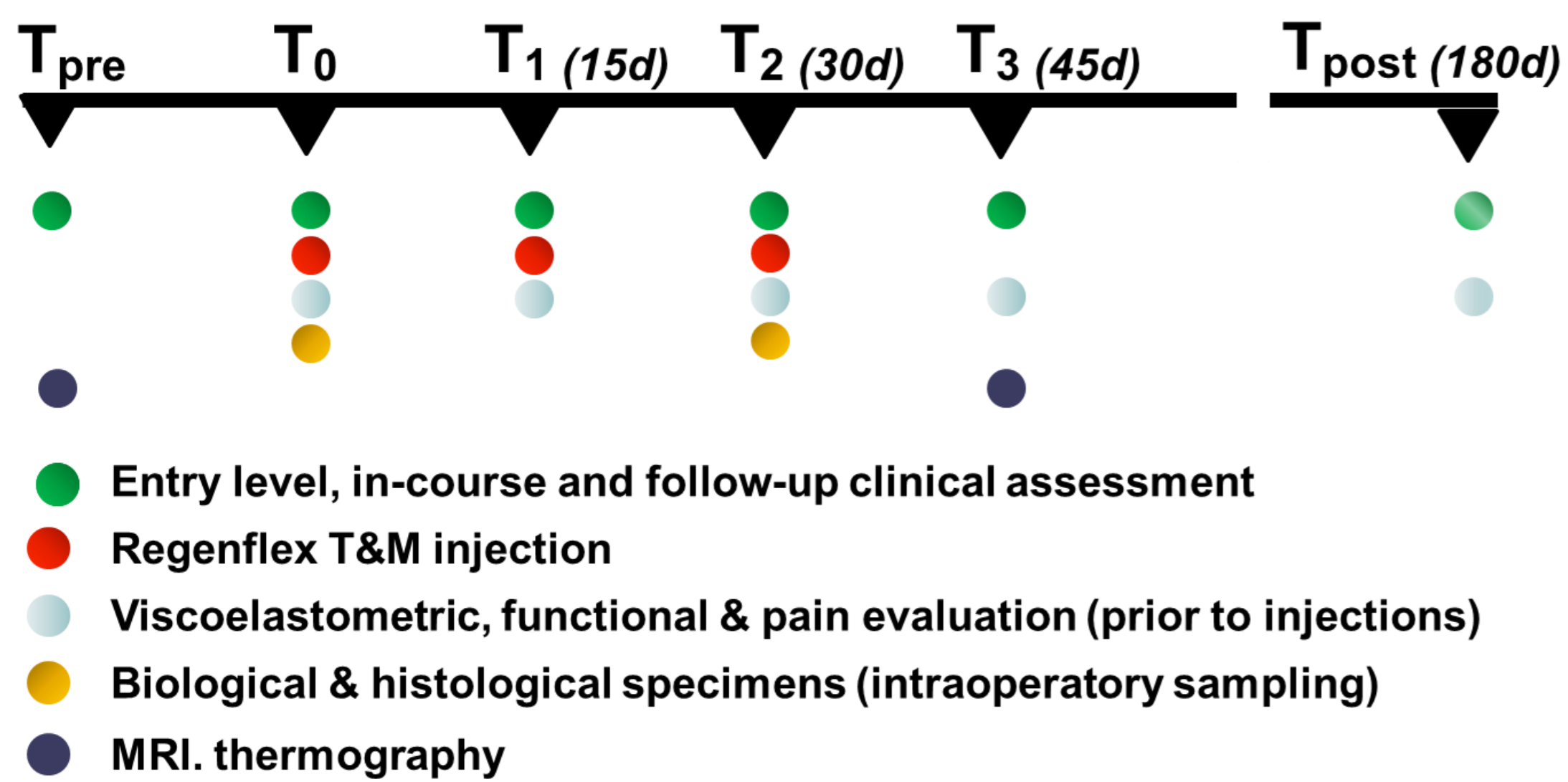


## Background

Achilles tendinitis (AT) causes 5% of professional athletes to end their careers; in Europe AT affects ca. 10 millions recreational runners. The aim of this study was to evaluate the clinical and functional efficacy of a three-local injections regimen of hyaluronic acid (HA) in ameliorating pain score and function in middle aged recreational runners with AT, whose functional and clinical parameters were recorded integrating multiple techniques.

