

# STANDARDIZATION OF PRP IN THE MANAGEMENT OF KNEE OSTEOARTHRITIS

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**Athens**  
**5-7 October 2023**



# DISCLOSURES

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## NO CONFLICT OF INTEREST RELATED TO THIS TOPIC

- MEMBER OF THE ADVISORY BOARD, PENDOPHARM
- SPEAKER
  - SANOFI
  - PENDOPHARM



# OBJECTIVES

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- Summarize the recommendations issued by the International Research Group on Platelet Rich Plasma injections (GRIIP) for the use of PRP in Knee osteoarthritis
- Analyze the latest evidence regarding the use of Platelet Rich Plasma (PRP) injections in knee osteoarthritis in relation with our recommendations

# RATIONNEL

- The use of autologous PRP in KOA has risen drastically in recent years
- The use of PRP in the management of knee osteoarthritis remains debated.
- The lack of standardization is a limitation of the current literature (*Filardo 2021*)
- Heterogeneity of preparation and injection protocols
- Objective: To formulate the first clinical practice recommendations on PRP injections in knee osteoarthritis via expert consensus

# MATERIALS AND METHODS

2020

## 15 French-speaking doctors:

- 10 Rheumatologists
- 4 Physiatrists / Sports medicine physicians
- 1 Radiologist

## 5 countries

- Belgium, Canada, France, Morocco and Switzerland

Comprehensive literature review

Delphi Method / Formalized Consensus

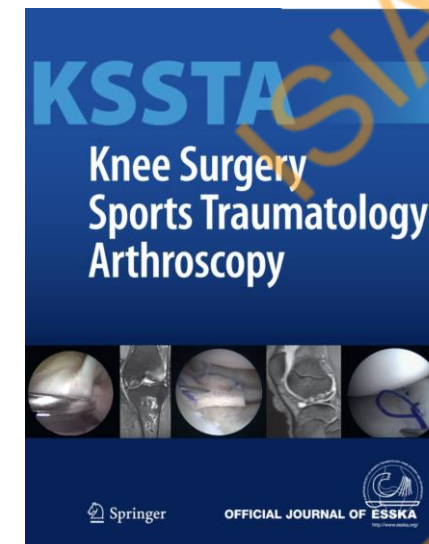
Knee Surgery, Sports Traumatology, Arthroscopy  
<https://doi.org/10.1007/s00167-020-06102-5>

KNEE



## Intra-articular injections of platelet-rich plasma in symptomatic knee osteoarthritis: a consensus statement from French-speaking experts

Florent Eymard<sup>1</sup> · Paul Ornetti<sup>2</sup> · Jérémy Maillot<sup>3</sup> · Éric Noel<sup>4</sup> · Philippe Adam<sup>5</sup> · Virginie Legré-Boyer<sup>6</sup> · Thierry Boyer<sup>7</sup> · Fadoua Allali<sup>8</sup> · Vincent Gremeaux<sup>9</sup> · Jean-François Kaux<sup>10</sup> · Karine Louati<sup>11</sup> · Martin Lamontagne<sup>12</sup> · Fabrice Michel<sup>13</sup> · Pascal Richette<sup>14</sup> · Hervé Bard<sup>15</sup> on behalf of the GRIP (Groupe de Recherche sur les Injections de PRP, PRP Injection Research Group)



# MATERIALS AND METHODS

2020

## 25 RECOMMENDATIONS

- Effectiveness of PRP
- General recommendations
- Characteristics of PRP
- Contraindications and interactions
- Rules of good practice and adverse effects

### CLASSIFIED (between 1 and 9) AS :

- Appropriate ( $\geq 7$ ) or
- Not appropriate ( $\leq 3.5$ )
- with strong agreement (distribution of ratings in the (1–3) range) or
- relative agreement (distribution of ratings in the (1–5) range)
- LEVEL OF EVIDENCE : 1 to 5

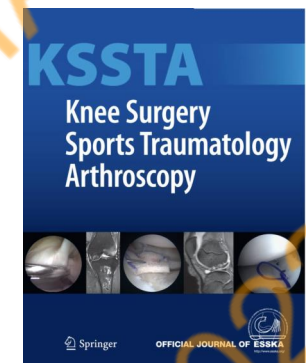
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KNEE



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SINCE OUR PUBLICATION:

2023

3 OTHER GROUPS OF EXPERTS PUBLISHED A GUIDELINE REGARDING PRP TREATMENTS

2022



**ESSKA**

**ESSKA ORBIT Consensus**  
Use of injectable orthobiologics for the treatment of knee osteoarthritis  
Part 1: blood-derived products (alias PRP)

