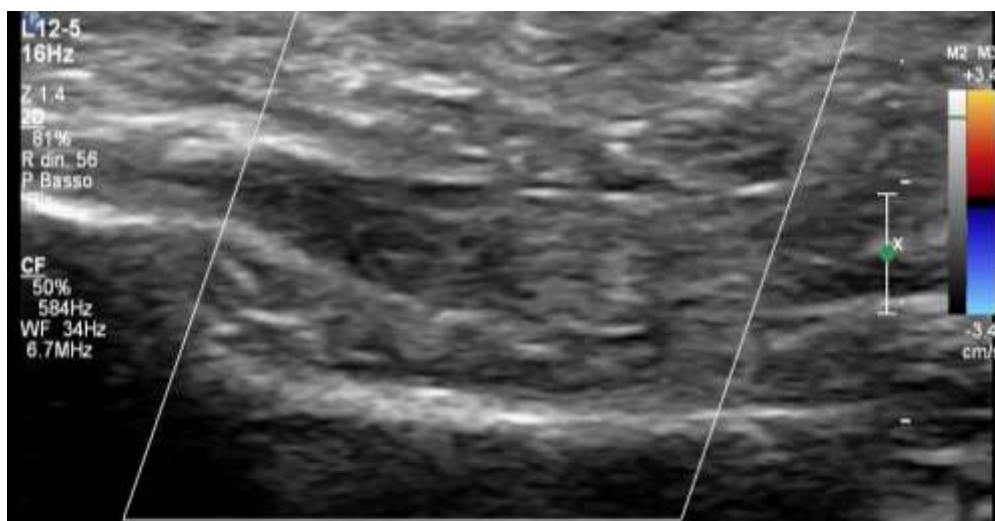
Dr. Annarita Piccinato.et.al/ Traumatic subcutaneous rupture of the plantar fascia after steroid injections in 22-year-old Olympic athlete. Implantation of mesenchymal cells taken from adipose tissue over the fascia at rupture insertion (Adipose tissue-derived mesenchymal stem cells ADMSCs).

The patient was immediately able to walk without limitations and no immobilization, wearing a good pair of sneakers. She abstained from physical activity and training with no load. She was allowed to swim and cautious manipulation of the fascia by the referred physiotherapist. Three weeks after the procedure, we observed the reduction of pain identified by the patient as discomfort (VAS3); at this point an increase in proprioceptive activity and reconditioning of both the fascia and the Achilles tendon was granted.

At day 35 from the administration, a control ultrasound examination was performed that showed the resolution of the partial lesion of the plantar aponeurosis with almost complete recovery of the fibrillar structure; the swollen appearance of the plantar fascia also appeared reduced; and the reactive phenomena associated with the regular representation of the surrounding loose tissue was without appreciation of contextual vascular signals. (Pic.5).



Pic 5a



Pic 5b

Pic. 5b; Longitudinal scanning; resolution of the lesion of the plantar aponeurosis (arrow; pic 5a); regular representation of the district loose tissue in the absence of vascular signals to the ECD (pic 6b). In this phase the algic symptoms disappeared and a very slight discomfort remained at load VAS 1-2.

Dr. Annarita Piccinato.et.al/ Traumatic subcutaneous rupture of the plantar fascia after steroid injections in 22-year-old Olympic athlete. Implantation of mesenchymal cells taken from adipose tissue over the fascia at rupture insertion (Adipose tissue-derived mesenchymal stem cells ADMSCs).

Comforted by the ultrasound images and the resolution of the symptoms, the patient was given exercises with progressively increased load, re-athletization and recovery of the athletic movements specific to her sport, and at a distance of 55 days from the procedure the athlete was able to participate in her first competition.

