

# PRP and tendinopathy, from *in vitro* to clinical trials

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Service de Médecine de l'Appareil Locomoteur  
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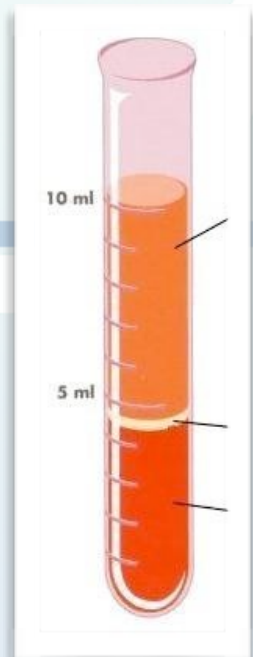
SPORTS<sup>2</sup>

CHU de Liège



# What's PRP?

- = Platelet-Rich Plasma
- Centrifugation of *autologous* blood
- *High concentration of platelets* (3-10x)
- Platelets → roles in coagulation, inflammation, immunity modulation, « *restorative* » properties
- Liberation of cytokines and *growth factors* (VEGF, PDGF, TGF-β, IGF-I, HGF)
- *Activation* by thrombine, CaCl<sub>2</sub> or collagen in situ  
→ degranulation → liberation of GF



# What's PRP?

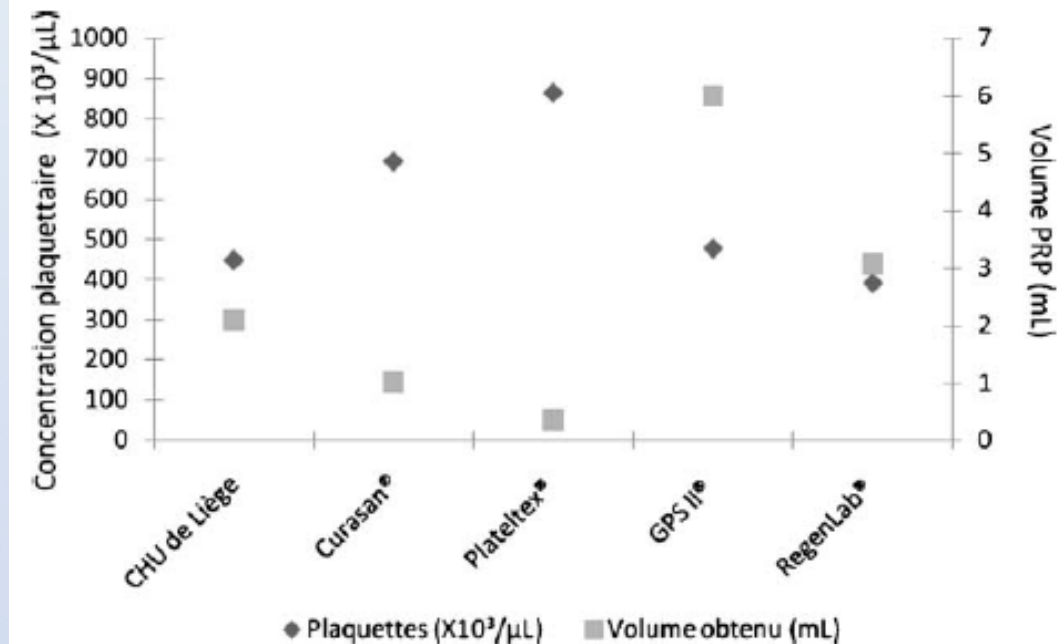
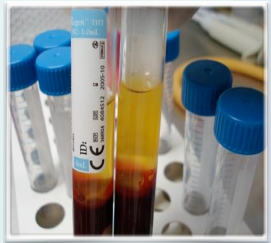


- *No consensus*
- *No local anesthetic*
- *Avoid NSAIDs*
- *Controversed in literature*
- *Very popular in sport*
- *Removed from the doping list of the WADA*