**Chairpersons:** Laura de Girolamo, Lior Laver

Original Article

Experts Achieve Consensus on a Majority of Statements Regarding Platelet-Rich Plasma Treatments for Treatment of Musculoskeletal Pathology

Eoghan T. Hurley, M.B., M.Ch., Ph.D., Seth L. Sherman, M.D., Daniel J. Stokes, M.D., Scott A. Rodeo, M.D., Shane A. Shapiro, M.D., Kenneth Mautner, M.D., Don A. Buford, M.D., Jason L. Dragoo, M.D., Bert R. Mandelbaum, M.D., Kenneth R. Zaslav, M.D., Brian J. Cole, M.D., M.B.A., Rachel M. Frank, M.D., and Members of the Biologics Association<sup>1</sup>

Review Article

**Platelet-rich Plasma in Patients with Symptomatic Osteoarthritis Knee: An Evidence- and Consensus-based 2023 International Society for Musculoskeletal Ultrasound in Pain Medicine Guidelines**

Gautam Das, Kanchan Sharma<sup>1</sup>, Sushpa Das, Ashok Jadon<sup>2</sup>, Karthic Babu Natarajan<sup>3</sup>, Guru Moorthi<sup>4,5</sup>, Kawsar Sardar<sup>6</sup>, Eltayeb Gadir<sup>6</sup>, Tct Novy<sup>7</sup>, Debjyoti Dutta, Vanmathy R<sup>8</sup>, Chinmoy Roy

# 25 RECOMMENDATIONS



- **EFFECTIVENESS OF PRP**
- General recommendations
- Characteristics of PRP
- Contraindications and interactions
- Rules of good practice and adverse effects



# EFFECTIVENESS OF PRP IN KNEE OA

| Recommandations   | Expert opinion                      | Median | Distribution |     |     | Level Evidence |
|---|-------------------------------------|--------|--------------|-----|-----|----------------|
|   |                                     |        | ≤ 3          | 4-6 | ≥ 7 |                |
| IA injections of PRP in the knee are an effective symptomatic treatment for early to moderate osteoarthritis      | Appropriate with relative agreement | 8      | 0            | 1   | 14  | 1A             |
| IA injections of PRP into the knee joint may be useful in severe osteoarthritis (Kellgren and Lawrence stage IV)  | Appropriate with relative agreement | 7      | 0            | 5   | 10  | 2B             |
| Age, weight and physical activity can influence the indication and the outcome of IA injections of PRP in knee OA | Appropriate with relative agreement | 8      | 0            | 1   | 14  | 4              |
| The location of knee osteoarthritis influences the outcome of knee osteoarthritis treatment with PRP              | Uncertain, Lack of consensus        | 7      | 0            | 4   | 11  | 4              |

## 4 RECOMMENDATIONS

- Indication according to radiographic severity
- Response predictors

# EFFECTIVENESS OF PRP IN KNEE OA

## RECOMMENDATION 1

| Recommandations  | Expert opinion                      | Median | Distribution |     |     |
|--|-------------------------------------|--------|--------------|-----|-----|
|  |                                     |        | ≤ 3          | 4-6 | ≥ 7 |
| IA injections of PRP in the knee are an effective symptomatic treatment for early to moderate osteoarthritis | Appropriate with relative agreement | 8      | 0            | 1   | 14  |

- **>75 published clinical studies (pubmed)**
  - 13 RCT vs. Placebo
- **A lot of SR and MA**

**Level of evidence 1A**

*Chang et al. Arch Phys Med Rehabil. 2014*  
*Laudy et al. Br J Sports Med. 2015*  
*Xu et al. Am J Phys Med Rehabil. 2017*  
*Shen et al. J Orthop Surg. 2017*  
*Dai et al. Arthroscopy. 2017*  
*Zhang et al. Drug Des Devel Ther. 2018*  
*Sadabad et al. Electron Physician. 2016*  
*Han et al. Pain Med. 2019*  
*Kanchanatawan et al. Knee Surg Sports Traumatol Arthrosc. 2016*

# WHAT'S NEW SINCE THIS PUBLICATION ?

## In 2020

- One Meta analysis vs HA
- One Meta analysis of RCT
- One systematic review and Meta analysis of RCT

**ALL IN FAVOR OF PRP  
in KOA**

Tang et al. *Journal of Orthopaedic Surgery and Research* (2020) 15:403  
<https://doi.org/10.1186/s13018-020-01919-9>

