

Evaluation of innovative treatment of patellar tendinopathy with MR



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Dr Rodas is a Doctor of Medicine and Surgery and a specialist in Sports Medicine from the University of Barcelona. He has more than 25 years of experience in the field of health and sport performance with top-level athletes. He has been part of the FC Barcelona medical department since 2003, having been the physician of the top football and basketball teams. From 2017, he has been responsible for the Barça Innovation Hub, which is a center for sports research, training, and innovation. He contributed to many national and international projects leading to publications in globally recognized international peer-reviewed journals.

Dr Rodas and the FC Barcelona medical team are world-renowned for their intent focus and innovation on muscle and tendon injury prevention, diagnosis, treatment and return-to-play; as well as on the study of biological therapies for musculoskeletal injury regeneration. In this paper we summarize the outcomes of one of their recently published studies on the use of biological therapies for injury regeneration. The team investigated two innovative therapies for patellar tendinopathy and used a Vantage Galan 3T to evaluate one of the outcomes¹.

Patellar tendinopathy is a common injury in both elite and non-elite jumping athletes. For many athletes, the disease can be managed with exercise-based rehabilitation, but some athletes do not respond adequately and require alternative treatments. Therefore, two innovative injection treatments were evaluated in 20 patients with chronic patellar tendinopathy. All patients were active in sports (varying from football to climbing). Ten patients received leukocyte-poor platelet-rich plasma (Lp-PRP) and 10 patients received bone marrow mesenchymal stem cells (BM-MSc) following the procedures of Institut de Teràpia Regenerativa Tissular (ITRT), Centre Mèdic Teknon. In addition, all patients followed a rehabilitation protocol after the treatment intervention (Figure 1).

To study the effect of the treatments, several outcome measures were evaluated, including: pain scores, muscle

The Barça Innovation Hub
The Barça Innovation Hub is a sports laboratory aiming to develop and share knowledge, transforming it into innovation, and promote an open and collaborative culture. To support these aims, 4 types of projects take place: scientific research; co-development of products and services; training sessions; and the organization of congress and conferences.

function, ultrasound measurements and MR imaging. These measures were determined before the treatment and 6 months after the intervention. Statistical analysis was performed to compare the outcomes.

The primary aim of the study was the evaluation of the clinical efficacy of both treatments based on pain rating and muscle function. Although there was no significant change after 6 months in muscle function, measured using dynamometry, the pain ratings were significantly reduced in both treatment groups. Both treatments were well tolerated and 18 of the 20 patients successfully returned to sport after the treatment (9 in each group).

