

Plasma PRP/ ACP Gonarthrosis



Basic Science

Buul et al, AJSM, 2011
Andia et al, Op. Tech. Ortho, 2012
Smyth et al, Arthroscopy, 2013
Anitua et al, J Biomed Mat.Res, 2014
Braun et al, AJSM, 2014
Sundman et al, AJSM, 2014

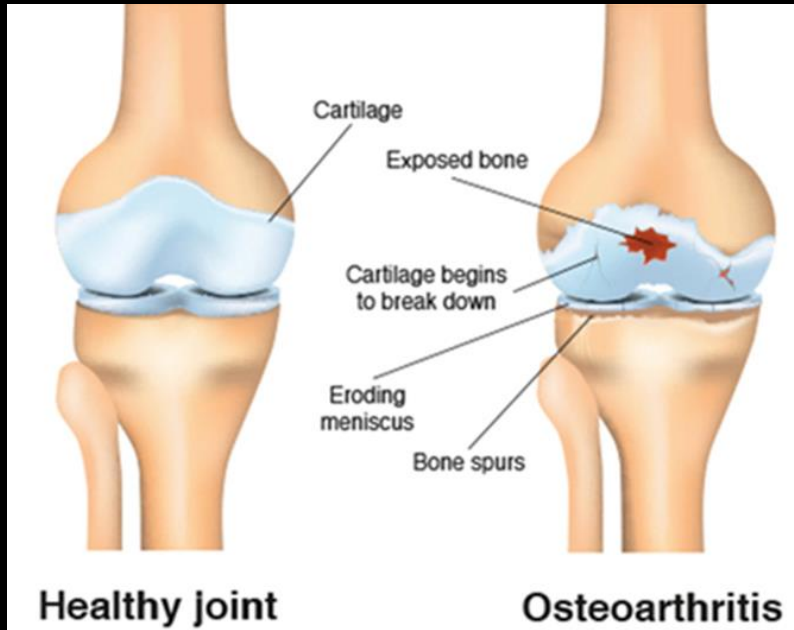
Reviews

Filardo et al, KSSTA 2013
Koshbin et al, JARS 2013
Chang et al, ACRM 2013
Pourcho, Osteoarthritis 2014
Kanchanatawan, KSSTA 2015
Meheux, Arthroscopy 2015
Dai et al, Arthroscopy 2016
Shen et al, JOSR 2017
Xing et al, IJRD 2017
Belk et al, CSMU 2021
Dong et al, Clin. Rheumatology 2021
Nie et al, OJSM 2021

Level I Randomized Trials

Cerza et al, AJSM, 2012	ACP vs. HA
Sanchez et al, Arthroscopy, 2012	PRGF vs. HA
Paterson et al, BMC, 2013	PRP vs. HA
Patel et al, AJSM, 2013	PRP vs. Placebo
Vaquerizo et al, Jars, 2013	PRGF vs. HA
Filardo et al, AJSM, 2015	PRP vs. HA
Görmeli et al, KSSTA, 2015	PRP vs. HA vs. Plac
Raeissadat et al, Clin Med Ins., 2015	PRP vs. HA
Cole et al, AJSM, 2016	ACP vs. HA
Duymus et al, KSSTA, 2016	PRP vs. HA vs. Oz
Smith et al, AJSM, 2016	ACP vs. Plac
Jubert et al, OJSM, 2017	L-PRP vs. CS
Lisi et al, Clin. Rehab. 2017	PRP vs. HA
Huang et al, Der Orthopäde 2019	PRP vs. HA, CS

Osteoarthritis (OA) – Knee



14 positive RCT Level I studies!!

>1,000 patients included

10 vs. HA; 3 vs. Placebo/NaCl

- 2 ACP vs. HA
 - 1 ACP vs. Placebo/NaCl
-

12 Reviews concluding

PRP superior to HA

PRP superior to placebo

PRP superior to corticosteroids

PRP superior to ozone

PRP in OA – Which PRP?

