



A Shot in the... PRP Injections

Chairperson:

Thomas Winters, MD, FACOEM,
FACPM

Principal & Chief Medical
Officer

Occupational & Environmental
Health Network

Tuesday, March 26th, 2024

9:00-9:40am



2024

**Work Related Injuries
Workshop**

Current Evidence & Literature Limitations Regarding PRP for MSK Pain

Thomas Winters, MD, FACOEM, FACPM
Principal & Chief Medical Officer

Occupational & Environmental Health
Network

&

Michael Erdil, MD, FACOEM

UConn Health

Division of Occupational &
Environmental Health

PRP MSK Evidence Considerations

- Generally limited evidence of effectiveness due to methodologic issues, potential bias, conflicting results
 - Study design?
 - MSK condition?
 - Agent, # injections, protocol?
 - Outcomes?
 - Potential bias?
 - Systematic reviews in Ovid: elbow 39, shoulder 29, knee 93, ankle 13
- Lack of studies evaluating work comp (WC) populations
- Lack of evidence for use as first level intervention in WC
- Low risk of adverse events (est 2-5% Moraes Cochrane 2014)
- FDA approval = performance and safety similar to other interventions, not necessarily effective

MSK Care Value Based Questions

2024

Work Related Injuries Workshop

THE **BACK**LETTER®

Published by Lippincott Williams & Wilkins

Vol. 32, No. 3, March 2017

Spending on Back Pain in the US: “Low-Value Care” Or “No-Value Care?”

©2013, Lippincott Williams & Wilkins, 800-638-3030

The Bleak Evidence on Opioids for Low Back Pain

Opioids have achieved a popularity in the treatment of chronic low back pain that has a weak evidence base in the management of persistent low back pain. L. E. Chaparro, MD, has performed a systematic review of randomized controlled trials of opioids in the management of chronic low back pain of at least four weeks in adults. (See Chaparro et al.)



©2015 Wolters Kluwer Health, Inc. All rights reserved.

5 trials embracing a total of 1,000 patients. These examined the

Downloaded from <http://bjsm.bmj.com/> on March 25, 2017 - Published

Spinal Fusion: Poor Outcomes Among Patients on Workers’ Compensation

Is spinal fusion surgery a viable treatment for patients with chronic back pain? A study of 1,000 workers’ compensation patients found that those who underwent spinal fusion surgery had significantly worse outcomes than those who were treated with a nonspecific diagnosis (i.e. DDD). (See Chaparro et al.)

Editorials

It is time to stop causing harm with inappropriate imaging for low back pain

Ben Darlow,¹ Bruce B Forster,² Kieran O’Sullivan,³ Peter O’Sullivan⁴



RAPID RECOMMENDATIONS

Subacromial decompression surgery for adults with shoulder pain: a clinical practice guideline

LIPPINCOTT'S **BONE and JOINT** NEWSLETTER

Vol. 24, No. 7, July-August 2018
Published by Lippincott Williams & Wilkins The Newsletter on Musculoskeletal Medicine