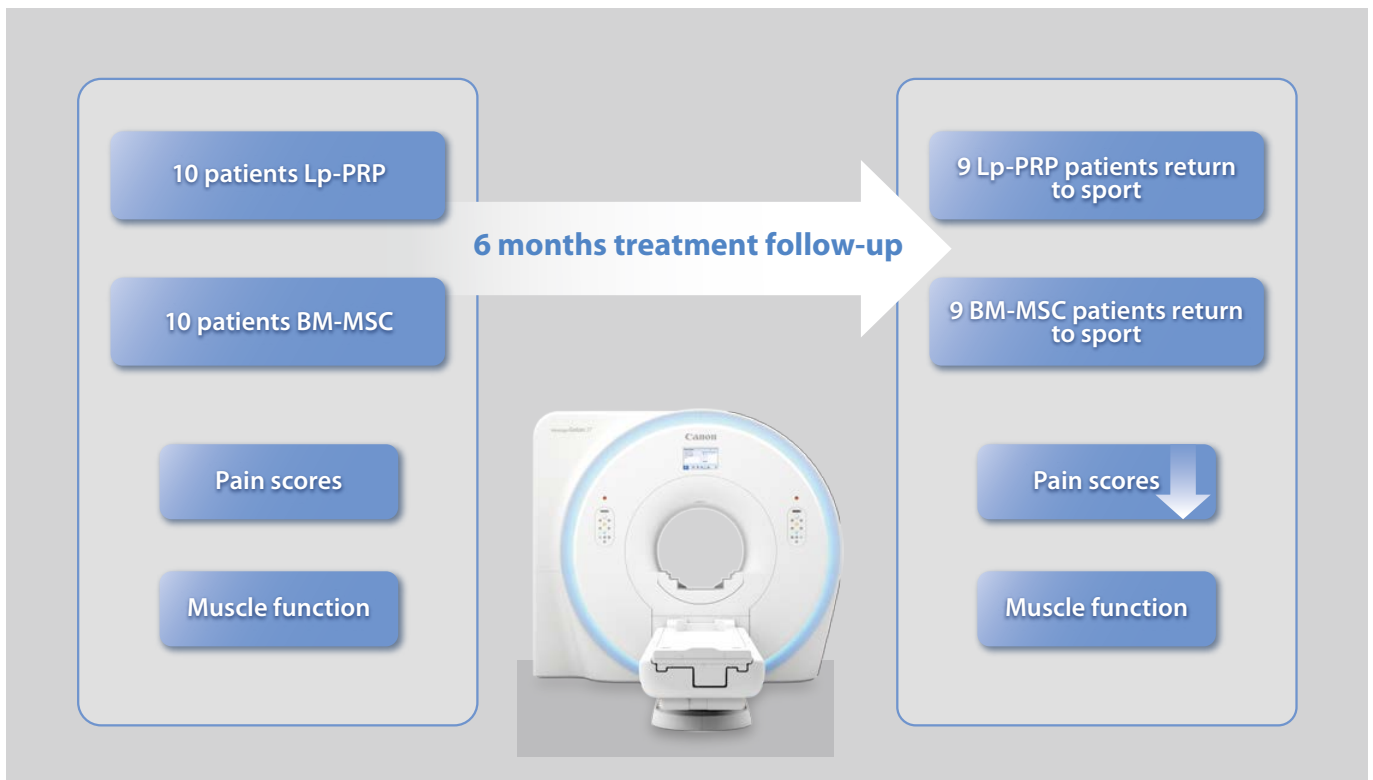


Figure 1 Schematic of the clinical trial for the two treatments for patellar tendinopathy

The secondary aim of the study was to evaluate patellar gap regeneration, which was studied using different imaging techniques including MRI. Scanning sessions were performed on a Vantage Galan 3T with a 16ch Flex SPEEDER Medium coil. The imaging protocol consisted of 5 sequences: sagittal fat-saturated proton density-weighted (PD FS, in-plane resolution=0.17×0.17 mm and slice thickness=2 mm); coronal PD FS (in-plane resolution=0.16×0.16 mm and slice thickness=1.5 mm); axial PD FS (in-plane resolution=0.16×0.16 mm and slice thickness=2 mm); coronal T2-weighted (in-plane resolution=0.21×0.21 mm and slice thickness=1 mm) and sagittal multi-echo T2 (TE=20, 60, 100 and 140 ms; in-plane resolution=0.27×0.27 mm and slice thickness=2 mm). Figure 2 shows for one patient these images at baseline and 6-month follow-up.

Three radiologists scored the tendon structure using the following indicators on the PD FS images: size of the injury, passage of fibers, Hoffa fat pad edema and lower patellar bone edema. On the T2-weighted images, the extent of the hyperintense signal in the tendon was scored.

Interestingly, only in the group of patients that received BM-MSCs, significant changes were observed in the MR parameters after 6 months (Figure 2 and Figure 3). The most significant improvements were found in the passage of fibers on PD FS images and the extent of hyperintense signal

on T2-weighted images in the BM-MSC group.

Although the group of patients was small, this preliminary study showed that both Lp-PRP and BM-MSC in combination with a rehabilitation protocol may decrease pain and improve activity levels in patients with chronic patellar tendinopathy. MR imaging enables monitoring of structural changes in the tendon and these changes were only observed in the group of patients who received BM-MSC treatment.

“Our Vantage Galan 3T made feasible the study of the tendon microstructure, enabling us to monitor very subtle structural changes over time.”