“Responders to Platelet-Rich Plasma in Osteoarthritis: A Technical Analysis” (Milant, BMRI, 2017)

Review Article

Responders to Platelet-Rich Plasma in Osteoarthritis: A Technical Analysis

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Academic Editor: Giuseppe Filardo

- 19 RCTs analyzed

Very good responders: 7 studies

Bad responders: 4 studies

Use of leukocyte-rich PRP only found in
Bad responders group

**“...use of a single spinning technique, a
platelet concentration lower than 5 times
the baseline, and avoidance of
leukocytes should be preferred”**

ACP

Knee OA – Review 2017

“Intra-articular PRP injections for knee osteoarthritis: An overview of systematic reviews and risk of bias considerations” (Xing, 2017)



SPECIAL EDITORIAL REVIEW

Intra-articular platelet-rich plasma injections for knee osteoarthritis: An overview of systematic reviews and risk of bias considerations

Dan XING,^{1,2,*} Bin WANG,^{3,*} Wei ZHANG,^{1,2} Ziyi YANG,^{1,2} Yunfei HOU,^{1,2} Yaolong CHEN^{4,5} and Jianhao LIN^{1,2}

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10 reviews included
4 with low risk of bias
6 with high risk of bias

Best evidence: Meheux et al. and Dai et al.

Meheux et al.:

In patients with symptomatic knee OA, **PRP injection results in significant clinical improvements up to 12 months post injection**. Clinical outcomes and WOMAC scores are significantly **better after PRP versus HA** at 3 to 12 months post injection.

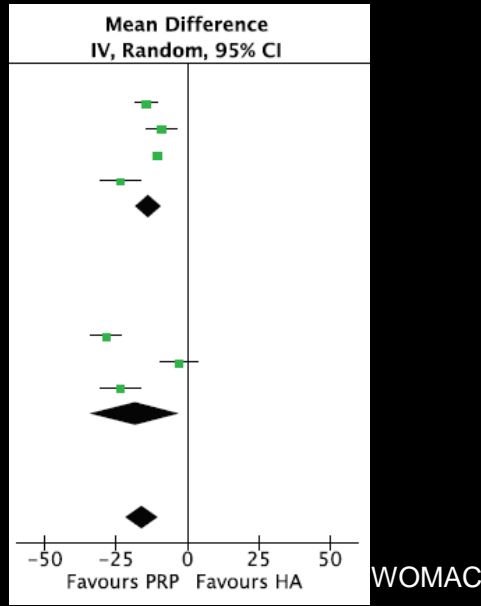
Dai et al.:

Current evidence indicates that, compared with HA and saline, intra-articular **PRP injection may have more benefit in pain relief and functional improvement** in patients with symptomatic knee OA at 1 year post injection.

Knee OA – Review 2021



“Platelet-Rich Plasma Versus Hyaluronic Acid for Knee Osteoarthritis” (Belk CSMU 2021)



Results

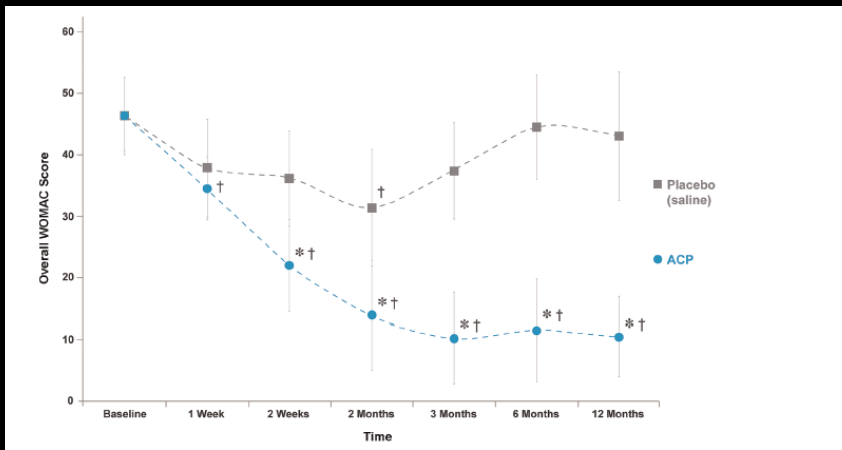
Patients undergoing treatment for knee OA with PRP can be expected to experience improved clinical outcomes when compared with HA

Leukocyte-poor PRP a superior line of treatment for knee OA over leukocyte rich PRP

- Level I studies Meta-Analysis
- 18 studies
- 811 patients
- WOMAC, VAS, IKDC

Knee OA – ACP vs Placebo

ACP vs. Placebo (Smith, AJSM, 2016)