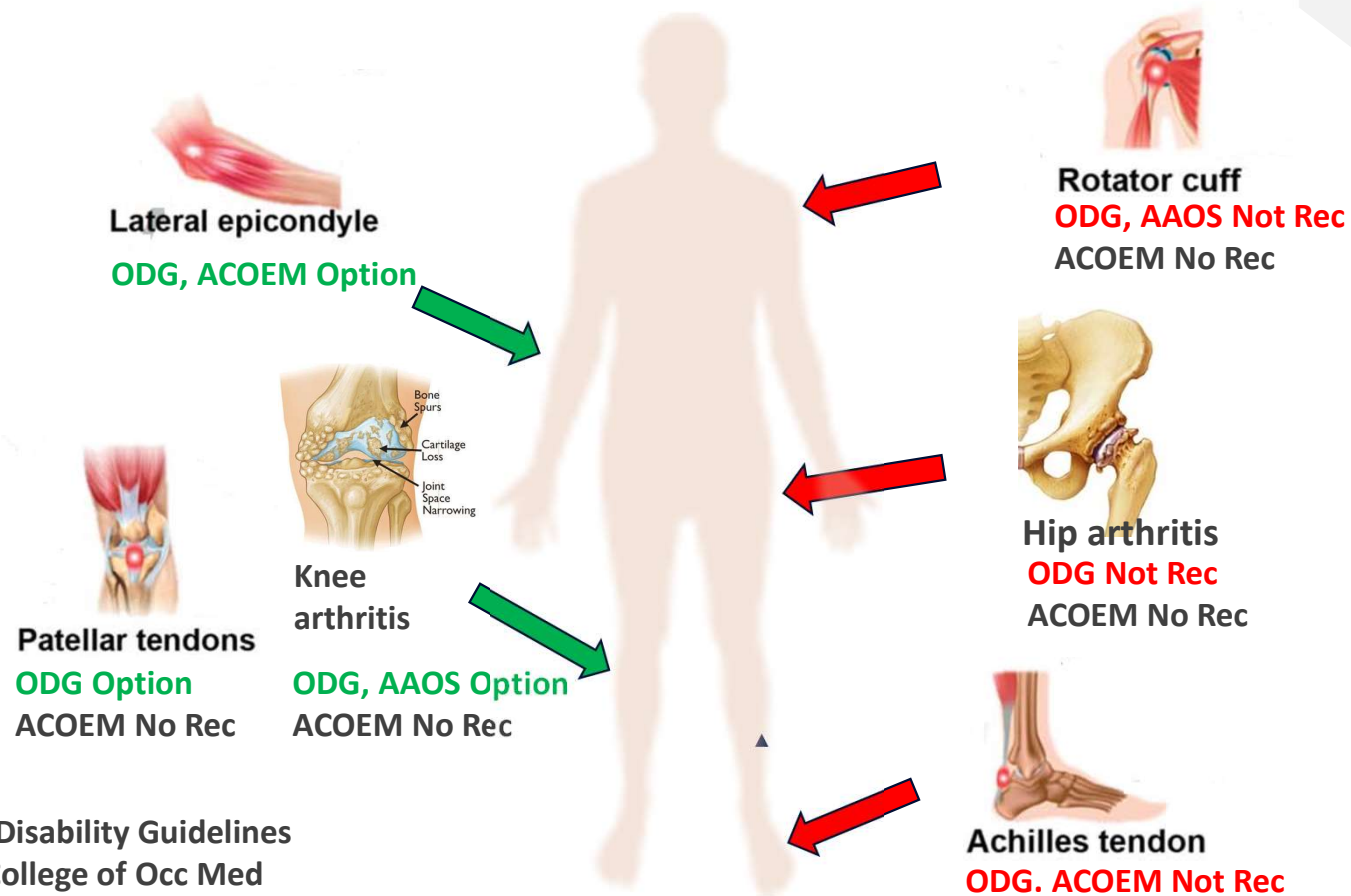
To earn CME credit, you must read the CME articles and complete the quiz and evaluation assessment survey on the enclosed form, answering at least 70% of the quiz questions correctly. This continuing medical education material activity expires June 30, 2020.



Researchers Assert Arthroscopic Partial Meniscectomy No Better Than Placebo Surgery

CME Article by Ellen Hoffmeister

PRP Guideline Recommendations



ODG: Official Disability Guidelines
ACOEM: Am College of Occ Med
AAOS: Am Academy of Ortho Surg

PRP Decision Making

- MSK condition and guideline recommendations
- Patient factors
 - Clinical condition and functional limitations / job demands
 - Age and comorbidities
 - Contraindications
 - Treatment expectations and goals
 - Compliance with rehab and RTW
- Shared decision discussion
 - Proposed treatment, evidence / guideline recommendations
 - Benefits, risks, alternatives
 - FDA off label use
 - Cost

Case

- 50 year old male machinist is being treated for lateral epicondylitis
- He has not improved with 6 months of treatment
 - Tennis elbow support, PT, home exercise program, NSAIDs, and modified duty
- His orthopedist has discussed additional options including
 - Steroid injection
 - PRP
 - Surgery

2024

Work Related Injuries
Workshop

Fair Use Policy

Workers Comp Care

The contents of these slides are for educational and informational purposes only. The slides may contain copyrighted material owned by a third party, the use of which has not always been specifically authorized by the copyright owner. Notwithstanding a copyright owner's rights under the Copyright Act, Section 107 of the Copyright Act allows limited use of copyrighted material without requiring permission from the rights holders, for purposes such as education, criticism, comment, news reporting, teaching, scholarship, and research. These so-called "fair uses" are permitted even if the use of the work would otherwise be infringing.



2024

**Work Related Injuries
Workshop**

Clinical Application & Benefits of Platelet Rich Plasma (PRP)

Xinning (Tiger) Li, M.D.

Professor of Orthopaedic Surgery

Sports Medicine and Shoulder Surgery

**Boston University School of Medicine – Boston
Medical Center**

BU Sports Medicine Fellowship - Director

Team Physician – Boston University Athletics

Introduction

▶ Presentation Outline

- Introduction and history
- Mechanism of Action
- Preparation
- Clinical Utility of PRP
 - Osteoarthritis
 - Tendinopathy
 - Contraindications to therapy
- Cost
- Conclusions & clinical practice