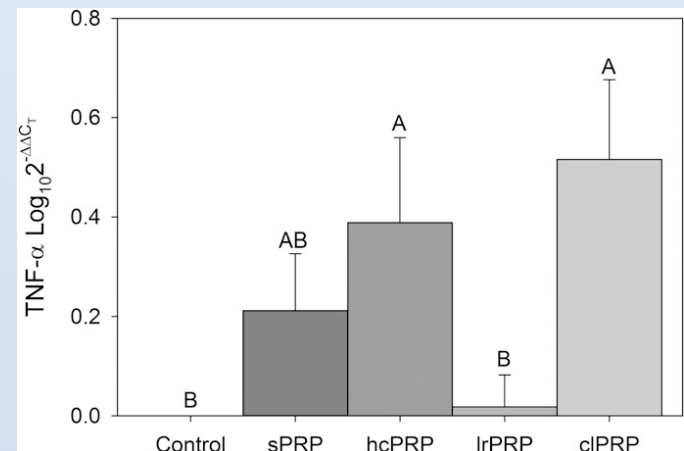
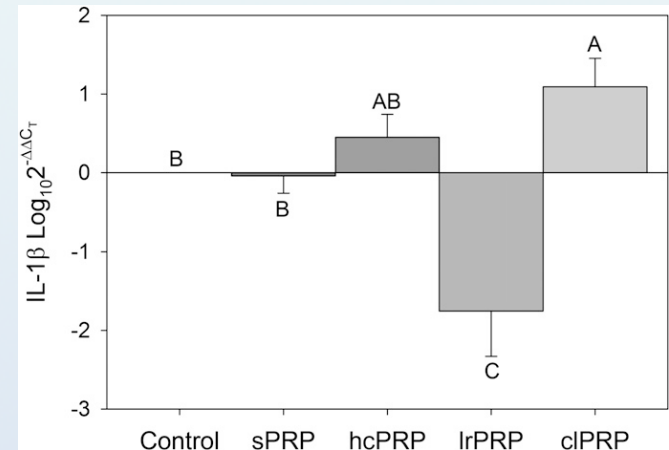
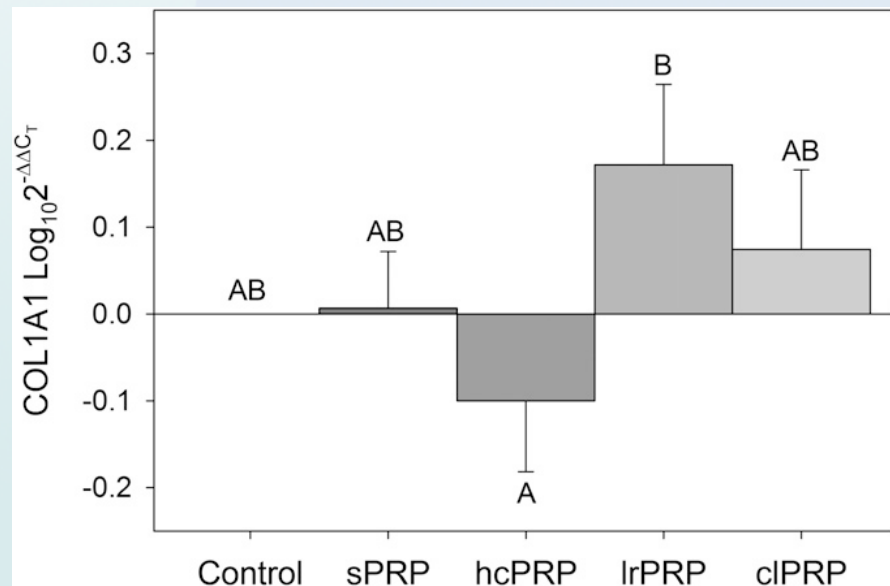
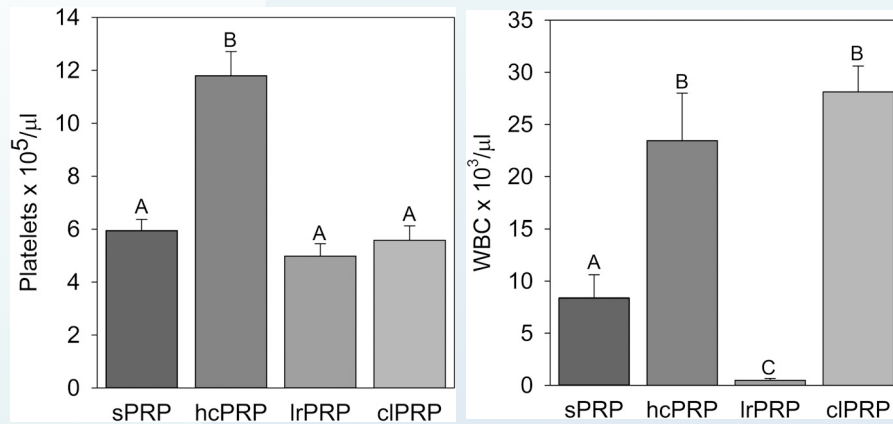
# Preparation

- Many varied techniques → different PRP
  - variation of *platelet concentration*
  - presence or not of *erythrocytes* and *leucocytes*





# Leucocytes or not?



- Tendons = *small metabolic index*
- GF → tenocyte proliferation, *collagen synthesis*, stimulation of angiogenesis, analgesic properties (Anitua 2009; Bosch 2011)
- *Stimulation and acceleration of tissue regeneration* (Virchenko 2006; Bosch 2011; Kaux 2012)
- The application of *mechanical loads* is required to obtain an optimal tissue quality (Virchenko 2006; Kaux 2012)