From week 2 onwards, **ACP was significantly superior to saline placebo up to 12 months!**

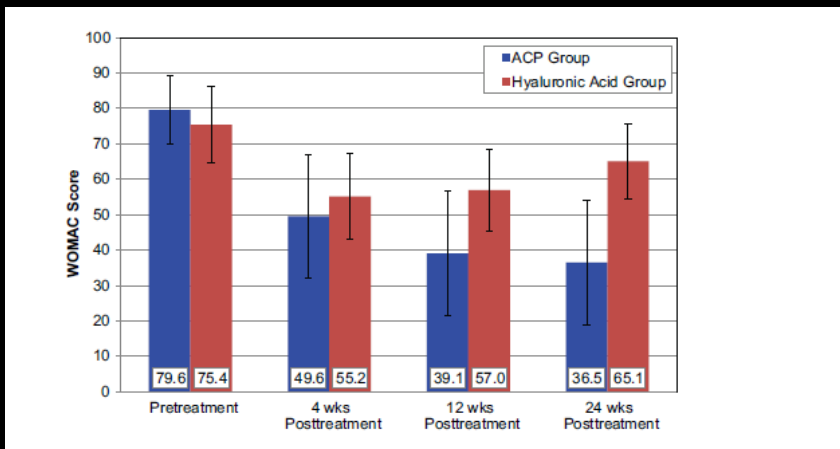
ACP group improved their WOMAC scores by 78% from baseline vs. 7% for the placebo group

No adverse events

- RCT, double-blind, regulated by the FDA, level I
- 30 patients
- 3 injections, weekly interval
- OA grade II-III; WOMAC

Knee OA – ACP vs HA

ACP vs. HA (Cerza, AJSM, 2012)



- RCT, level I
- 120 patients
- 4 injections, weekly interval
- OA grade I-III, WOMAC

Results

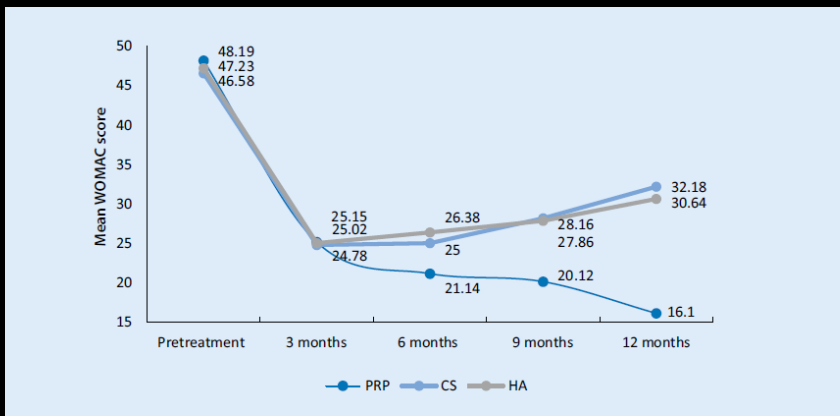
ACP showed a **significantly better** clinical outcome than did treatment with HA

Effective up to 6 months (up to 12 months, data not published)

Treatment with **HA** did not seem to be effective in the patients with grade III gonarthrosis

Knee OA – Corticosteroids

...INFERIOR: „Intra-articular injections of PRP, HA or corticosteroids for knee osteoarthritis” (Huang, Orthopäde, 2019)



Results

- Clinical efficacy of IA-PRP is comparable to that of the IA-HA and IA-CS forms after 3 months
- **long-term efficacy of IA PRP is superior to IA-HA and IA-CS**

- Prospective RCT
- 120 patients, OA grade I-II
- 3 injections, LP-PRP (every 3 weeks) or HA (every week) or corticosteroid

Ankle Osteoarthritis



„Conservative Treatment of Ankle Osteoarthritis: Can Platelet-Rich Plasma Effectively Postpone Surgery?“ (Repetto, JFAS, 2017)

	Average	SD
FADI score		
Before treatment	59.22	13.60
After treatment	80.21	17.28
VAS score		
Before treatment	7.8	0.5
After treatment	2.6	2.2

- Retrospective
- 20 patients
- LP-PRP: 4 injections (3ml) weekly interval

Results

PRP injection in ankle OA is **effective in improving function and pain control.**

80% of the patients were satisfied and were able to return to their previous level of activity.