Journal of Orthopaedic  
Surgery and Research

### SYSTEMATIC REVIEW

Open Access

## Platelet-rich plasma versus hyaluronic acid in the treatment of knee osteoarthritis: a meta-analysis



Jia Zhu Tang, Ming Jun Nie, Jian Zhong Zhao, Guang Cheng Zhang, Qing Zhang and Bo Wang\*

*Clinical Rheumatology* (2021) 40:263–277  
<https://doi.org/10.1007/s10067-020-05185-2>

### ORIGINAL ARTICLE

## The effects of platelet-rich plasma injection in knee and hip osteoarthritis: a meta-analysis of randomized controlled trials

Yujie Dong<sup>1</sup> · Butian Zhang<sup>2</sup> · Qi Yang<sup>3</sup> · Jiajing Zhu<sup>2</sup> · Xiaojie Sun<sup>4</sup>

*European Journal of Orthopaedic Surgery & Traumatology* (2020) 30:955–967  
<https://doi.org/10.1007/s00590-020-02623-4>

### GENERAL REVIEW

## Is platelet-rich plasma effective for the treatment of knee osteoarthritis? A systematic review and meta-analysis of level 1 and 2 randomized controlled trials

Erik Hohmann<sup>1,2</sup> · Kevin Tetsworth<sup>3,4,5,6</sup> · Vaida Glatt<sup>6,7</sup>

# WHAT'S NEW SINCE THIS PUBLICATION ?

ONE META-  
ANALYSIS PRP  
VS. PLACEBO

Filardo.  
Cartilage. 2021)

3 STUDIES PRP  
VS PLACEBO

Bennell. JAMA.  
2021

Lewis. Bone Joint  
J. 2022

Chu. Knee Surg  
Sports Traumatol  
Arthrosc. 2022

# META-ANALYSIS PRP vs. PLACEBO

2021

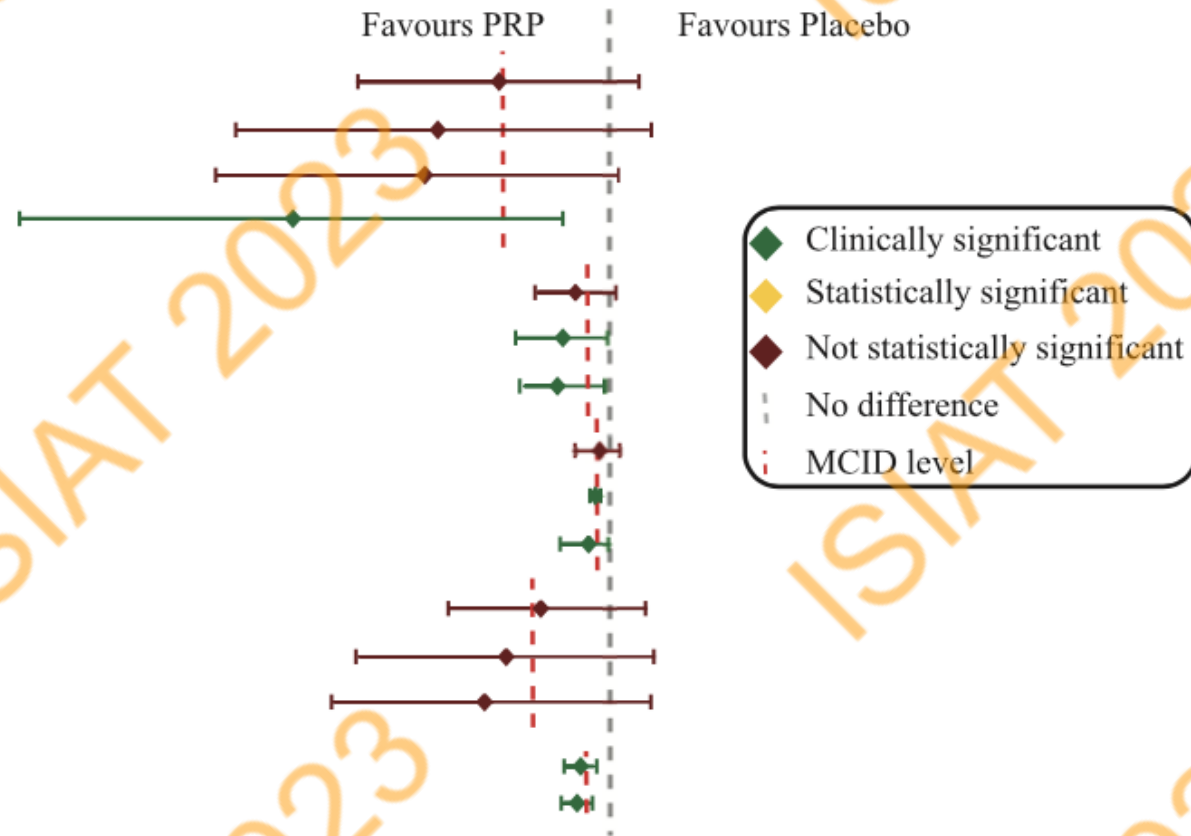
Compared treatment Outcome Follow-up No. of trials No. of pts Mean difference [95% C.I.]