- Each GF has a *specific action* during the healing process (Molloy 2003; Anitua 2007)
- *Improve cicatricial process* and decrease time of cicatrization:
  - *differentiation* of cells from circulation (Anitua 2006 & 2007; Kajikawa 2008)
  - improve MMPs-3 expression → *remodeling ECM* (de Mos 2008)
  - *improve initial stages* of healing (Anitua 2006 & 2007; Kajikawa 2008; Kaux 2012)
  - improve *type I collagen fiber synthesis and organisation*, neovascularisation (Lyras 2009; Kajikawa 2008; Mishra 2009; Kaux 2012)
  - *better maturation* of the tendinous cal (Aspenberg 2004; Virchenko 2006; Kaux 2012)

- *Chronic* tendinopathies
- Initiate an *acute inflammatory reaction* that quickly moves on to the *proliferative phase*
- **NOT** to be used for acute tendinitis nor tenosynovitis



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**Platelet-rich plasma application in the management of chronic tendinopathies**

Jean-François KAUX, Jean-Michel CRIELAARD

*From the University and University Hospital of Liège, Belgium*

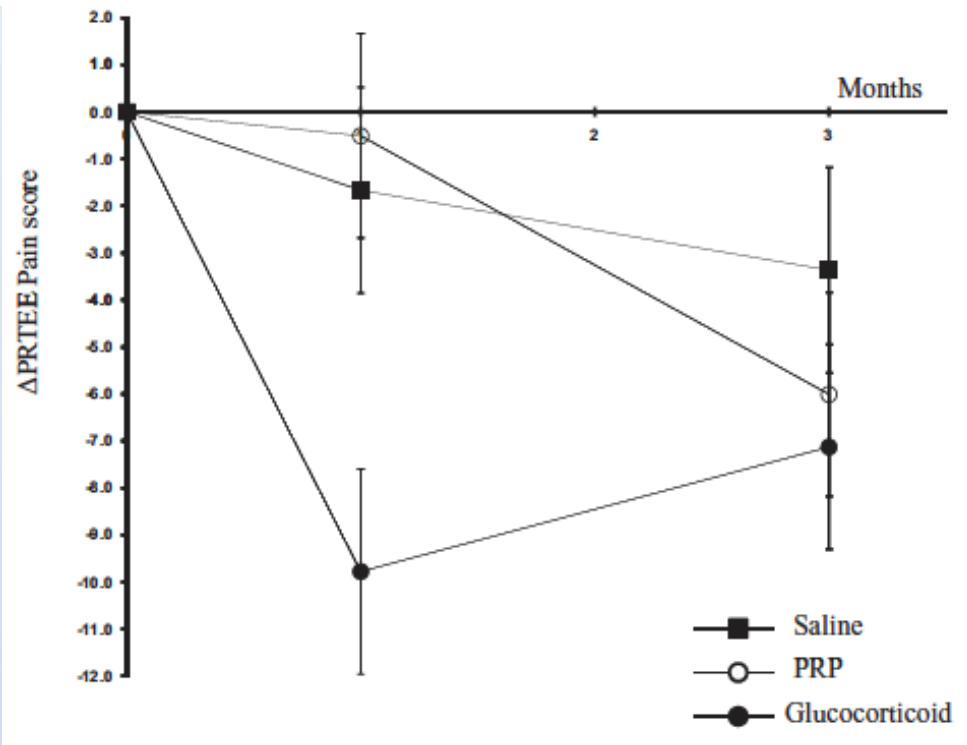


# Lateral epicondylitis

## Treatment of Lateral Epicondylitis With Platelet-Rich Plasma, Glucocorticoid, or Saline

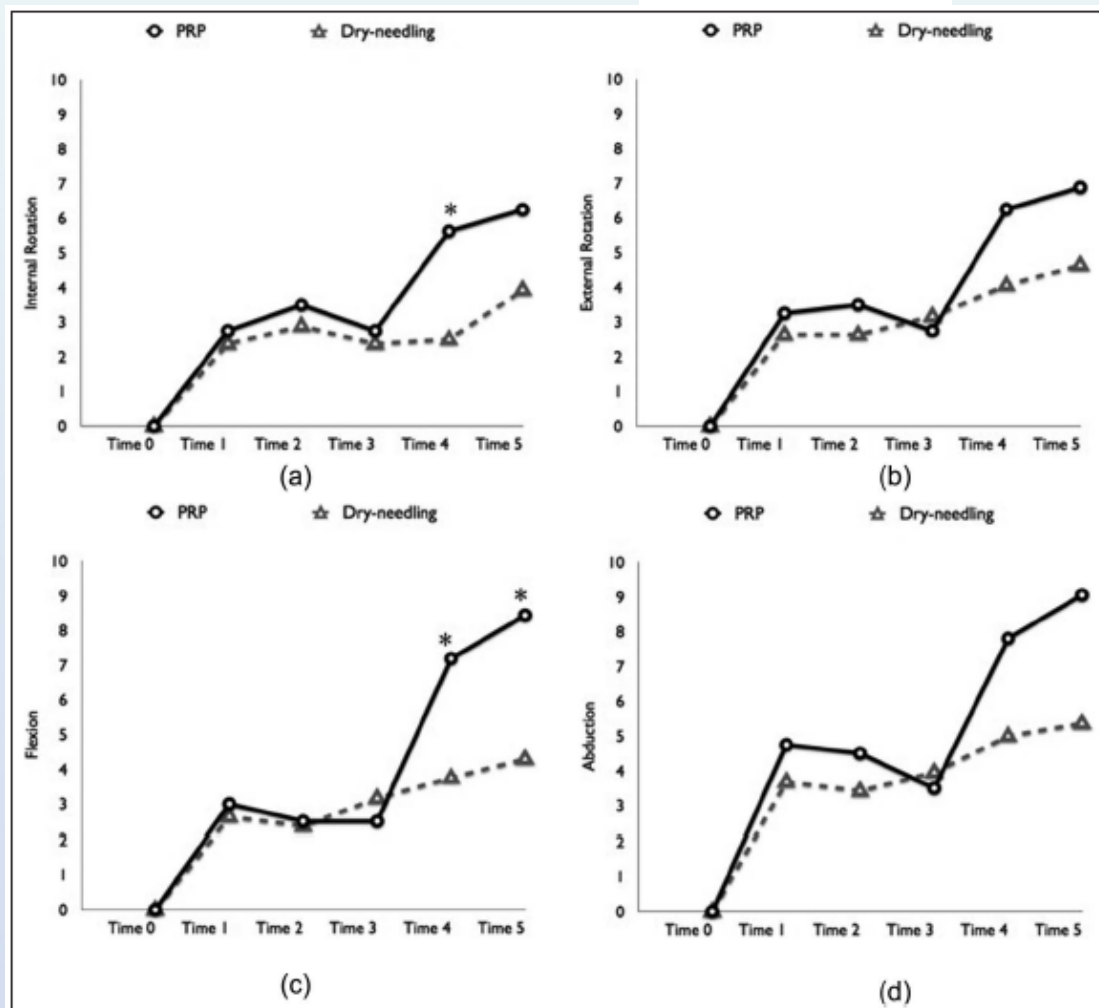
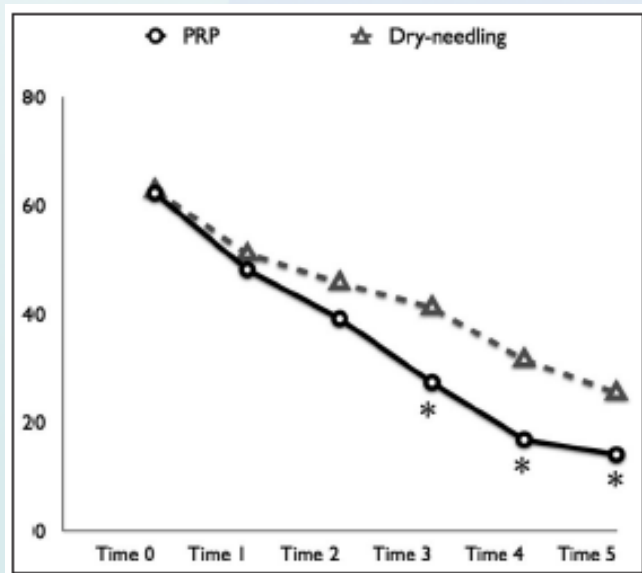