No adverse effects or complications

PRP is a valid and safe **alternative to postpone the need for surgery.**

Hip Osteoarthritis

„Comparing Intra-articular Injections of Leukocyte-Poor Platelet-Rich Plasma Versus Low-Molecular Weight Hyaluronic Acid for the Treatment of Symptomatic Osteoarthritis of the Hip” (Kraeutler, OJSM 2021)



TABLE 5
ROM: Time × Group Interaction^a

	LMW-HA (n = 14 Hips)		LP-PRP (n = 19 Hips)		P Value ^b
	n	Mean ± SD	n	Mean ± SD	
Internal rotation ^c					
0 wk	14	2.3 ± 13.5	18	2.8 ± 7.0	.90
6 wk	13	0.9 ± 14.1	18	3.3 ± 6.6	.58
12 wk	14	0.7 ± 14.5	18	4.7 ± 7.9	.37
24 wk	13	0.8 ± 11.3	18	7.8 ± 10.3	.09

- Level 1 RCT
- 34 patients (36 hips)
- 3 weekly injections of LP-PRP or LMW-HA
- Follow-up 6 weeks, 3, 6, 12, 24 months

Results

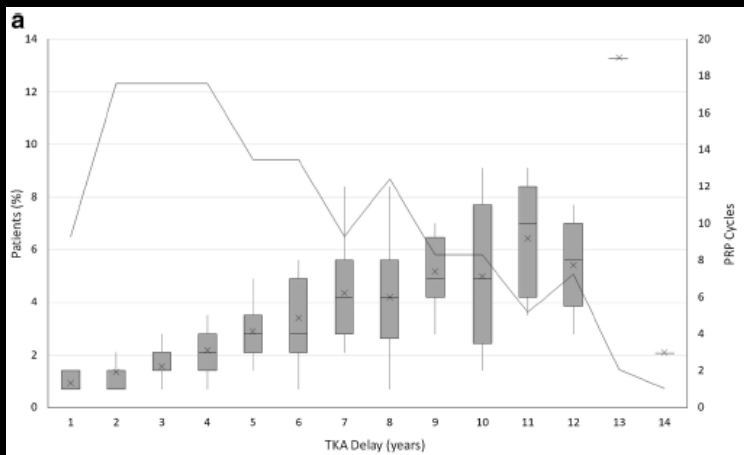
Significantly more patients converted to THA or hip resurfacing procedure in LMW-HA group

WOMAC overall and function scores as well as internal rotation significantly improved in the LP-PRP group, not in the LMW-HA group

LP-PRP injections delayed the need for THA or hip resurfacing

PRP – Alternative to surgery?

„Platelet-rich plasma injections delay the need for knee arthroplasty: a retrospective study and survival analysis” (Sánchez, Int. Orth. 2021)



- Retrospective analysis and survival analysis
- 667 knee OA patients with 5 year follow-up
- Dates of PRP treatment and TKA analysed

Results

74,1% achieved a delay in TKA of more than 1.5 years

85,7% did not undergo TKA during the 5-year follow-up

>15% delayed joint replacement for more than 10 years

Severity degree, age, PRP cycles and administration route had a statistically significant influence on the efficacy of PRP in delaying surgery

PRP for tendinopathy - Review

„Efficacy of PRP injections for symptomatic tendinopathy“ (Miller, BMJ Open Sport Exerc Med 2017)



Downloaded from <http://bmjopen.bmj.com/> on February 16, 2018 - Published by group.bmj.com

Open Access Original article

BMJ Open Sport & Exercise Medicine

Efficacy of platelet-rich plasma injections for symptomatic tendinopathy: systematic review and meta-analysis of randomised injection-controlled trials

Larry E Miller,¹ William R Parrish,² Breana Roides,² Samir Bhattacharyya²

To cite: Miller LE, Parrish WR, Roides B, et al. Efficacy of platelet-rich plasma injections for symptomatic tendinopathy: systematic review and meta-analysis of randomised injection-controlled trials. *BMJ Open Sport Exerc Med* 2017;3:e00237. doi:10.1136/bmjsem-2017-00237

Received 08 February 2017

ABSTRACT

Aim To determine the efficacy of platelet-rich plasma (PRP) injections for symptomatic tendinopathy.

