




# PRP Platelet-Rich Plasma in Orthopaedics

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## Company driven activities



## PRP in tendon

- In tendon regeneration**
  - TGF- $\beta_1$
  - Increases expression of procollagen type I and III
  - Increases mechanical properties
- PDGF-BB, IGF-1, VEGF, BFGF...
  - Promote tendon healing and tendon cell proliferation
- PRP in vitro**
  - Stimulates gene expression of the matrix molecules
  - Stimulates collagen production
  - Stimulates tendon cell proliferation
  - Stimulates tenocyte synthesis of VEGF and HGF
  - Activates circulation-derived cells
- In animal studies**
  - Increases tendon callus strength and stiffness

## PRP in tendon



- n=140, elbow epicondylar tendinosis
- Failed conservative ttr
- One injection of PRP
- At 8 weeks, 63% improvement in VAS versus 13% in control

Mirsha & Pavelko *Am J Sports Med* 2006

## PRP in tendon

Reference	Level of evidence	Tendon	Patients (n)	Follow-up	Outcome	Complications
Pearbooms et al <sup>21</sup>	Prospective randomised study (level I)	Elbow anterior or flexor tendon	100	52 weeks	ODAS score improved in both groups, but sign. much more in the platelet-rich plasma group	No
De Vos et al <sup>22</sup>	Prospective randomised study (level I)	Achilles tendon	54	24 weeks	Mean VISA-A score improved in both groups; however, no significant group differences	No
Randelli et al <sup>23</sup>	Prospective randomised study (level I)	Rotator cuff tendon	55	104 weeks	Significantly better external rotation strength, and higher SSI, UCLA, constant scores 2 months after surgery, but no group differences after 2 years (only for subgroups)	No
Castirci et al <sup>24</sup>	Prospective randomised study (level I)	Rotator cuff tendon	88	65 weeks	No significant difference in total Constant Score or in MRI tendon score PPRM	No
Mirsha & Pavelko <sup>25</sup>	Prospective cohort study (level II)	Elbow anterior or flexor tendon	20	23.6 months (12-38 months)	Reduction in visual analogue pain score (82% of treated patients)	No
Filardo et al <sup>26</sup>	Prospective cohort study (level III)	Patellar tendon	31	6 months	Significant improvements in Tegner score, EQ-5D	No
Gavvedel et al <sup>26</sup>	Case-control study (level III)	Achilles tendon	14	18 months	ADFAAS scale improved from 55 to 96 points	No
Sánchez et al <sup>27</sup>	Case-control study (level III)	Achilles tendon	12	32-50 months	VISA-A scale improved from 24 to 98 points	In the control group (wounds)
Kon et al <sup>28</sup>	Cohort study (level IV)	Patellar tendon	20	6 months	Improvements in Tegner, EQ-5D VAS and Short Form (SR) Health Survey scores	No

From IOC consensus paper *BJSM* 2010

## PRP in tendon acute lesion

- RCT - n=30 patients
- FU 1 year
- Autologous platelets have no effect on the healing of human Achilles tendon ruptures
- In acute tendon repair - no evidence of improvement
- Safe

Schepull et al *Am J Sports Med* 2011

## PRP in tendon chronic lesion

- RCT - n=54 patients
- Two groups: eccentric training protocol
- PRP injection vs saline in the control group
- FU 1 year
  - Ultrasound examination at baseline and FU
  - Victorian Institute of Sports Achilles-assessment score

This randomized controlled trial showed **no clinical and ultrasonographic superiority of platelet-rich plasma injection** over a placebo injection in chronic Achilles tendinopathy at 1 year combined with an eccentric training program.

De Jonge et al *Am J Sports Med* 2011

## PRP in PT tendinopathy

Int Orthop 2010 Aug;34(8):909-15. Epub 2009 Jul 31.  
Use of platelet-rich plasma for the treatment of refractory jumper's knee.  
Filardo G, Kon E, Della Villa S, Vincenzetti F, Fomasoni FM, Marozzi M.  
Department of Orthopaedic and Sports Trauma, Rizzoli Orthopaedic Institute, Bologna, Italy. g.filardo@biomec.ior.it

- n=31 patients, case control study
- Standard Physical Therapy treatment
- Failed all ttr modalities
- EQ-VAS, VAS, patient satisfaction
- FU: 6 months
- Safe