### A Randomized, Double-Blind, Placebo-Controlled Trial

Thøger Persson Krogh,<sup>\*</sup> MD, Ulrich Fredberg,<sup>\*</sup> MD, PhD, Kristian Stengaard-Pedersen,<sup>†</sup> MD, DMSc, Robin Christensen,<sup>‡§</sup> MSc, PhD, Pia Jensen,<sup>\*</sup> RN, and Torkell Ellingsen,<sup>¶||</sup> MD, PhD  
Investigation performed at the Diagnostic Centre, Region Hospital Silkeborg, Silkeborg, Denmark



## Comparison of the therapeutic effects of ultrasound-guided platelet-rich plasma injection and dry needling in rotator cuff disease: a randomized controlled trial

Dong-wook Rha<sup>1</sup>, Gi-Young Park<sup>2</sup>, Yong-Kyun Kim<sup>3</sup>, Min Tae Kim<sup>3</sup> and Sang Chul Lee<sup>3</sup>



## Platelet-Rich Plasma Versus Focused Shock Waves in the Treatment of Jumper's Knee in Athletes

Mario Vetrano,<sup>\*†</sup> MD, Anna Castorina,<sup>†</sup> MD, Maria Chiara Vulpiani,<sup>†</sup> MD, Rossella Baldini,<sup>‡</sup> PhD, Antonio Pavan,<sup>§</sup> MD, and Andrea Ferretti,<sup>||</sup> MD  
*Investigation performed at the Sant'Andrea Hospital, Sapienza University of Rome, Rome, Italy*



**Background:** Tendinopathies represent a serious challenge for orthopaedic surgeons involved in treatment of athletes.

**Purpose:** To compare the effectiveness and safety of platelet-rich plasma (PRP) injections and focused extracorporeal shock wave therapy (ESWT) in athletes with jumper's knee.