Introduction & History

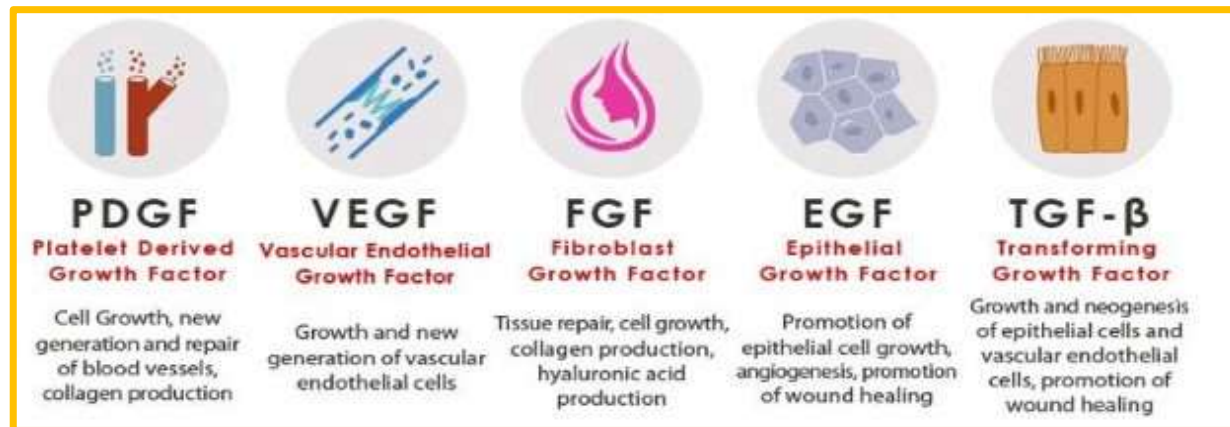
- ▶ **Definition of platelet rich plasma**
 - Autologous blood with a concentration of platelets above baseline values.
- ▶ **Origins**
 - Initially was used in the 1980s – 1990s in oral maxillofacial and periodontal surgery to aid in reducing inflammation and to promote healing¹
- ▶ **Contents of platelet rich plasma**
 - Beyond platelets, it contains numerous growth factors (GFs) thought to aid in healing and dampening inflammation

Growth Factor	Source	Function
Platelet-derived growth factor	Platelets	Stimulates cell replication, angiogenesis, mitogen for fibroblasts
Vascular endothelial growth factor	Platelets	Angiogenesis
Transforming growth factor- β 1	Platelets	Key regulator in balance between fibrosis and myocyte regeneration
Fibroblast growth factor	Platelets	Stimulates proliferation of myoblasts, angiogenesis
Epidermal growth factor	Platelets	Proliferation of mesenchymal and epithelial cells, potentiation of other growth factors
Hepatocyte growth factor	Plasma	Angiogenesis, mitogen for endothelial cells, antifibrotic
Insulin-like growth factor-1	Plasma	Stimulates myoblasts and fibroblasts, mediates growth and repair of skeletal muscle

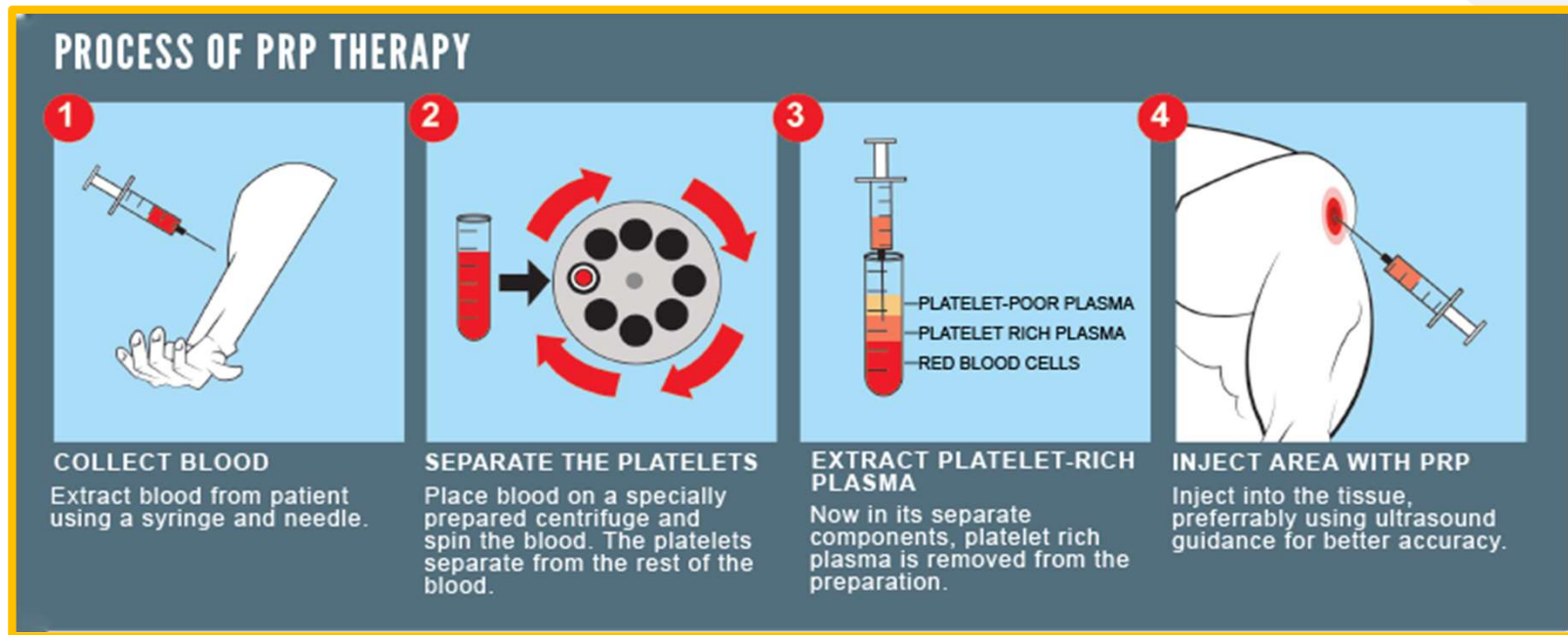
Reproduced with permission from Creaney L, Hamilton B: Growth factor delivery methods in the management of sports injuries: The state of play. *Br J Sports Med* 2008;42:314-320.