Design Systematic review of randomised, injection-controlled trials with meta-analysis.

Data sources Systematic searches of MEDLINE and EMBASE, supplemented by manual searches.

Eligibility criteria for selecting studies Randomised controlled trials with 3 months minimum follow-up that evaluated pain reduction with PRP versus control (saline, local anaesthetic, corticosteroid) injections in patients with symptomatic tendinopathy.

What is already known?

- ▶ Chronic tendinopathy presents a therapeutic challenge to clinicians and there is no consensus on preferred treatment regimens.
- ▶ While platelet-rich plasma (PRP) injections have shown generally positive results in tendinopathy, study designs and PRP preparation methods vary widely which complicates interpretation of efficacy.

Results

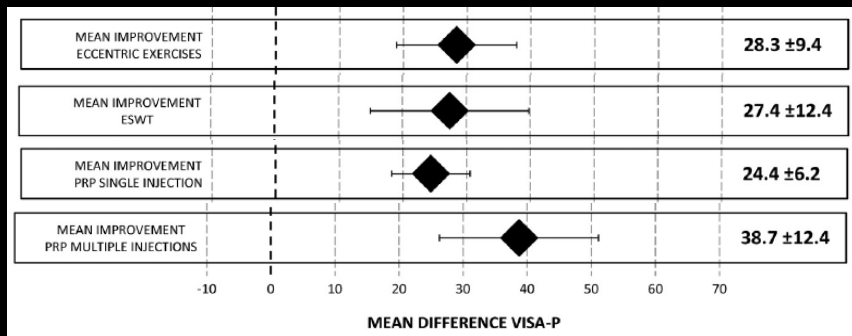
PRP is more efficacious than control injections in patients with symptomatic tendinopathy

PRP injections may be more efficacious in woman than men

- Lateral epicondylar, Achilles, Patellar, Rotator cuff
- 16 randomized controlled trials
- Control groups: LA, Saline, Corticosteroid

Patellar Tendinopathy – Review

„Nonsurgical Treatments of Patellar Tendinopathy: Multiple Injections of Platelet-Rich Plasma Are a Suitable Option” (Andriolo et al., AJSM, 2018)



- 22 studies, 591 patients
- Various PRPs and injection protocols

Results

The comparison among treatments showed that **multiple injections of PRP obtained the best results in terms of improvement at long-term follow-up**

2 or 3 consecutive infiltrations should be considered when administering PRP”

“...**multiple PRP injections** may offer more satisfactory results at long-term follow-up and **can be therefore considered a suitable option for the treatment of patellar tendinopathy.**”

Patellar Tendinopathy – ACP



Zayni, MLTJ, 2015

Clinical scores	At baseline			At 34 monthmean FU		
	VAS (SD)	Tegner score (SD)	VISA-P (SD)	VAS (SD)	Tegner score (SD)	VISA-P (SD)
Group a: 1 PRP injection	7.1 (1.6)	4.1 (1.3)	36.7 (10.6)	3.6 (1.2)	5.9 (5.9)	65.7 (19.8)
Group b: 2 PRP injections	6.7 (1.7)	4.8 (0.94)	35.7 (9.4)	1.07 (1.5)	8.1 (1.7)	93.2 (14)
p value	ns	ns	ns	0.0005	0.0003	<0.0001

- Randomized prospect. consec. series, level II
- 40 athletes
- Single vs. Two injections (2 weeks apart)
- VISA-P, VAS, Tegner

Results

PRP injection improved clinical outcomes in almost 77% of patients and allowed them to return to their pre-symptom activity level in 86% of cases.

Two consecutive ultrasound-guided intratendinous PRP injections showed a better improvement in their outcomes when compared to a single injection

Patellar Tendinopathy – ACP



Are Multiple Platelet-Rich Plasma Injections Useful for Treatment of Chronic Patellar Tendinopathy in Athletes?” (Charousset, AJSM, 2014)

Comparison of Clinical Outcomes Before the Procedure and at the 2-Year Follow-up^a

Outcome Measure	Preprocedure	2-Year Follow-up	P Value
Lysholm score	60 (40-70)	96 (70-100)	<.001
VISA-P score	39 (28-60)	94 (60-100)	<.001
VAS	7 (4-8)	0.8 (0-3)	<.0001

^aValues are expressed as mean (range).