**Study Design:** Randomized controlled trial; Level of evidence, 1.

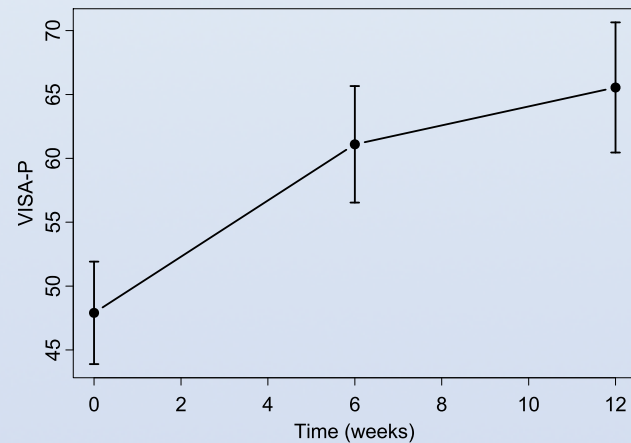
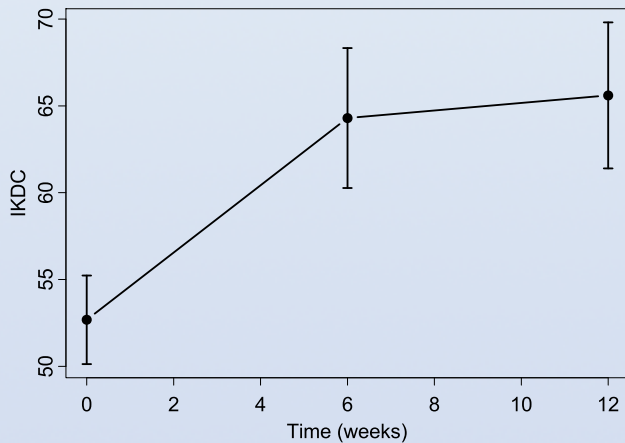
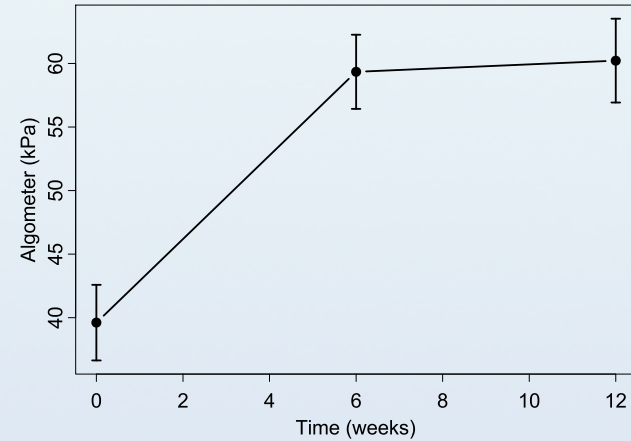
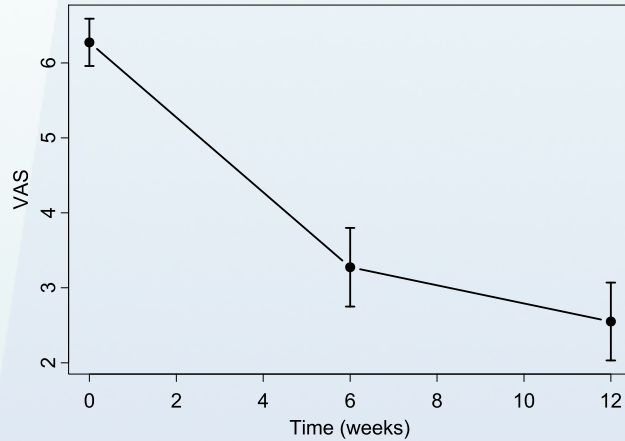
**Methods:** Forty-six consecutive athletes with jumper's knee were selected for this study and randomized into 2 treatment groups: 2 autologous PRP injections over 2 weeks under ultrasound guidance (PRP group;  $n = 23$ ), and 3 sessions of focused extracorporeal shock wave therapy (2,400 impulses at  $0.17\text{--}0.25\text{ mJ/mm}^2$  per session) (ESWT group;  $n = 23$ ). The outcome measures were Victorian Institute of Sports Assessment–Patella (VISA-P) questionnaire, pain visual analog scale (VAS), and modified Blazina scale. A reviewer who was blinded as to the group allocation of participants performed outcome assessments before treatment and at 2, 6, and 12 months after treatment. Nonparametric tests were used for within-group (Friedman/Wilcoxon test) and between-group (Kruskal-Wallis/Fisher test) testing, and the significance level was set at .05.