Mechanism of Action

- ▶ **Anti-inflammatory effects**
 - Reduces inflammation by enhancing the expression of an NF-kappa-beta inhibitor, thus reducing NF-kappa-beta signaling and dampening its downstream inflammatory cytokine activation
- ▶ **Tissue repair augmentation**
 - The high concentrations of growth factors including tissue growth factor and platelet-derived growth factors, aid in mediating the proliferation of mesenchymal stem cells and increase matrix synthesis and collagen formation



Preparation



Analysis of Platelet-Rich Plasma Extraction

Variations in Platelet and Blood Components Between 4 Common Commercial Kits

Jane Fitzpatrick,^{*†‡} FACSP, MBBS, Max K. Bulsara,[§] PhD, MSc, BSc(Hons),
Paul Robert McCrory,^{||} PhD, FFSEM, FACSP, FRACP, MBBS,
Martin D. Richardson,[¶] FRACS, MBBS, MS, and Ming Hao Zheng,^{‡#} PhD, DM, FRCPATH, FRCPA
Investigation performed at the University of Western Australia,

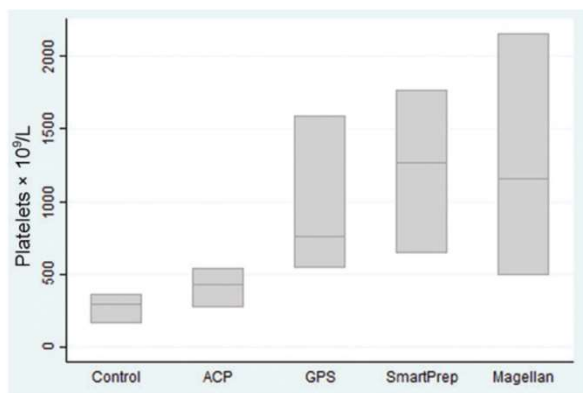


Figure 1. Platelet counts by kit type.

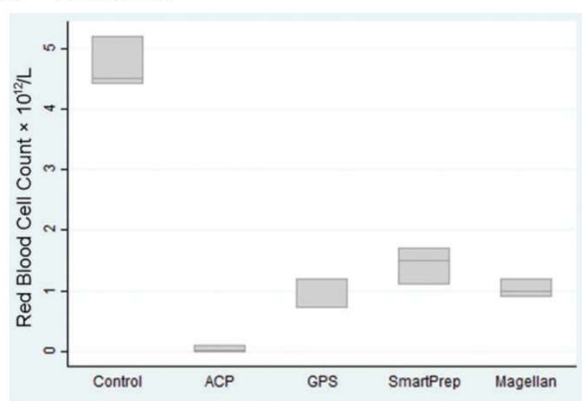


Figure 2. Red blood cell counts by kit type.

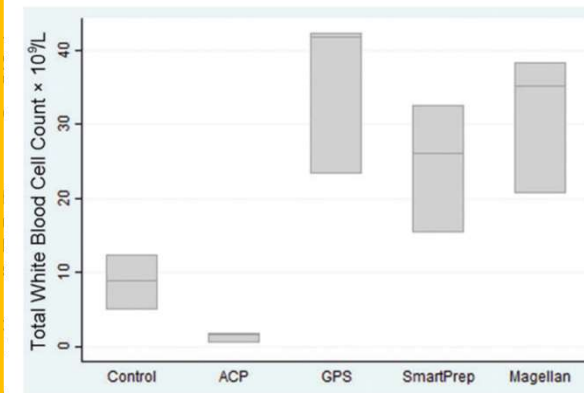


Figure 3. Total white blood cell counts by kit type.

Conclusion: This study reveals the variation of blood components, including platelets, red blood cells, leukocytes, pH, and glucose in PRP extractions. The high concentrations of cells are important, as the white blood cell count in PRP samples has frequently been ignored, being considered insignificant. The lack of standardization of PRP preparation for clinical use has contributed at least in part to the varying clinical efficacy in PRP use.

Clinical Relevance: The variation of platelet and other blood component concentrations between commercial PRP kits may affect clinical treatment outcomes. There is a need for standardization of PRP for clinical use.