## Experimental protocol (n=11)



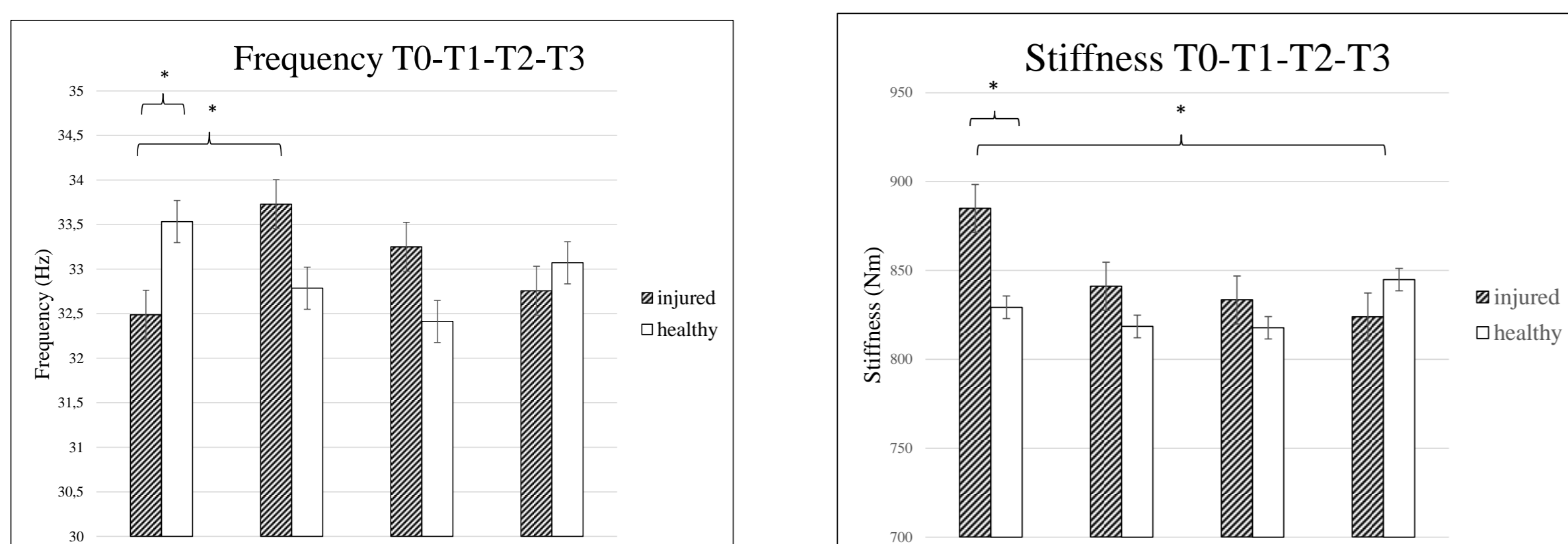
Males and women, aged 35-70, mean 50

## HA injection regimen:

T0-T1-T2 (0-15-30 days) RegenFlex T&M, a blend of 2 to 1000 KDa

