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Trans-passing Achilles Tenotomy: A New Improved Experimental Surgical Technique in Rats

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Tendinopathy is a debilitating musculoskeletal condition which can cause significant pain and can lead to a complete rupture of the tendon. These disorders continue to be a clinical challenge, although a range of different biomaterials have been developed to fabricate biomimetic scaffolds for tendon regenerative medicine. Thus, there is now the realistic potential for new technologies to significantly improve the clinical outcomes of this challenging pathology.

Animal models are often used in this field of research as they offer an attractive framework to examine the cascade of processes that occur throughout both tendon pathology and repair. Additionally, animal models provide the ability to reproduce consistent and repeatable injuries that can be treated in a controlled and quantifiable manner and also allow the evaluation of invasive treatments and assessment that would be unethical with human subjects.

The aim of this study was to identify, in rats, a new surgical experimental model that allows to test the safety, biocompatibility and teno-regenerative potential of tendon biomimetic scaffolds for a future in vivo treatment of damaged tendons.

Surgical procedures were performed in 10 cadaver Wistar rats under stereomicroscope. A posterior longitudinal incision, approximately five millimeters in length, was made. The Plantaris tendon was recognized and retracted medially, under a stereomicroscope, which allowed recognition of the Achilles tendon. A longitudinal and trans-passing cut was created in the middle of Achilles tendon, medial to the plantaris tendon, which was carefully preserved. The incision was filled with a biomimetic scaffold and closed using 2 cross stitches using dissolvable sutures.

The improved surgical technique used, for the tenotomy of the Achilles tendon in rats is simple and quickly done and could be used as an easily reproducible and validated model of experimental tendon lesion to test the biocompatibility of tissue specific scaffolds. Indeed, this technique would give in the future the main advantage to verify in vivo if the inserted scaffold within the produced experimental lesion would integrate, and if it is safely tolerated within the host tissue, as well as if it would have any teno-regenerative potential, which could be determined ex vivo on tissue explants.

Moreover, this technique, thanks to the use of tendon specific scaffolds and to this innovative surgical approach, could reduce the possibility of post-surgery adhesions and tendons' scars, which could encourage translation researches about this common tendon injury in humans.

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