Keywords: platelet-rich plasma; PRP; leukocyte; osteoarthritis; tendinopathy

COMMENTARY AND PERSPECTIVE

Rich or Poor? Examining Platelet-Rich Plasma Leukocyte Concentration in Knee Osteoarthritis

Commentary on article by Aazad Abbas, HBS Sc, et al.: “The Effect of Leukocyte Concentration on Platelet-Rich Plasma Injections for Knee Osteoarthritis. A Network Meta-Analysis”

 Vellios, Evan E. MD^{1,a}

[Author Information](#) 

Results are Mixed!!

The Journal of Bone and Joint Surgery: March 16, 2022 - Volume 104 - Issue 6 - p e26

doi: 10.2106/JBJS.21.01186

Clinical Utility – Osteoarthritis of the knee

- ▶ The American Journal of Sports Medicine²

Hyaluronic Acid Versus Platelet-Rich Plasma

A Prospective, Double-Blind Randomized Controlled Trial Comparing Clinical Outcomes and Effects on Intra-articular Biology for the Treatment of Knee Osteoarthritis

Brian J. Cole,^{*,†,§||¶} MD, MBA, Vasili Karas,[#] MD, MS, Kristen Hussey,[†] MS, David B. Merkow,[†] BA, Kyle Pilz,^{†¶} MMS, PA-C, and Lisa A. Fortier,^{**} DVM, PhD, DACVS
Investigation performed at the Rush University Medical Center, Chicago, Illinois, USA

- ▶ **Population & Intervention:** 111 patients with unilateral symptomatic knee OA (KL Grade 1-3) with a minimum of 3 mo of knee pain were randomized to PRP vs HA.
- ▶ **End Points:** Primary end points were WOMAC pain score, IKDC score and visual analog score were monitored for 1-year.
- ▶ **Conclusion:** There was no significant difference in WOMAC score, but IKDC and visual analog scores were statistically improved at 24 and 52 weeks in the PRP group vs HA group.



Clinical Utility – Osteoarthritis of the knee



**PRP Is Better vs HA at 52 weeks or 1year:
IKDC Scores
VAS**

Figure 3. Mean IKDC score in the hyaluronic acid (HA) and platelet-rich plasma (PRP) groups over the course of 52 weeks. *Statistically significant difference ($P = .013$) between treatment groups at 24 weeks. Error bars demonstrate the standard error.

... HA and platelet-rich plasma (PRP) groups over the course of 52 weeks. *Statistically significant difference between treatment groups at 24 ($P = .0096$) and 52 weeks ($P = .0039$). Error bars demonstrate the standard error.



Clinical Utility – Osteoarthritis of the knee

- ▶ Arthroscopy: The Journal of Arthroscopy and Related Surgery³

Intra-articular Injection of Platelet-Rich Plasma Is Superior to Hyaluronic Acid or Saline Solution in the

**PRP Is Better vs HA or Saline at 52 weeks or 1year:
IKDC Scores
WOMAC**

- ▶ **End Points:** WOMAC and IKDC scores were collected at 1,2,6 and 12 months
- ▶ **Conclusion:** All three groups showed improvement at 1 mo, but only the PRP group demonstrated statistically significant improvements in WOMAC and IKDC scores at 2, 6 and 12 months. Only the PRP group reached the minimal clinically important difference in both the WOMAC and IKDC. There was no difference between HA and NS during the interval of study.



Clinical Utility – Osteoarthritis of the knee

- ▶ The Orthopaedic Journal of Sports Medicine¹¹

Platelet-Rich Plasma Injections for Advanced Knee Osteoarthritis

PRP vs Saline

NO DIFFERENCE at 6 months!

- ▶ were randomized to a single treatment with PRP or CSI.
- ▶ **End Points:** VAS, Knee Injury and Osteoarthritis Score (KOOS) and Short Form-36 were at 1, 3 and 6 months.
- ▶ **Conclusion:** VAS, KOOS and SF-36 scores all improved during the study interval, but did not reach statistical significance during the study period. They postulated this might be the product of their study population.



KL – Grade Knee OA

Kellgren-Lawrence (KL) grading scale

	Grade 1	Grade 2	Grade 3	Grade 4	
CLASSIFICATION	Normal	Doubtful	Mild	Moderate	Severe
DESCRIPTION	No features of OA	Minute osteophyte: doubtful significance	Definite osteophyte: normal joint space	Moderate joint space reduction	Joint space greatly reduced: subchondral sclerosis