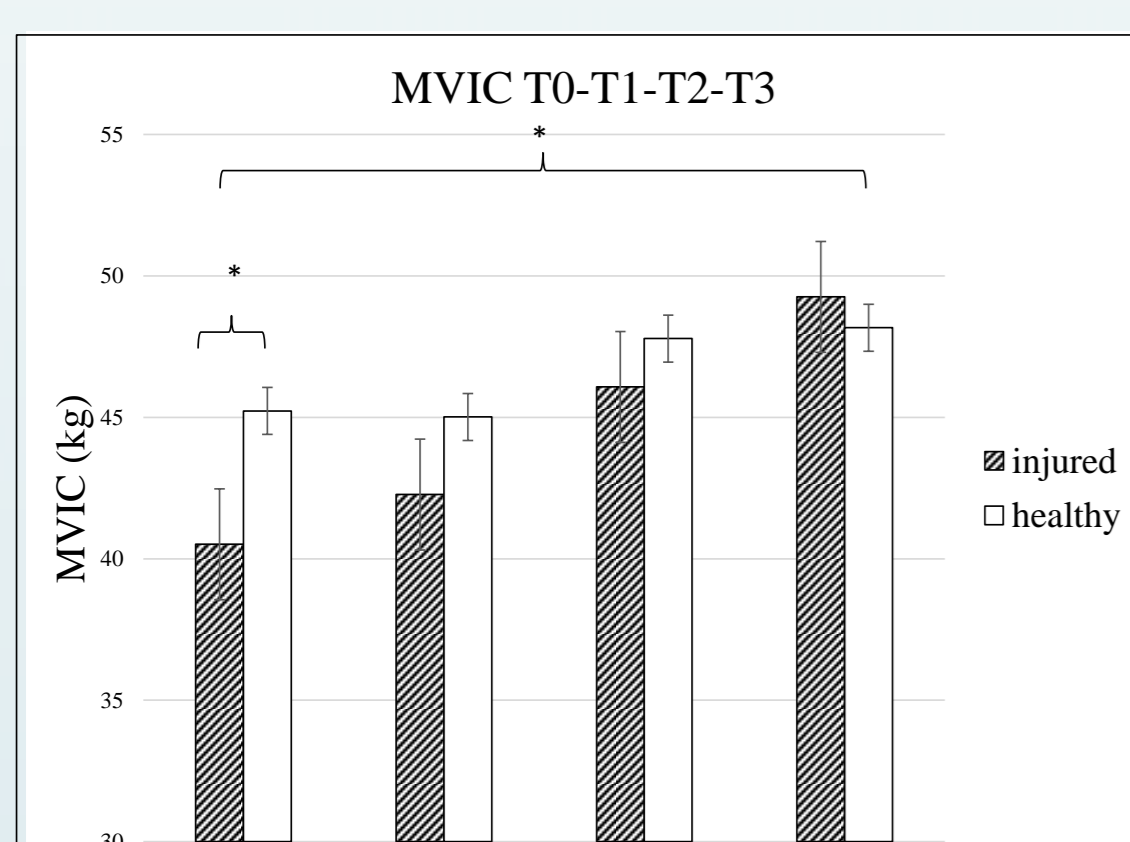


## Viscoelastic data

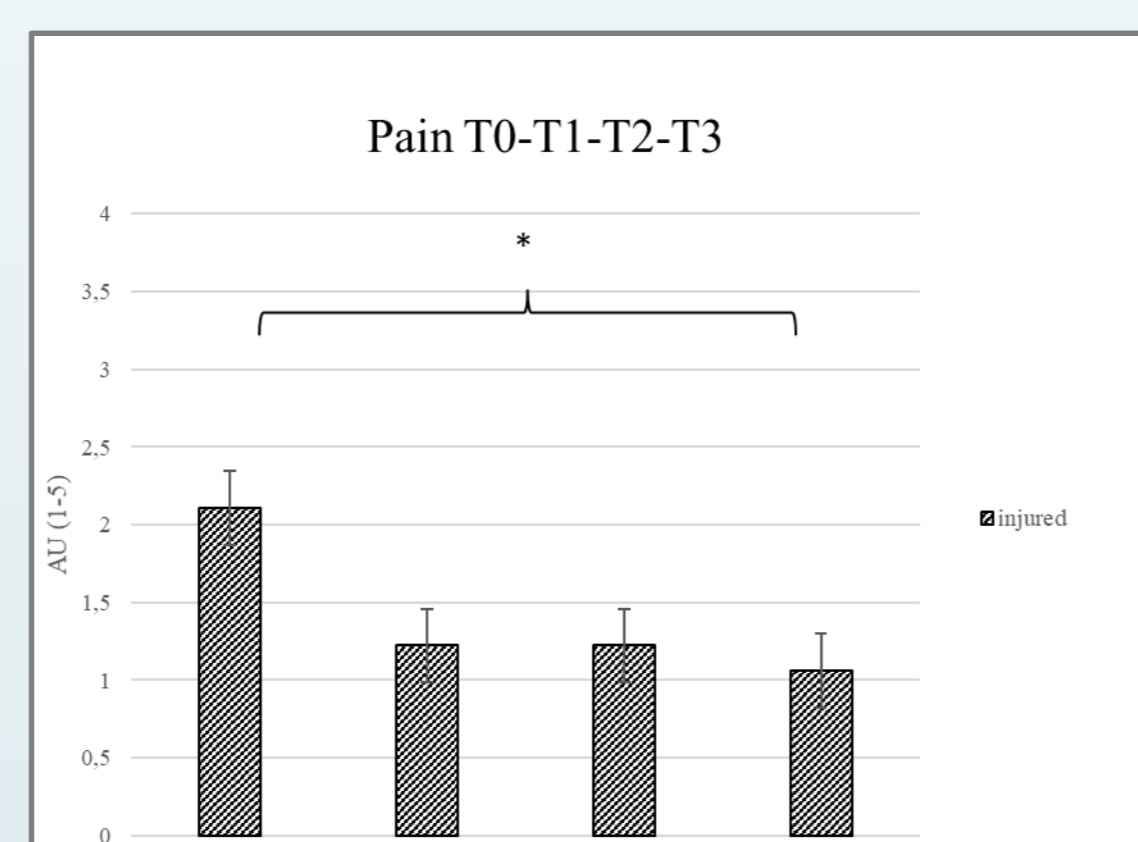


Bar represent the mean values in A) frequency (Hz), in B) Stiffness (Nm) measured in injured and healthy side at baseline (T0), after