- Case series, level IV
- 28 athletes
- 3 injections, weekly interval
- VISA-P, VAS, Lysholm

Results

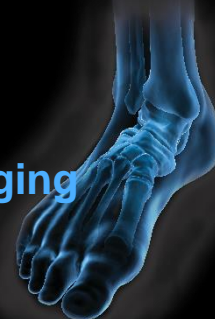
VISA-P, VAS, and Lysholm scores all significantly improved at the 2-year follow-up

75% were able to return to their presymptom sporting level after a mean period of 3 months

Alternative treatment to surgery, which has allowed only 50% to 70% of the treated patients (either arthroscopic or open surgery) to return to a presymptom sporting level

Plantar Fasciitis - Review

„ Effectiveness and relevant factors of platelet-rich plasma treatment in managing plantar fasciitis: A systematic review” (J Res Med Sci, 2016)



Author/year	Study design and quality	Number of patients	Intervention	Control	Results
Ragheb and Othman 2019 ²⁴	Prospective cohort (good)	25	5 ml PRP injection	None	Injection of PRP is safe, reduce post injection pain and doesn't affect the biomechanical function of the foot
Marfell et al. 2013 ²⁵	Prospective cohort (good)	14	PRP injection (platelet and mesenchymal)	None	PRP is safe and has significantly reduced pain and improved function
Kumar et al. 2013 ²⁶	Prospective cohort (good)	44 (50 heels)	2.5-3.5 ml PRP injection	None	PRP produce an efficacy rate, approaching 2 out of every 3. The procedure was safe
O' Malley et al. 2019 ²⁷	Retrospective cohort (good)	23	2-3 ml PRP injection	None	Pain, symptoms and quality of life improved significantly with PRP injection, with safety assured
Kim and Lee 2013 ²⁸	RCT (good)	21 (10 in PRP group, 11 in Dexamethasone group)	2 ml PRP injection	2cc Dexamethasone/ lidocaine injection	Both group showed improvement, even though PRP showed better initial improvement, there is no statistical significance between these group
Akasha et al. 2012 ²⁹	RCT (good)	40 (30 in each group)	3 ml PRP injection (40 mg methylprednisolone)	Steroid injection (40 mg methylprednisolone)	Both group showed significantly lowered pain score but no significant different between these groups. PRP was safer than steroid with same effectiveness
Monto 2018 ³⁰	RCT (good)	40 (Cortisone 20+ PRP 20)	3 ml PRP injection	Corticisone injection	Significant difference between 2 groups. PRP was more effective and durable than cortisone
Jain et al. 2015 ³¹	Prospective cohort (good)	44 Patients (40 heels)	2.5 ml PRP injection	Triamcinolone 40 mg and Chlorzoxane	At 3 months, all scores had significantly improved in both groups. At 6 months, there was no statistically significant difference between the two groups. At 12 months, PRP is significantly more effective than Steroid
Sheryy et al. 2015 ³²	RCT (good)	50 Patients (25 in each group)	3 ml PRP injection	2 ml Intracortical acetic acid	At 15 months post-injection, there was more improvement in the PRP than in the steroid group. There was no significant difference between both groups at 3 months
Shetty et al. 2014 ³³	Prospective cohort (good)	40 Patients (35 in each group)	8 ml PRP injection	40 mg of triamcinolone acetonide and 3 ml of 2% lignocaine	There was significant clinical improvement in PRP group at three months after the injection
Wilson et al. 2014 ³⁴	Prospective cohort (case series) (good)	22 Patients (24 heels)	5 ml PRP injection	None	Treatment with PRP injection resulted in clinically and statistically significant improvements in self-reported pain and functioning compared with pre-injection baseline measurements
Say et al. 2014 ³⁵	Prospective cohort (good)	50 Patients (25 in each group)	2.5 ml PRP injection	40 mg/1 ml of methylprednisolone and 1 ml of procaine	The PRP group had significantly higher mean VAS and VAS scores at follow-up than the steroid group (P<0.001)