Gil Rodas, MD, MS, PhD

References

1. Rodas et al. Effect of Autologous Expanded Bone Marrow Mesenchymal Stem Cells or Leukocyte-Poor Platelet-Rich Plasma in Chronic Patellar Tendinopathy. *The American Journal of Sports Medicine*, 2021.

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FC Barcelona and Canon Medical Systems partnership to develop advanced sports medicine solutions



Vantage Galan 3T in the FC Barcelona medical center at the Ciutat Esportiva Joan Gamper training facilities.

The aim of the partnership between FC Barcelona and Canon Medical Systems is to lead the way with advanced solutions for the sporting community and beyond. The partnership started in 2015 and was renewed in 2020 for five more seasons with the installation of a Vantage Galan 3T MR System, 13 Ultrasound systems: Aplio (i800, i900, a450 and a550) and Viamo (sv7 and c100); and the digital X-ray system Aceso Plus. As part of the partnership, Canon Medical Systems and the Barça Innovation Hub collaborate to develop ground-breaking sports medicine solutions to improve diagnosis and follow-up of injured athletes.

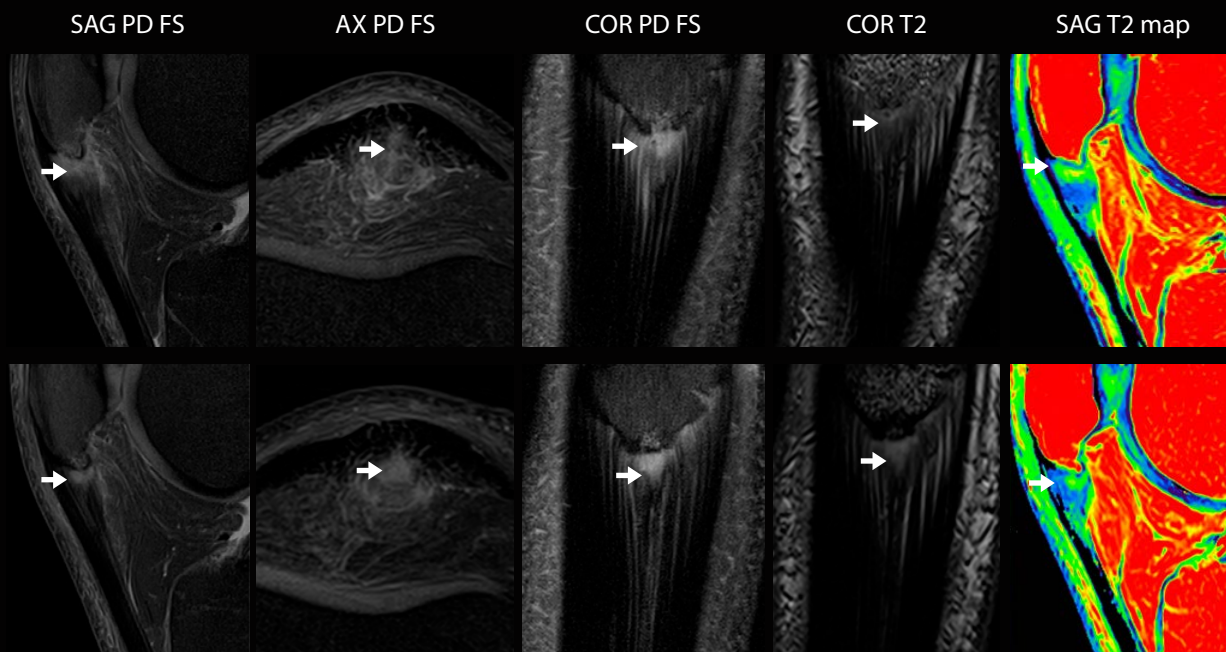


Figure 2 Magnetic resonance imaging protocol showing the evolution of patellar tendinopathy from baseline (upper row) to 6-month follow-up (lower row) in a participant that underwent a treatment with BM-MSC. White arrows indicate the area of the injury. Less edema and thinner tendon are observed after treatment, with a reduction of the inflammatory area and the presence of reparative tissue in the follow-up.