**Results:** The 2 groups were homogeneous in terms of age, sex, level of sports participation, and pretreatment clinical status. Patients in both groups showed statistically significant improvement of symptoms at all follow-up assessments. The VISA-P, VAS, and modified Blazina scale scores showed no significant differences between groups at 2-month follow-up ( $P = .635$ ,  $.360$ , and  $.339$ , respectively). The PRP group showed significantly better improvement than the ESWT group in VISA-P, VAS scores at 6- and 12-month follow-up, and modified Blazina scale score at 12-month follow-up ( $P < .05$  for all).

**Conclusion:** Therapeutic injections of PRP lead to better midterm clinical results compared with focused ESWT in the treatment of jumper's knee in athletes.

**Keywords:** jumper's knee; platelet-rich plasma; extracorporeal shock wave therapy; tendinopathy/therapy

# Patellar tendinopathies



# Patellar tendinopathies

- Patients with best improvement → younger (24.7 vs 32.2 y.o.)
  - VAS  $\leq$  I
  - significant increase of IKDC score
  - significant improvement of pain during isokinetic evaluation and optojump
  - 70% return to sport (50% same level)





# Achilles tendinopathies

- **RCT PRP vs isotonic saline** (n = 54) + **eccentric** activities for 3 months → after 24 weeks algo-functional scores, patient satisfaction, and return to sports activities significantly **improved in both groups** → idem after 1 year + **no US differences** (de Vos 2010 & 2011; de Jonge 2010)



- Critics:
  - no eccentric treatment before study
  - injection could cause local bleeding
  - change in pressure-volume related to the presence of saline solution
  - relatively invasive for control groups
  - PRP quality may not have been optimal

(Creaney 2010; McCormack 2010; Rabago 2010)

# No efficacy of PRP ?

## Platelet-Rich Plasma as a Treatment for Patellar Tendinopathy

### A Double-Blind, Randomized Controlled Trial

Jason L. Dragoo,<sup>\*†‡</sup> MD, Amy S. Wasterlain,<sup>†‡</sup> MD, Hillary J. Braun,<sup>†</sup> BA, and Kevin T. Nead,<sup>†</sup> MPhil

*Investigation performed at Stanford University, Redwood City, California, USA*

### Platelet-rich therapies for musculoskeletal soft tissue injuries (Review)

Moraes VY, Lenza M, Tamaoki MJ, Faloppa E, Belloti JC

# Strong evidence against platelet-rich plasma injections for chronic lateral epicondylar tendinopathy: a systematic review

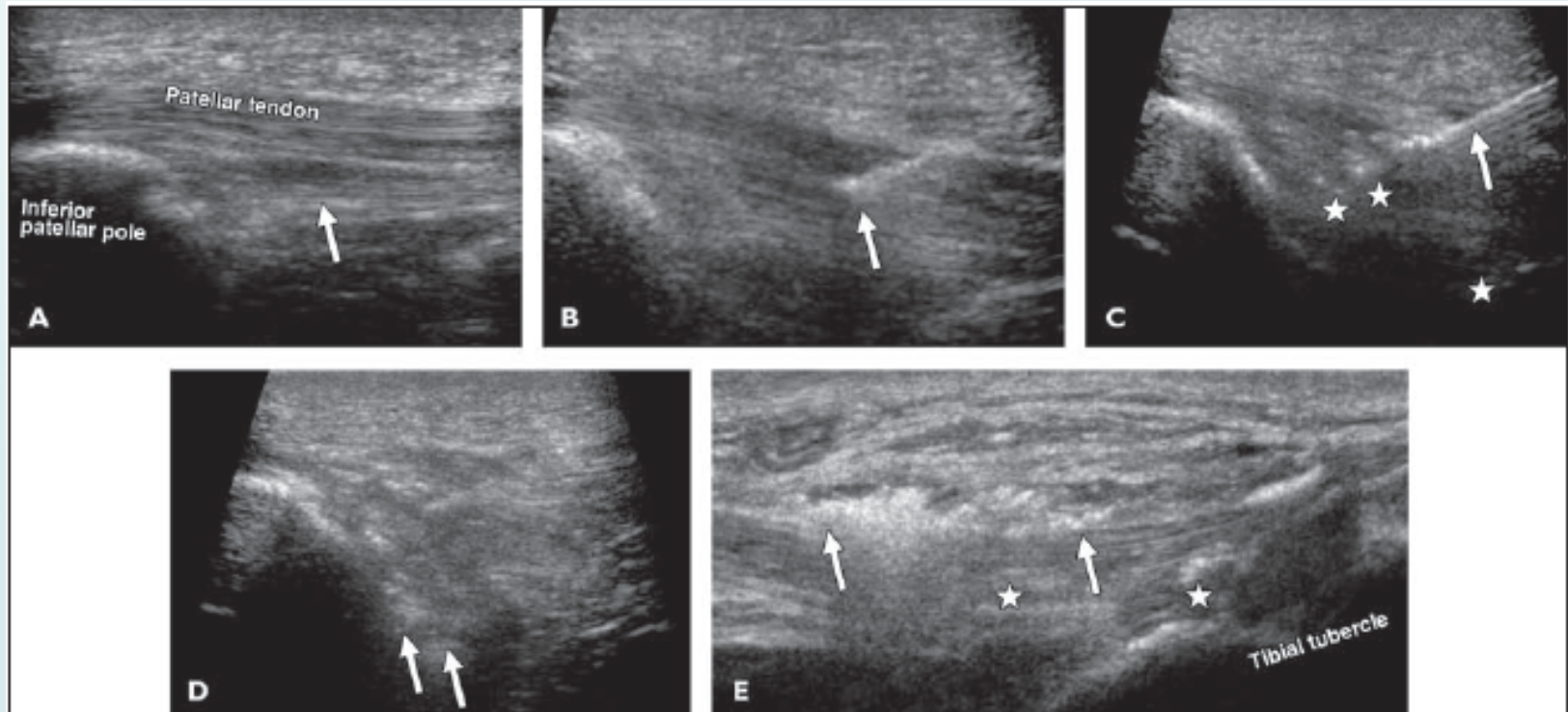
Robert-Jan de Vos,<sup>1,2,3</sup> Johann Windt,<sup>4</sup> Adam Weir<sup>1</sup>