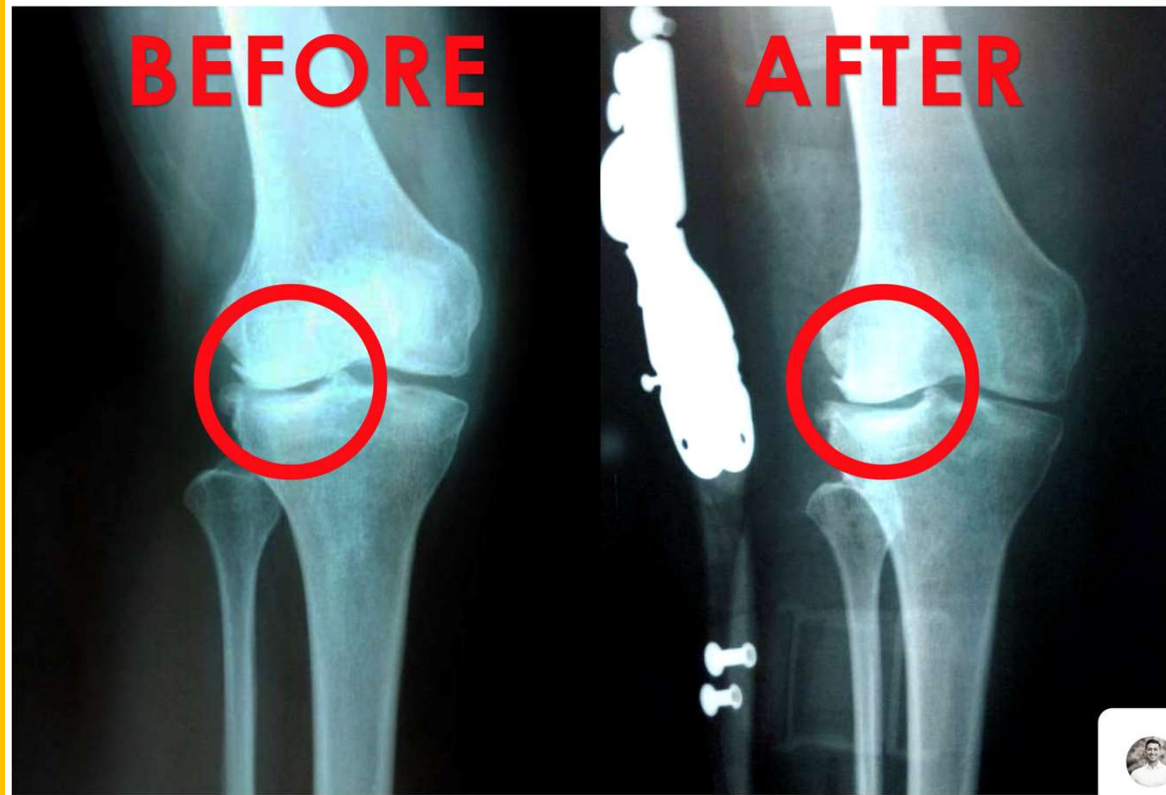
DO NOT BELIEVE THIS!



Before

After

Weight-bearing X-Ray demonstrates increased bone separation from cartilage regeneration.



Clinical Utility – Osteoarthritis of the hip

- ▶ The American Journal of Sports Medicine⁵

Ultrasound-Guided Injection of Platelet-Rich Plasma and Hyaluronic Acid, Separately and

PRP Is Better vs PRP+HA or HA at 6 months but NOT at 12 months:

VAS

WOMAC

by Reigron Lawrence grading who were symptomatic were randomized to receive PRP, PRP+HA, or HA.

- ▶ **End Points:** VAS pain score and WOMAC at 2, 6 and 12 months.
- ▶ **Conclusion:** The PRP alone group had statistically significant improvements in VAS throughout the duration of the study and WOMAC scores at 2 and 6 months compared to both the PRP+HA and HA groups.

Clinical Utility – Osteoarthritis of the shoulder



Clinical Utility – Osteoarthritis of the shoulder

▶ Case Report

- Freitag and Barnard published a case report in 2016 of a 62 yo female patient with severe GH arthritis who was able to achieve significant reductions in both VAS pain score DASH score that were sustained for greater than 6 months with a PRP injection.⁶



Clinical Utility – Rotator Cuff Tear (Shoulder)

ORIGINAL ARTICLE | VOLUME 37, ISSUE 2, P510-517, FEBRUARY 01, 2021

Platelet-Rich Plasma vs Steroid for Rotator Cuff Tears: A Randomized Controlled Trial

Pla

Tea

Pai

Do

Cory

Eva

Ian K

Published: October 27, 2020 • DOI: <https://doi.org/10.1016/j.arthro.2020.10.037> •  Check for updates

Results

We followed up 99 patients (47 in the PRP group and 52 in the CS group) until 12 months after injection. There were no

PRP Is Better vs Steroid at 3 months but NO Difference at 1 year:

VAS
ASES

13.6 vs 0.4, $P = .05$), ASES (13.0 vs 2.9, $P = .02$), and WORC (16.8 vs 5.8, $P = .03$) scores. There were no differences in patient-reported outcomes at 6 weeks or 12 months. There was no difference in the rate of failure ($P = .31$) or conversion to surgery ($P = .83$) between groups.

