Platelet-Rich Plasma injection to improve tendon healing process

KAUX JF [1], Drion P [2], Pascon F [3], Libertiaux V [3], Le Goff C [4], Gothot A [4], Cescotto S [3], Defraigne JO [5], Rickert M [6], Crielaard JM [1]

1. Physical Medicine Service, Department of Motility Sciences, University Hospital of Liège, University of Liège, Belgium – jfkaux@chu.ulg.ac.be
2. Animal Facility of University Hospital of Liège, ULg-GIGA-R, University of Liège, Belgium.
3. Department Argenco, University of Liège, Belgium.
4. Department of Clinical Biology, University Hospital of Liège, University of Liège, Belgium.
5. CREDEC, Laboratory of Experimental Surgery, University of Liège, Belgium.
6. Department of Orthopaedic Surgery, University of Heidelberg, Germany.

Introduction

It is well known that injured tendons do not heal easily. For example, tendinopathy is a condition which often becomes chronic in the case of bad or late management. Recently, several studies, essentially in vitro and, more recently, a few in clinical practice, have demonstrated the positive effects of **platelets** on the healing process of different tissues. In fact, platelets contain lots of **growth factors** which can be released after a local injection. These growth factors have the potentiality to enhance the tendon healing process, for example after rupture or tendinopathy.

The aim of our experiment was to ascertain whether the use of Platelet-Rich Plasma (**PRP**) was of interest for accelerating the healing process of Achilles tendon after surgical induced lesion.

Methods

All experimental procedures and protocols used in this investigation were reviewed and approved by the Institutional Animal Care and Use Committee of the University of Liège.

60 rats were divided into **2 groups**: A: control (no injection) and B: PRP injection. A 5mm defect was surgically induced in the rats' Achilles tendon after resection of plantaris tendon (Fig. 1-4). Rats of group B received a PRP injection in situ after the surgery. Afterwards, rats of both groups were placed in their cages without immobilization.

After 5, 15 and 30 days, the traumatized Achilles tendons of 10 rats of both groups were removed and dissected during their healing process (Fig. 5). Immediately after sampling, tendons were submitted to a **biomechanical tensile test** up to rupture, using a "**Cryo-jaw**" (Fig. 6-8). Rats were then euthanized.

Statistical analyses were made with an ANOVA. Values are significant when p-value is below 0.05.

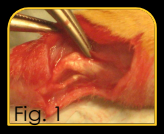


Fig. 1


Fig. 4


Fig. 2

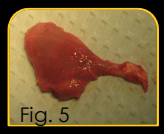


Fig. 5


Fig. 3

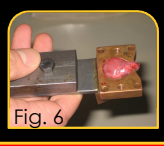
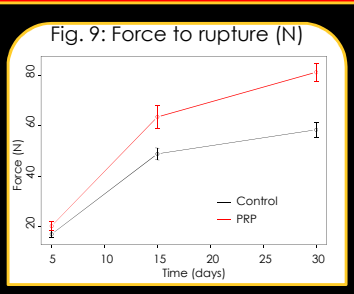
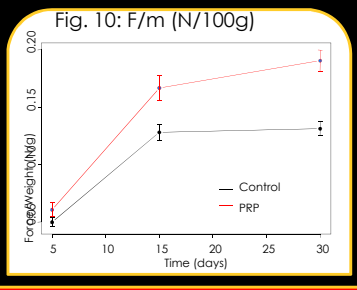


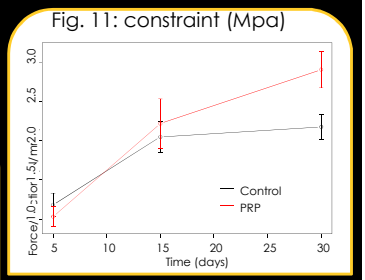
Fig. 6


Fig. 7


Fig. 8







Results

We observed that the **force** necessary to induce tendon rupture (F) during biomechanical tensile testing increased with time in both groups; that this force was **greater** for tendons which had been submitted to an injection of **PRP** (Fig. 9).

The **ratio** between **force** and **weight** (F/100g) increased with time in both groups; that this ratio was **greater** for tendons which had been submitted to an injection of **PRP** too. There is also a significant interaction between time and the group (Fig. 10).

The surface area of the **section** of the tendons increased between 5 and 15 days followed by a stabilization. **After 30 days**, sections in both groups were **similar**. Thus, the **constraint** was similar after 5 and 15 days but is **significantly better** for **PRP** group **after one month** (Fig. 11).

Discussion – Conclusion

We demonstrated that the **force** necessary to induce tendon rupture during biomechanical tensile testing was **greater** for tendons which had been submitted to an injection of **PRP**. These results were observed and significant ($p<0.05$) from day 5 onwards. We observed too that the section of the tendon was the same in both groups after 30 days. Thus the **quality** of the healing tendon is **better** with an injection of **PRP**, as shown with the increase of the constraint until rupture.

Acknowledgement

This experimentation was partially financed by "Standard de Liège" and "Lejeune-Lechien" grants.