# US guidance or not ?

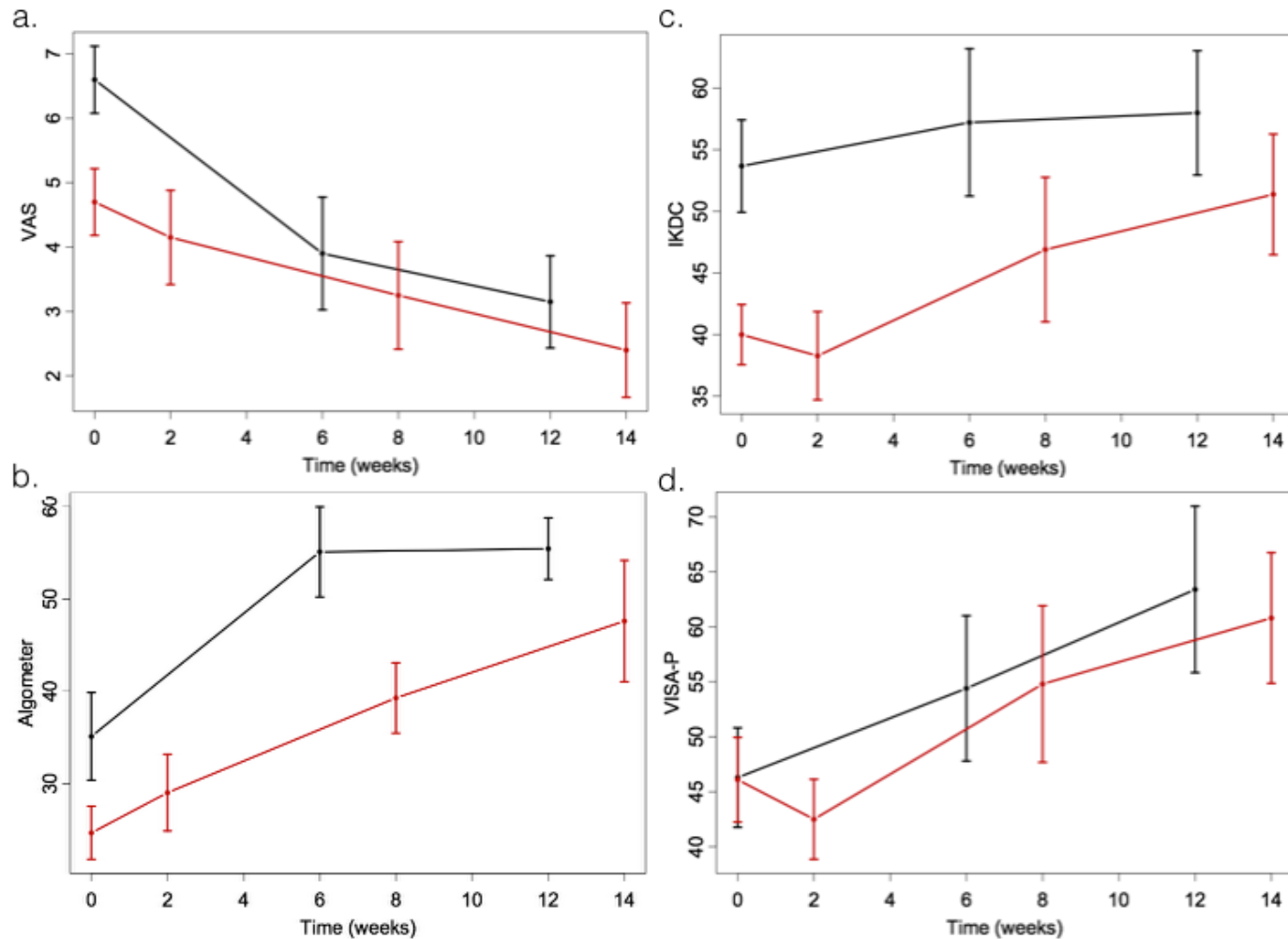
## Retrospective Analysis of Postinjection Ultrasound Imaging After Platelet-Rich Plasma or Autologous Blood: Observational Review of Anatomic Distribution of Injected Material