Clinical Utility – Lateral epicondylitis

- ▶ The American Journal of Sports Medicine⁷

Positive Effect of an Autologous Platelet Concentrate in Lateral Epicondylitis in a Double-Blind Randomized Controlled Trial

Platelet-Rich Plasma Versus Corticosteroid Injection
With a 1-Year Follow-Up

PRP Is Better vs Steroid at 6 months:

VAS

DASH

- ▶ **Population & Intervention:** Lateral epicondylitis (symptomatic) treated with corticosteroid
- ▶ **End Points:** VAS and DASH outcome measure scores (success was defined as a 25% reduction/improvement respectively)
- ▶ **Conclusion:** There was a statistically significant difference in primary end point in the PRP group vs the CSI group (73% vs 49%, $p < 0.001$). Improvement was sustained in the PRP at the end of the study while the CSI group's initial benefit resolved by the studies end.



Clinical Utility – Lateral epicondylitis

▶ The American Journal of Sports Medicine⁷

Positive Effect of an Autologous Platelet Concentrate in Lateral Epicondylitis in a Double-Blind Randomized Controlled Trial

Platelet-Rich Plasma Versus Corticosteroid Injection With a 1-Year Follow-up

**PRP vs Steroid at 6 months:
NO DIFFERENCE!**

VAS	0	4	8	12	26	52
CS	0	44.2 ± 26.4	42.9 ± 29.2	44.2 ± 27.1	56.6 ± 23.2	50.1 ± 28.1
PRP	0	55.4 ± 24.2	46.9 ± 24.9	38.7 ± 27.2	32.6 ± 31.5	25.3 ± 31.2

Figure 2. Twenty-four of the 49 patients (49%) in the corticosteroid (CS) group and 37 of the 51 patients (73%) in the platelet-rich plasma (PRP) group were defined as *successful* with the visual analog score (VAS), a significant difference ($P < .001$). CI, confidence interval. 0, CS; x, PRP.

	4	8	12	26	52
CS	97.4 ± 69.0	84.7 ± 73.4	92.2 ± 68.7	117.3 ± 75.6	108.4 ± 82.2
PRP	135.9 ± 78.0	113.4 ± 79.6	92.0 ± 78.8	79.5 ± 80.3	54.7 ± 73.2

Figure 3. Twenty-five of the 49 patients (51%) in the corticosteroid (CS) group and 37 of the 51 patients (73%) patients in the platelet-rich plasma (PRP) group were defined as *successful* with the DASH Outcome Measure, a significant difference ($P = .005$). CI, confidence interval. 0, CS; x, PRP.



Clinical Utility – Lateral epicondylitis

- ▶ The American Journal of Sports Medicine⁸

Ongoing Positive Effect of Platelet-Rich Plasma Versus Corticosteroid Injection in Lateral Epicondylitis

A Double-Blind
Randomized Controlled Trial
With 2-Year Follow-Up

PRP vs Steroid at 2 years:
PRP is better!

- ▶ **Population & Intervention:** 100 patients with chronic lateral epicondylitis (symptoms > 6 mo) were randomized to PRP and corticosteroid
- ▶ **End Points:** VAS and DASH outcome measure scores (success was defined as a 25% reduction/improvement respectively)
- ▶ **Conclusion:** There was sustained continued improvement at 2 years post intervention.



Clinical Utility – Patellar tendonitis

- ▶ Knee Surgery and Related Research¹²

Platelet-Rich Plasma Injections as a Treatment for Refractory Patellar Tendinosis: A Meta-Analysis of Randomised Trials

PRP is better vs. Dry Needling and Shockwave Therapy

- ▶ extracorporeal shockwave therapy.
- ▶ **Population:** First study required completion of 6 weeks of physical therapy with MRI confirmation of diagnosis. The second study required > 6 months of symptoms with confirmatory U/S and patients had to be “athletic”. Age > 18.
- ▶ **Conclusion:** PRP demonstrated statistically significant improvements at 6-months up to 1 year compared to alternative techniques of treatment.



Patient selection for PRP

- ▶ Who are NOT appropriate candidates for platelet rich plasma injections?
 - Patients with thrombocytopenia
 - Patients on chronic anti-coagulation therapy (that cannot be stopped peri-procedure)
 - Patient with active malignancy or metastatic disease (solid organ cancer or hematologic)
 - Patients with active rheumatologic disorder
 - Patients with a superficial skin infection overlying the area of the injection
 - Patient who are currently ill
 - Pregnant patients or those breastfeeding