PRP = Platelet-rich plasma

Results

Improvement during the first 3 months

Significant improvement was also noted when the patient was followed up till 12 months postinjection

Regardless of PRP variations, superiority of PRP treatment compared to steroid was reported in all studies

PRP therapy might provide an effective alternative ... with no obvious side effects or complication

- 4 RCTs, 8 cohort studies, 455 patients
- PRP vs. corticosteroids
- Various PRPs and injection protocols

Plantar Fasciitis

„Platelet-Rich Plasma Has Better Long Term Results Than Corticosteroids or Placebo for Chronic Plantar Fasciitis: Randomized Control Trial” (Shetty, JFAS 2018)



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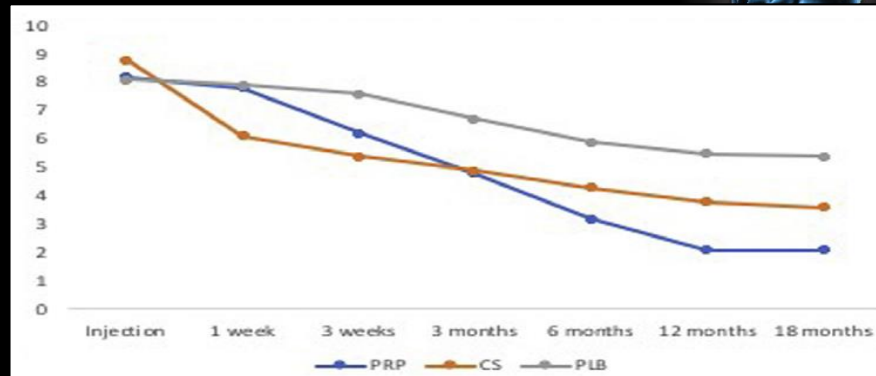
journal homepage: www.jfas.org

Original Research

Platelet-Rich Plasma Has Better Long-Term Results Than Corticosteroids or Placebo for Chronic Plantar Fasciitis: Randomized Control Trial

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Results

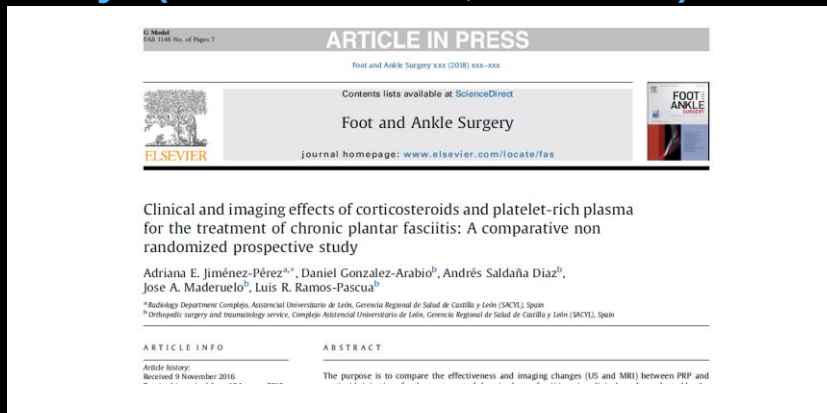
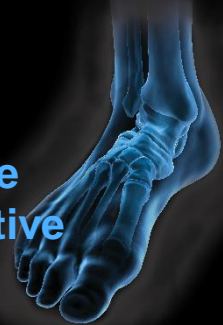
The CS arm showed better improvement in the shortterm, whereas the **PRP arm showed better results in the longterm.**

More patients on CS require either repeat injection or plantar release surgery compared with PRP.

- 90 patients, 3 groups: PRP, CS, Placebo
- 1 injection
- Last Follow-up: 18 months

Plantar Fasciitis

„Clinical and imaging effects of corticosteroids and platelet-rich plasma for the treatment of chronic plantar fasciitis: A comparative non randomized prospective study” (Jiménez-Pérez, FAS 2018)



- 40 patients, 2 groups (no response to conservative treatment >6 months)
- 2 injections (4ml PRP or 40mg methylpred.)
- Mean follow-up of 33 months