The clinical **results are encouraging**, indicating that PRP injections have the potential to promote the achievement of a satisfactory clinical outcome, even in difficult cases with chronic refractory tendinopathy after previous classical treatments have failed

Kon et al *Injury* 2009  
Filardo et al *Int Orthopaedic* 2010

## PRP in tendon chronic lesion

J Bone Joint Surg Am. 2012 Jan 11.  
Efficacy of Autologous Platelet-Rich Plasma Use for Orthopaedic Indications: A Meta-Analysis.  
Sheeth U, Simanovic N, Kwon G, Fu F, Eirikson TA, Schmitzsch E, Ayeni OR, Bhandari M.  
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- Meta-analysis
- 23 randomized trials and 10 cohort studies
- Acromion, rotator cuff, ACL, lateral epicondyle, Achilles & patellar tendons, tibial bone and spine
- Lack of consistency in outcomes report
- Most studies: VAS scores

The current literature is complicated by a **lack of standardization** of study protocols, platelet-separation techniques, and outcome measures. As a result, there is **uncertainty about the evidence** to support the increasing clinical use of platelet-rich plasma and autologous blood concentrates as a treatment modality for orthopaedic bone and soft-tissue injuries.

## Summary in chronic lesion

- PRP possibly has a positive effect in RC
- Tremendous variability in the biology of RC lesion
- *Chronic Achilles tendinopathy* - data is increasing
- PRP may be effective - not demonstrated yet
- *Chronic PT tendinopathy* - PRP can have an effect in more severe cases - failed regular ttr
- *Elbow* - May be effective in patients who failed regular ttr

## If you still want to do it

- Use a validated system of platelets separation
- Anatomical lesion identified
- Intrinsic collagen activation
- Ultrasound guided injection



- Post-injection:
  - 10 days no physical constraint
  - 10 days light sports activity
  - 3 weeks progressive return to training

## Limitations

- Further characterization of biologic mechanisms of PRP
- Ideal concentration of platelets?
- Timing of injection
- Serial injection ?
- Effect of local tissue pH on PRP activity
- Overexposure PRP - limit differentiation of cells into the appropriate cell lines

Marx *J Oral Maxillofac Surg* 2004  
From IOC consensus paper BJSM 2010

## PRP contra-indications

- Absolute:
  - Platelet dysfunction syndrome
  - Hypofibrinogenemia
  - Septicemia
  - Sensitivity to bovine thrombin  
(if using with calcium to make platelet gel, this may lead to intravascular coagulopathy due to antibodies interactions)

Everts et al Proceeding of 21st Mechanism of Perfusion Congress Orlando 2006

## PRP contra-indications

- Relative:
  - Thrombocytopenia
    - Platelet counts less than  $10^5$
  - HCB: < 10g /dl
  - Acute infections
  - Consistent use of NSAIDs within 48h of procedure

Everts et al Proceeding of 21st Mechanism of Perfusion Congress Orlando 2006

## PRP contra-indications

- Relative:
  - Corticosteroid injection at treatment site or systemic use of corticosteroids within 2 weeks of injection
  - Recent fever of illness
  - Cancer (hematopoietic or bone)

Everts et al Proceeding of 21st Mechanism of Perfusion Congress Orlando 2006

## New trend

### Ultrasound-guided injections of hyperosmolar dextrose for overuse patellar tendinopathy: a pilot study

Michael Ryan,<sup>1</sup> Anthony Wong,<sup>2</sup> David Rabago,<sup>3</sup> Kenneth Lee,<sup>4</sup> Jack Taunton<sup>5</sup>

BJSM January 2012

**Conclusion** There was a reduction in pain and an improvement in ultrasound appearance following ultrasound-guided dextrose injections for refractory patellar tendinopathy. An improved hypoechoic appearance of the tendon was associated with decreased pain scores, suggesting that dextrose injections may modify patellar tendinopathy at the tissue level and that fibrillar changes may play a role in tendon nociception.

## Take home message

- PRP might be effective in several applications
- Standardisation of the preparation
- More data in basic science
- Currently, RCT show no effect or non-reproducible effect
- More robust RCT

*Recommend to proceed with caution in the use of PRP in athletic sporting injuries*

swiss olympic medical center

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FACULTÉ DE MÉDECINE

Thank you for listening