Cost of therapies

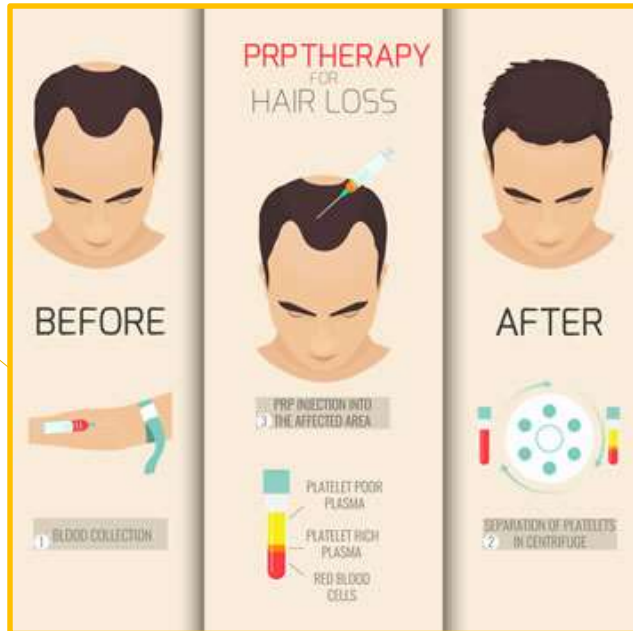
▶ Platelet Rich Plasma

- \$500 - \$1500

■ Hartford, CT	\$400 - \$500
■ New York City, NY	\$400 - \$1,000
■ Rutherford, NJ	\$650 - \$1,300
■ Washington, DC	\$600
■ Chicago, IL	\$600
■ Los Angeles, CA	\$800
■ Atlanta, GA	\$800
■ Dallas, TX	\$700
■ Houston, TX	\$1,000 - 1,500
■ Miami, FL	\$500 - \$1,000



Other PRP Applications



prp vampire facial in nashville garza plastic surgery treatment?

PRP facial treatments

PRP facial treatments, or "vampire facials" are an extremely popular anti-aging treatment. The Platelet-rich plasma (**PRP**) **facial rejuvenation** uses your own blood to promote collagen production and trigger growth factors.

The groundbreaking solution for aging or damaged skin pairs microneedling with a plasma "serum," leaving skin looking **younger**, **smoother**, and overall **healthier**.

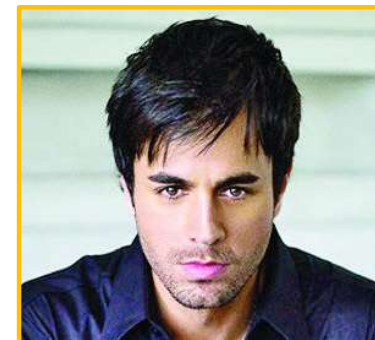
[REQUEST A PRP FACIAL CONSULT](#)



Kim Kardashian's infamous vampire facial, before and after comparison. Image courtesy of @kimkardashian Instagram & Shutterstock



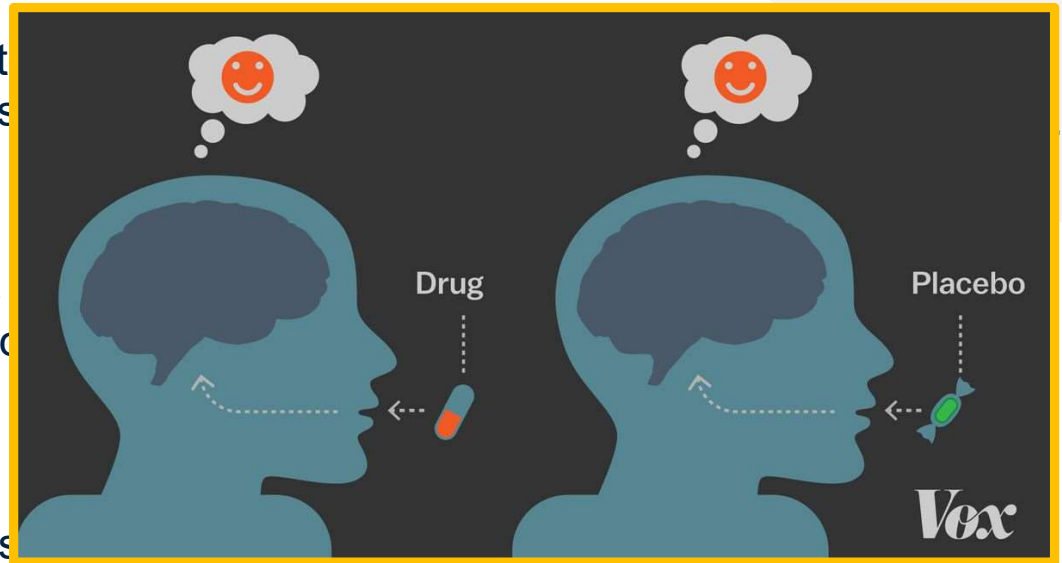
PRP is made by injecting the platelet-rich plasma obtained by centrifugation of the person's own blood to the face. Various growth factors secreted from platelets create a bio-revitalization (skin regeneration) effect on the skin. More successful results are obtained when combined with methods such as fractional laser and chemical peeling. Generally, sessions are in the form of 6-10 applications with 2-3 week intervals.



Conclusions & Clinical Practice

2024

Work Related Injuries
Workshop



2024

and Injuries
Workshop



THANKS!





2024

Work Related Injuries
Workshop

Under What Circumstances Are PRP Injections Approved?

Julianna Hardy