Discussion:

The literature agrees that this is conservative⁵ treatment for an acute rupture of the proximal plantar fascia (heel insertion), with immobilization ranging from 3 to 6 weeks before proceeding onto functional recovery and granting increased load. Surgery is rarely used. In the case illustrated, the operative treatment with infiltration of mesenchymal cells from adipose tissue⁶⁻⁷ was agreed to by the patient and established in an attempt to accelerate functional recovery and regain an adequate level of athletic performance for professional competition. MSCs are believed to promote tissue regeneration through paracrine factors⁸ that bolster tissue regeneration by limiting scarring. The painful symptoms gradually decreased until their disappearance, with the resumption of normal daily activities immediately after the procedure followed by sports. Ultrasound evidence of the restoration of the fascia structure guided the subsequent rehabilitation steps, until the full recommencement of competitive activities.

Conclusions:

Infiltrative therapy with ADMSC appears to therefore be a valid treatment in the field of regenerative medicine for the acceleration of recovery and healing of injured tissue, in particular for both amateur and/or professional athletes who require a prompt recovery times to meet the commitments of their sporting lives.

References:

- [1] Ruptures of Plantar Fascia: A Systematic Review of Literature. Mosca M, Fuiano M, Massimi S, Censoni D, Catanese G, Grassi A, Caravelli S, Zaffagnini S. *Foot Ankle Spec.* 2022 Jun;15(3):272-282. doi: 10.1177/1938640020974889. Epub 2020 Dec 14. PMID: 33307799
- [2] Complications of plantar fascia rupture associated with corticosteroid injection. Acevedo JI, Beskin JL. *Foot Ankle Int.* 1998 Feb;19(2):91-7. doi:10.1177/107110079801900207. PMID: 9498581
- [3] Diagnosis and Treatment of Plantar Fasciitis JAMES D. GOFF, DO, and ROBERT CRAWFORD, MD, Summa Health System, Akron, Ohio *Am Fam Physician.* 2011;84(6):676-682
- [4] PPI Piccinato's Peritendinous Injection: : infiltrazione peritendinosa non invasiva con cannula per patologia dei tendini sottocutanei. Studio pilota a confronto con tecnica classica con ago. Nuova procedura senza dolore. Non-invasive peritendineous injection with cannula for subcutaneous tendons diseases. Pilot study versus classical needle technique. A new painless procedure Piccinato A, Battista M. *GIOT* 2023;49:1-7;
- [5] Rupture of plantar fascia: Current standard of therapy: A systematic literature review. Florian Debus, Daphne Eschbach, Steffen Ruchholtz, Christian Dominik Peterlein *Foot Ankle Surg.* 2020 Jun; 26(4):358-362
- [6] Mesenchymal Stem Cell Migration and Tissue Repair. Xiaorong Fu, Ge Liu, Alexander Halim Yang Ju, Qing Luo, And Guanbin Song *Cells.* 2019 Jul 28;8(8):784. doi: 10.3390/cells8080784
- [7] The Role of MSC in Wound Healing, Scarring and Regeneration Raquel Guillamat Prats *Cells.* 2021 Jul 8;10(7):1729. doi: 10.3390/cells10071729.
- [8] Mesenchymal Stem Cells Empowering Tendon Regenerative Therapies. Raquel Costa-Almeida; Isabel Calejo, Manuela e Gomes. *Int J Mol Sci.* 2019 Jun 19;20(12):3002. doi: 10.3390/ijms20123002
- [9] Extracellular Vesicles of Adipose-Derived Stem Cells Promote the Healing of Traumatized Achilles Tendons Shih-Heng Chen, Huang-Kai Kao, Zhi-Yu Chen, Ya-Hsuan Lin, Shih-Hsien Chen, Pang-Yun Chou, and Feng-Huei Lin. *Int. J. Mol. Sci.* 2021, 22, 12373. <https://doi.org/10.3390/ijms222212373>

Dr. Annarita Piccinato.et.al/ Traumatic subcutaneous rupture of the plantar fascia after steroid injections in 22-year-old Olympic athlete. Implantation of mesenchymal cells taken from adipose tissue over the fascia at rupture insertion (Adipose tissue-derived mesenchymal stem cells ADMSCs).



Open Access This article is licensed under a Creative Commons Attribution 4.0 International

License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <https://creativecommons.org/licenses/by/4.0/>.