Results of the meta-analysis

Placebo

|                 |           |   |     |                        |
|-----------------|-----------|---|-----|------------------------|
| WOMAC overall   | 1 month   | 6 | 266 | -6.47 [-14.39, 1.45]   |
|                 | 3 months  | 4 | 153 | -10.71 [-23.71, 2.29]  |
|                 | 6 months  | 6 | 266 | -12.50 [-25.69, 0.69]  |
|                 | 12 months | 3 | 129 | -19.38 [-36.04, -2.72] |
| WOMAC pain      | 1 month   | 5 | 210 | -1.66 [-3.87, 0.55]    |
|                 | 3 months  | 4 | 153 | -3.03 [-5.74, -0.32]   |
|                 | 6 months  | 5 | 210 | -3.08 [-5.51, -0.65]   |
| WOMAC stiffness | 1 month   | 5 | 210 | -0.55 [-1.77, 0.66]    |
|                 | 3 months  | 4 | 153 | -0.89 [-1.26, -0.52]   |
|                 | 6 months  | 5 | 210 | -1.32 [-2.59, -0.05]   |
| WOMAC function  | 1 month   | 5 | 210 | -4.43 [-11.45, 2.58]   |
|                 | 3 months  | 4 | 153 | -6.78 [-16.89, 3.33]   |
|                 | 6 months  | 5 | 210 | -8.03 [-18.57, 2.51]   |
| VAS             | 1 month   | 3 | 140 | -1.47 [-2.12, -0.82]   |
|                 | 6 months  | 4 | 238 | -1.91 [-2.71, -1.10]   |

Favours PRP Favours Placebo



- PRP injections provide better results than other injectable options.
- This benefit increases over time, being not significant at earlier follow-ups but becoming clinically significant after 6 to 12 months

## RECOMMENDATION 1

# RCT: PRP vs. PLACEBO

288 patients

Knee OA KL 2-3

PRP (3B) vs. Placebo

3 weekly injections (5mL)

12 month follow-up

Primary endpoint: ENS/MRI 12 months

102 patients

Low grade of knee OA (KL 0-2)

P-PRP (3B) (x1 or x3) vs. Placebo 3

weekly injections (5mL)

12 month follow-up

Main criterion: KOOS and EQ5DL

610 patients

Symptomatic knee osteoarthritis (KL 1-3)

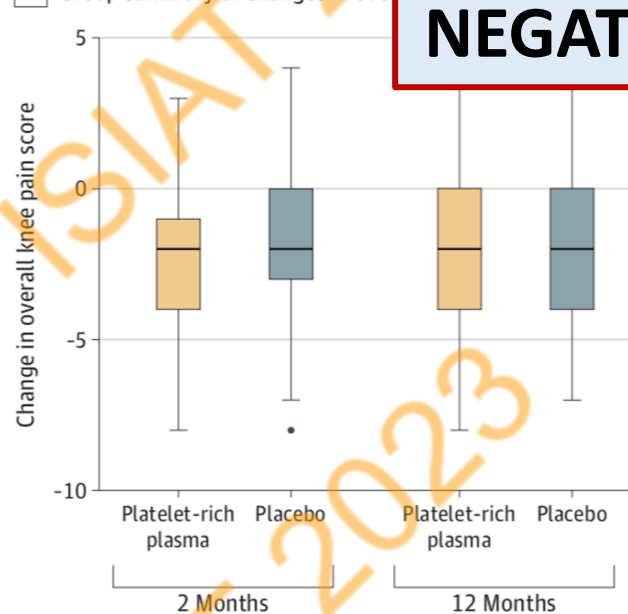
P-PRP (3B) vs. Placebo

3 weekly injections (5mL)