first (T1), second (T2) and third injection (T3) in injured tendon, N=8

## Maximal Voluntary Isometric (MVIC) Contraction data



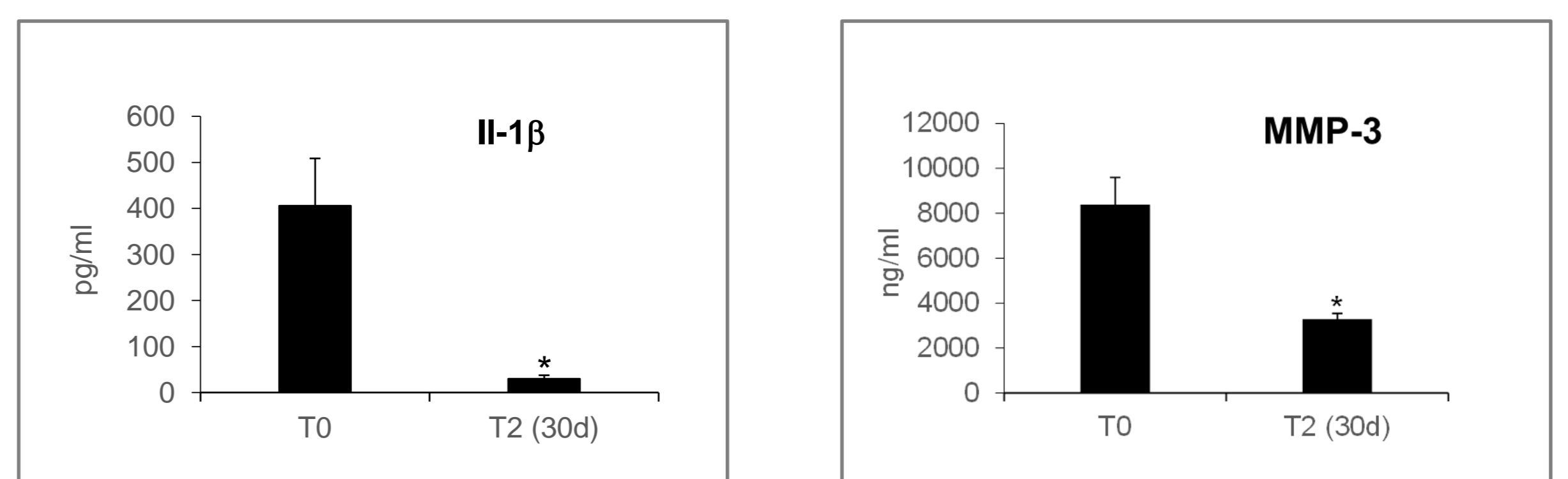
## Post-MVIC- referred pain (Likert scale)