Michael L. Loftus<sup>1</sup>  
Yoshimi Endo<sup>2</sup>  
Ronald S. Adler<sup>3</sup>

**AJR** *American Journal of Roentgenology*  
Diagnostic Imaging and Related Sciences

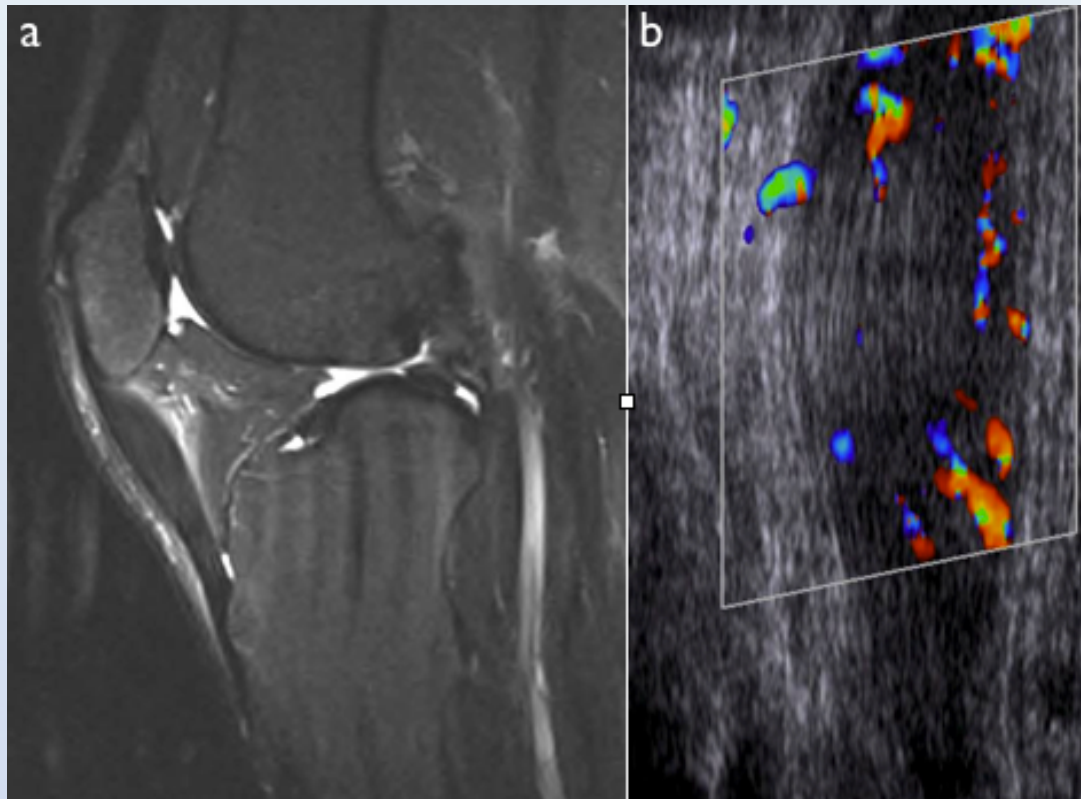


# Second infiltration ?





- **Potential side effect: exuberant inflammatory reaction** (Kaux 2014)





- PRP seems to be efficient in *chronic tendinopathies*
- PRP remains *controversial*
- Ideal PRP treatment
  - reproducible for all patients
  - poor in leukocytes and erythrocytes (?)
  - platelet activation (?)
  - no local anesthetics nor NSAIDs
  - infiltration US-guided (?)
  - rehabilitation protocol post-infiltration

Dank u  
voor uw aandacht !



<http://hdl.handle.net/2268/163372>



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