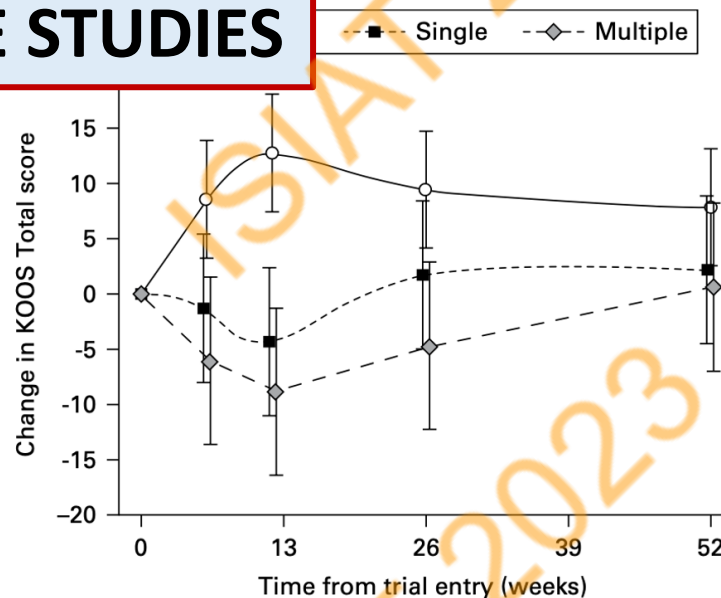
60 month follow-up

Main criterion: WOMAC

B Group summary of changes in over



Bennell. JAMA. 2021



Lewis. Bone Joint J. 2022

## POSITIVE STUDY

| Variable   |                              |                           |                        | P value |
|--|------------------------------|---------------------------|------------------------|---------|
| <b>WOMAC</b>   |                              |                           |                        |         |
| 3  | 5.4 (2.7, 5.1 to 5.7)        | 8.3 (2.7, 8.0 to 8.6)     | -2.9 (-3.3 to -2.4)    | <0.001  |
| 6  | 3.8 (2.4, 3.5 to 4.0)        | 9.5 (2.5, 9.2 to 9.8)     | -5.7 (-6.1 to -5.3)    | <0.001  |
| 12   | 3.6 (2.7, 3.3 to 3.9)        | 10.2 (2.6, 9.9 to 10.5)   | -6.6 (-7.1 to -6.2)    | <0.001  |
| 24   | 4.7 (3.2, 4.3 to 5.0)        | 11.5 (2.6, 11.2 to 11.7)  | -6.8 (-7.2 to -6.3)    | <0.001  |
| 60   | 12.3 (2.9, 11.9 to 12.6)     | 13.7 (2.4, 13.4 to 13.9)  | -1.4 (-1.8 to -1.0)    | <0.001  |
| <b>WOMAC score, physical function, mean (SD, 95% CI), months</b> |                              |                           |                        |         |
| 3  | 29.0 (10.1, 27.8 to 30.1)    | 32.5 (10.9, 31.3 to 33.8) | -3.6 (-5.2 to -1.9)    | <0.001  |
| 6  | 23.6 (9.0, 22.6 to 24.6)     | 35.4 (10.8, 34.2 to 36.6) | -11.8 (-13.4 to -10.2) | <0.001  |
| 12   | 22.3 (8.7, 21.4 to 23.3)     | 38.9 (11.0, 37.7 to 40.2) | -16.6 (-18.2 to -15.0) | <0.001  |
| 24   | 24.0 (9.4, 23.0 to 25.1)     | 41.9 (10.9, 40.7 to 43.2) | -17.9 (-19.5 to -16.3) | <0.001  |
| 60   | 37.5 (11.27, 36.20 to 38.73) | 49.8 (9.6, 48.8 to 50.9)  | -12.4 (-14.0 to -10.7) | <0.001  |
| <b>Visual analogue scale score, mean (SD, 95% CI), months</b>    |                              |                           |                        |         |
| 3  | 2.2 (1.5, 2.0 to 2.4)        | 3.4 (1.3, 3 to 3.6)       | -1.25 (-1.5 to -1.0)   | <0.001  |
| 6  | 1.3 (1.1, 1.2 to 1.4)        | 4.3 (1.1, 4.1 to 4.4)     | -2.9 (-3.1 to -2.8)    | <0.001  |
| 12   | 1.2 (1.2, 1.1 to 1.4)        | 4.6 (1.1, 4.5 to 4.7)     | -3.4 (-3.5 to -3.2)    | <0.001  |
| 24   | 1.6 (1.5, 1.4 to 1.8)        | 5.1 (1.0, 5.0 to 5.2)     | -3.5 (-3.7 to -3.3)    | <0.001  |
| 60   | 4.9 (1.7, 4.7 to 5.1)        | 6.2 (0.9, 6.1 to 6.4)     | -1.4 (-1.6 to -1.2)    | <0.001  |