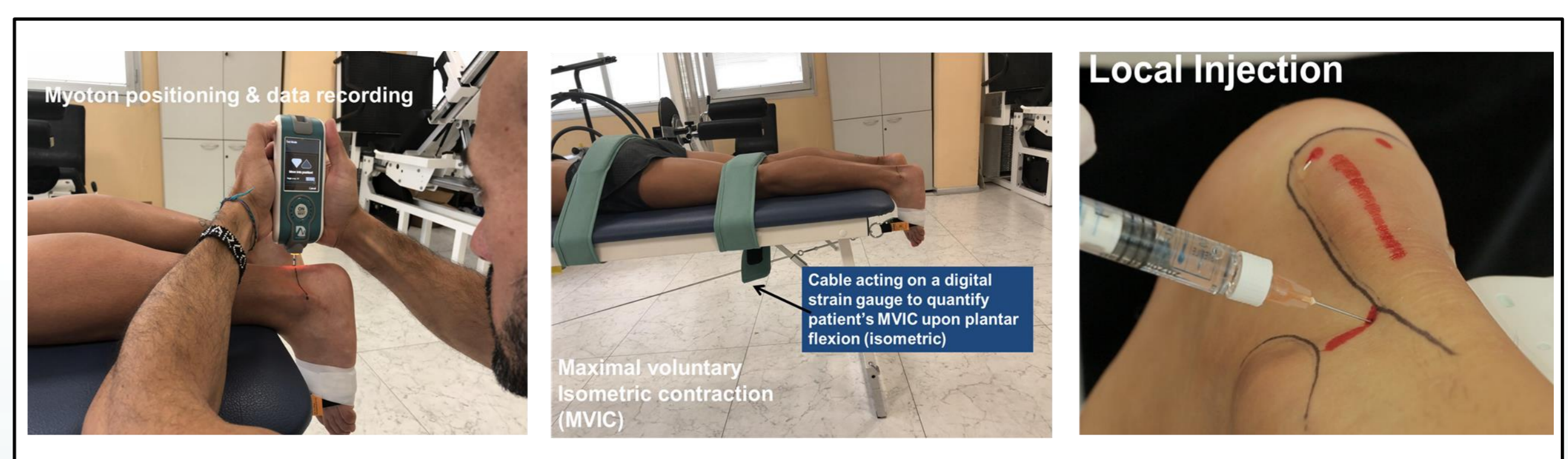
Results: at T0, tone and stiffness values were significantly different between injured and contralateral tendons, especially when measured at the relaxed state. Pain score and MVI, coherently with clinical outcomes, were significantly higher and lower in injured tendons, respectively. Interestingly, the above differences gradually disappeared at T1, 2 and 3. In keeping with these results, tendon exudates volumes also decreased.

**Methods:** 11 recreational runners previously diagnosed for monolateral AT were enrolled. AT was confirmed before the first local HA injection (T0) by clinical examination, MRI and thermography. At T0 patients were assessed for maximal voluntary isometric contraction (MVI) involving Achilles tendon (both injured and healthy), and pain level with a Likert scale; Achilles tendon viscoelastic state, i.e. tone and stiffness, were then measured at relaxed state and at 10 % of MVI with MyotonPro (Myoton Ltd, UK). Finally patients received the first HA injection (RegenFlex T&M, a blend of 2 to 1000 KDa HA, Regenyal, IT). All the measurements were repeated at T1, at T2 and at T3, i.e. over a total of 45 days. Clinical visits were also performed. Furthermore, before each injection, injured tendon exudates were collected by needle aspiration and analyzed for IL-1 and MMP-3 content with an ELISA test.

## Biological data



IL-1 $\beta$  and matrix metalloprotease-3 levels in tendon exudate at 0 and 30 days



**Discussion:** RegenFlex T&M injections treatment were effective in the management of AT, as determined with a multi-methodological approach. In particular, this is the first study indicating that AT alters the viscoelastic features of the tendon. To this regard, the healing process promoted by RegenFlex T&M is accompanied by recovery of tendon viscoelastic parameters

## Conclusions:

- Results of VEM and F testing suggest that Regenflex T&M local injections attenuate the symptoms of AT patients and significantly contribute to normalize functional features of the injured tendon as compared to the healthy one in a longitudinal experimental setting.
- Biochemical results are in keeping with VEM and F outcomes
- Myoton testing is a promising, costless, safe and friendly technique to monitor the very meaningful features of AT