Results

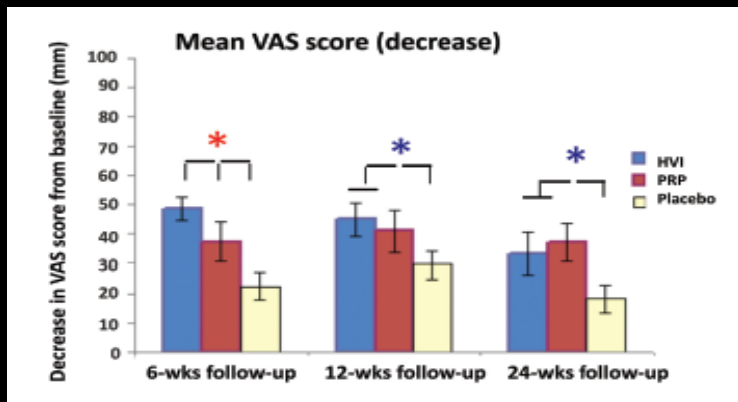
VAS changed from 8.25 to 1.85 (PRP) and from 7.7 to 5.3 (steroid)

Thickness of plantar fascia and all the local inflammatory signs were significantly reduced in the PRP group

The treatment of chronic plantar fasciitis by two injections of PRP is a **safe, more efficient and long-lasting method** than corticoid injections.

Chronic Midportion Achilles Tendinopathy

“Effect of High-Volume Injection, Platelet-Rich Plasma, and Sham Treatment in Chronic Midportion Achilles Tendinopathy” (Boesen, AJSM, 2017)



- RCT, double-blinded, Level I, 6 months follow-up
- 60 patients
- Eccentric Training + Steroid/NaCl/LA (HVI) vs. 4 ACP inject., bi-weekly interval vs. placebo (subcutaneous NaCl)

Results

HVI or multiple PRP injections is superior compared with eccentric training alone at the time points studied

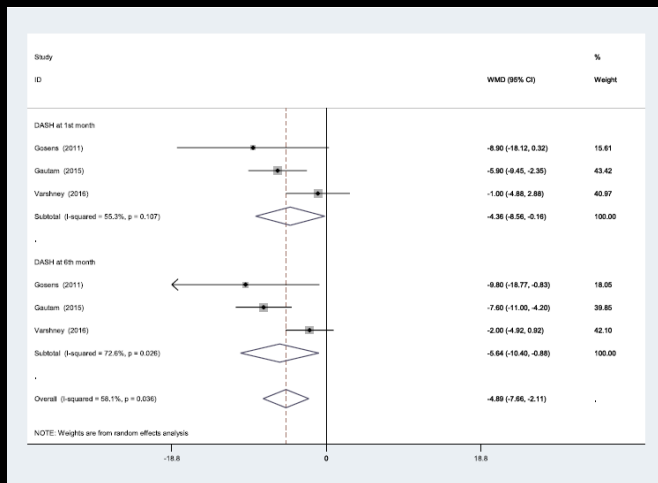
HVI seems to be more effective at improving pain, function, and patient satisfaction than PRP in the short term (6 and 12 weeks) but not medium term (24 weeks)

Epicondylitis: Review



„Comparison of platelet rich plasma and corticosteroids in the management of lateral epicondylitis: A meta-analysis of randomized controlled trials”
(Xu, IJS, 2019)

Forest plot diagram of DASH score



Results

7 RCT's, 515 Patients

PRP injection **statistically significant superior** in pain scores and elbow joint function at a **6-month follow up** compared with local corticosteroid injection

Epicondylitis – ACP

“A randomized study of autologous conditioned plasma and steroid injections in the treatment of lateral epicondylitis” (Lebiedzinski, SICOT, 2015)



	ACP group; n=53		Betamethasone group; n=46	
	Range	Mean	Range	Mean
Before treatment	22.5–94.2	53.2±15.5	27.8–88.7	58.6±14.8
At 6 weeks	2.5–66.7	32.2±18.2	0–68.2	20.6±21.5
At 6 months	0–42.5	14.2±13.4	0–68.8	14.7±22.0
After 1 year	0–66.7	9.9±17.1	73.0	14.4±25.2

- Randomized study
- 99 patients
- Single injection
- DASH

Results

After 6 weeks and six months mean DASH significantly better in steroid group

After 1 year ACP was significantly better

ACP therapy of LE allows better results to be obtained at 12 months, **effect is longer lasting**