Chu. Knee Surg Sports Traumatol Arthrosc. 2022

# HOW TO EXPLAIN THESE CONTRADICTIONARY RESULTS??

Research

JAMA | Original Investigation

Effect of Intra-articular Platelet-Rich Plasma vs Placebo Injection on Pain and Medial Tibial Cartilage Volume in Patients With Knee Osteoarthritis: The RESTORE Randomized Clinical Trial

Kim L. Bennell, PhD; Kade L. Paterson, PhD; Ben R. Metcalf, BSc; Vicky Duong, DPT; Jillian Eyles, PhD; Jessica Kasza, PhD; Yuanyuan Wang, PhD; Flavia Cicuttini, PhD; Rachelle Buchbinder, PhD; Andrew Forbes, PhD; Anthony Harris, MSc; Shirley P. Yu, MPH; David Connell, MMed; James Linklater, MBBS; Bing Hui Wang, PhD; Win Min Oo, PhD; David J. Hunter, PhD



■ KNEE

The effectiveness of leucocyte-poor platelet-rich plasma injections on symptomatic early osteoarthritis of the knee: the PEAK randomized controlled trial

E. Lewis,

Knee Surgery, Sports Traumatology, Arthroscopy (2022) 30:4063–4071  
<https://doi.org/10.1007/s00167-022-06887-7>

KNEE



Intra-articular injections of platelet-rich plasma decrease pain and improve functional outcomes than sham saline in patients with knee osteoarthritis

Jiabao Chu<sup>1,7</sup> · Weifeng Duan<sup>1</sup> · Ziqiang Yu<sup>2,3</sup> · Tao Tao<sup>4</sup> · Jie Xu<sup>5</sup> · Qianli Ma<sup>6</sup> · Lingying Zhao<sup>2,3</sup> · Jiong Jiong Guo<sup>1,2</sup>

Platelet concentration: 1.6 x  
Volume: 5ml

Absolute platelets count: **1.6 billion**

BENNELL 2021

Platelet concentration: 1.3 x  
Volume: 4-6 ml

Absolute platelets count: **1.3 to 1.9 billion**

LEWIS 2022

Platelet concentration: x= 4,3 x  
Volume: 5ml

Absolute platelets count: **5.3 billion**

CHU 2022

## Platelet-rich Plasma in Patients with Symptomatic Osteoarthritis Knee: An Evidence- and Consensus-based 2023 International Society for Musculoskeletal Ultrasound in Pain Medicine Guidelines

Gautam Das, Kanchan Sharma<sup>1</sup>, Sushpa Das, Ashok Jadon<sup>2</sup>, Karthic Babu Natarajan<sup>3</sup>, Guru Moorthi<sup>4,5</sup>, Kawsar Sardar<sup>6</sup>, Elltayeb Gadir<sup>4</sup>, Tct Novy<sup>7</sup>, Debjyoti Dutta, Vanmathy R<sup>3</sup>, Chinmoy Roy

### Recommendations of 2023 International Society for Musculoskeletal Ultrasound in Pain Medicine Guidelines

#### Recommendation 1

In adult patients with mild-moderate OAK, refractory to conventional therapy, the ISMPM recommends that IA-PRP should be preferred over other IA modalities.

- Grade of recommendation: A
- Level of evidence: I
- Strength of consensus: Strong



2022-23

#### Does current clinical evidence support the use of PRP for knee OA?

Clinical evidence confirms the efficacy of PRP in the treatment of knee osteoarthritis (OA). Level I and II clinical studies, as well as additional prospective studies, support the safety and clinical benefit of PRP for knee OA, which was shown in comparison to both placebo (saline) and control treatments such as hyaluronic acid or corticosteroids (CS). The efficacy of PRP in the treatment of knee OA has been also supported by meta-analyses and confirms the findings of preclinical research.

The consensus group can therefore conclude that there is enough preclinical and clinical evidence to recommend/support the use of PRP in knee OA (see following questions addressing PRP specifications and indications).