Image review in consultation with Dr Alomar, Clinica Creu Blanca, Barcelona, Spain.

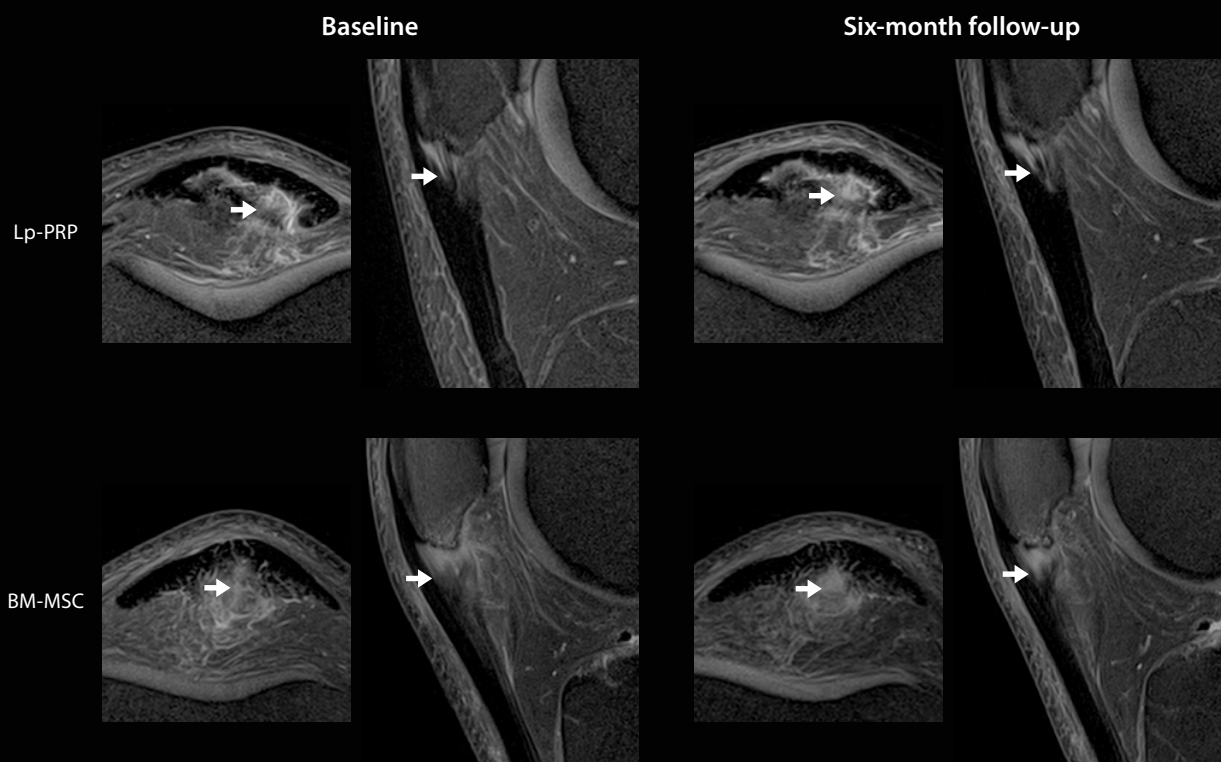


Figure 3 Fat-suppressed proton density-weighted images (in axial and sagittal planes) showing the differences in tendon structure between a participant treated with Lp-PRP (upper row) and a participant treated with BM-MSC (lower row) at baseline (left side) and after 6 months of treatment (right side). Compared to the BM-MSC case, in the Lp-PRP case the intratendinous edema is not reduced and more inflammatory activity is visible at the follow-up. In addition, the case treated with BM-MSC present a more defined edema and signs of granular activation for tissue regeneration.

Image review in consultation with Dr Alomar, Clinica Creu Blanca, Barcelona, Spain.

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