*Grade A*



# EFFECTIVENESS OF PRP IN KNEE OA

## RECOMMENDATION 2

| Recommandations  | Expert opinion                      | Median | Distribution |     |     |
|--|-------------------------------------|--------|--------------|-----|-----|
|  |                                     |        | ≤ 3          | 4-6 | ≥ 7 |
| <b>Injections of PRP into the knee joint may be useful in severe osteoarthritis (Kellgren and Lawrence IV)</b> | Appropriée avec accord relatif      | 8      | 0            | 1   | 14  |
|  | Appropriate with relative agreement | 7      | 0            | 5   | 10  |
|  | Appropriée avec accord relatif      | 8      | 0            | 1   | 14  |
|  | Absence de consensus                | 7      | 0            | 4   | 11  |

**Evidence level 2B**

Görmeli et al. *Knee Surg Sports Traumatol Arthrosc.* 2017  
 Chang et al. *Arch Phys Med Rehabil.* 2014  
 Joshi Jubert et al. *Orthop J Sports Med.* 2017  
 Filardo et al. *Knee Surg Sports Traumatol Arthrosc.* 2012  
 Kon et al. *Arthroscopy.* 2011

Injections of PRP into the knee joint may be useful in severe osteoarthritis (Kellgren and Lawrence IV)

# WHAT'S NEW SINCE THIS PUBLICATION ?

- 1 observational study (*Kemmochi 2022*)
- 1 RCT : All KL grade 4: PRP vs NACL (*Saraf 2022*)
- One systematic review and meta analysis (*Cavazos 2023*)



Consecutive injections of leukocyte-rich platelet-rich plasma are effective in not only mild but also severe knee degeneration

Masahiko Kemmochi\*

Kemmochi Orthopedic Surgery Sports Clinic, 42-1 Higashi-honcho, Ota, Gunma Prefecture, 373-0026, Japan

Indian Journal of Orthopaedics (2022) 56:1722–1728  
<https://doi.org/10.1007/s43465-022-00730-4>

ORIGINAL ARTICLE

**Serial Platelet-Rich Plasma Intra-articular Injections in Kellgren and Lawrence Grade IV Knee Joint Osteoarthritis: A Prospective Blinded Placebo-Controlled Interventional Study**

Amit Saraf<sup>1</sup> · Altaf Hussain<sup>1,2</sup> · Sandeep Bishnoi<sup>1</sup> · Goushul Azam<sup>1</sup> · Hamza Habib<sup>1</sup>

Archives of Orthopaedic and Trauma Surgery (2023) 143:1393–1408  
<https://doi.org/10.1007/s00402-021-04304-1>

ORTHOPAEDIC SURGERY

**The use of platelet-rich plasma in studies with early knee osteoarthritis versus advanced stages of the disease: a systematic review and meta-analysis of 31 randomized clinical trials**

Félix Vilchez-Cavazos<sup>1</sup> · Jaime Blázquez-Saldaña<sup>1</sup> · Augusto Andrés Gamboa-Alonso<sup>2</sup> · Víctor Manuel Peña-Martínez<sup>1</sup> · Carlos Alberto Acosta-Olivo<sup>1</sup> · Adriana Sánchez-García<sup>3</sup> · Mario Simental-Mendía<sup>1</sup>

## Radiographic severity

**RECO 2**

260 patients  
 6 injections, monthly LR-PRP injections (2.4ml)  
 Double centrifugation  
 24 month follow-up

Consecutive injections of leukocyte-rich platelet-rich plasma are effective in not only mild but also severe knee degeneration  
 Masahiko Kemmochi  
 Kemmochi Orthopedic Surgery Sports Clinic, 42-1 Higashi-hancho, Ono, Gumma Prefecture, 373-0026, Japan

| Characteristics | Total       | K-L grade I | K-L grade II | K-L grade III | K-L grade IV |
|-----------------|-------------|-------------|--------------|---------------|--------------|
| Cases, n        | 260         | 33          | 67           | 106           | 54           |
| Injections, n   | 1295        | 129         | 307          | 554           | 305          |
| Age, years      | 67.1 ± 11.1 | 59.2 ± 10.9 | 63.4 ± 9.8   | 69.6 ± 11.3   | 71.6 ± 7.6   |
| BMI             | 25.5 ± 4.2  | 23.7        | 25.2         | 25.3          | 27.1         |
| Mean FTA        | 180.9       | 178         | 178.3        | 181.0         | 185.5        |
| PLT CR          | 5.6         | 5.1         | 5.3          | 5.4           | 5.5          |
| WBC CR          | 2.9         | 2.6         | 2.9          | 2.9           | 2.9          |

CR = ratio PRP/WB

| K-L         | I    |      |        | II              |      |        | III             |       |        | IV              |      |        | P-value (comparison) |                      |         |          |         |           |          |           |       |
|-------------|------|------|--------|-----------------|------|--------|-----------------|-------|--------|-----------------|------|--------|----------------------|----------------------|---------|----------|---------|-----------|----------|-----------|-------|
|             | Time | mean | 95% CI | P-value vs. Pre | mean | 95% CI | P-value vs. Pre | mean  | 95% CI | P-value vs. Pre | mean | 95% CI | P-value vs. Pre      | P-value Time * group | I vs II | I vs III | I vs IV | II vs III | II vs IV | III vs IV |       |
| VAS         |      |      |        |                 |      |        |                 |       |        |                 |      |        |                      | 0.015                |         |          |         |           |          |           |       |
| Pre         | 51.9 | 43.6 | 60.2   |                 | 62.7 | 57.5   | 68.0            |       | 59.9   | 55.8            | 64.1 |        | 69.8                 | 63.9                 | 75.6    | 0.026    | 0.089   | 0.001     | 0.386    | 0.074     | 0.004 |
| 3 M         | 23.7 | 15.2 | 32.1   | 0.000           | 31.4 | 26.1   | 36.7            | 0.000 | 38.4   | 34.1            | 42.6 | 0.000  | 50.1                 | 44.2                 | 56.0    | 0.114    | 0.002   | 0.000     | 0.032    | 0.000     | 0.001 |
| 6 M         | 24.3 | 15.6 | 33.0   | 0.000           | 33.0 | 27.3   | 38.8            | 0.000 | 35.3   | 30.7            | 39.9 | 0.000  | 44.3                 | 38.1                 | 50.5    | 0.091    | 0.028   | 0.000     | 0.521    | 0.008     | 0.015 |
| 1Y          | 21.3 | 12.2 | 30.4   | 0.000           | 29.0 | 22.7   | 35.2            | 0.000 | 34.8   | 29.9            | 39.7 | 0.000  | 49.4                 | 42.2                 | 56.6    | 0.155    | 0.010   | 0.000     | 0.134    | 0.000     | 0.001 |
| 2Y          | 15.0 | 2.7  | 27.4   | 0.000           | 27.5 | 19.0   | 35.9            | 0.000 | 43.7   | 37.1            | 50.4 | 0.000  | 44.8                 | 34.7                 | 54.8    | 0.100    | 0.000   | 0.000     | 0.002    | 0.009     | 0.862 |
| KOOS (pain) |      |      |        |                 |      |        |                 |       |        |                 |      |        |                      | 0.230                |         |          |         |           |          |           |       |
| Pre         | 64.9 | 58.2 | 71.6   |                 | 57.0 | 52.8   | 61.2            |       | 54.0   | 50.6            | 57.3 |        | 44.4                 | 39.7                 | 49.1    | 0.040    | 0.004   | 0.000     | 0.238    | 0.000     | 0.000 |
| 3 M         | 81.0 | 74.3 | 87.7   | 0.000           | 71.3 | 67.0   | 75.5            | 0.000 | 64.3   | 60.9            | 67.7 | 0.000  | 57.6                 | 52.9                 | 62.3    | 0.012    | 0.000   | 0.000     | 0.007    | 0.000     | 0.015 |
| 6 M         | 80.1 | 73.1 | 87.0   | 0.000           | 70.7 | 66.2   | 75.3            | 0.000 | 68.4   | 64.7            | 72.1 | 0.000  | 62.4                 | 57.4                 | 67.3    | 0.022    | 0.003   | 0.000     | 0.404    | 0.013     | 0.039 |
| 1Y          | 82.4 | 75.2 | 89.6   | 0.000           | 75.8 | 70.8   | 80.7            | 0.000 | 67.8   | 63.9            | 71.7 | 0.000  | 60.3                 | 54.6                 | 66.0    | 0.118    | 0.000   | 0.000     | 0.009    | 0.000     | 0.024 |
| 2Y          | 86.2 | 76.5 | 95.9   | 0.000           | 76.9 | 70.3   | 83.5            | 0.000 | 66.3   | 61.1            | 71.5 | 0.000  | 53.9                 | 46.5                 | 61.3    | 0.115    | 0.000   | 0.000     | 0.010    | 0.000     | 0.005 |



## Serial Platelet-Rich Plasma Intra-articular Injections in Kellgren and Lawrence Grade IV Knee Joint Osteoarthritis: A Prospective Blinded Placebo-Controlled Interventional Study

Amit Saraf<sup>1</sup> · Altaf Hussain<sup>1,2</sup> · Sandeep Bishnoi<sup>1</sup> · Goushul Azam<sup>1</sup> · Hamza Habib<sup>1</sup>

RCT

84 patients

All KL grade 4

PRP vs Saline

Outcomes : VAS and WOMAC

3 injections, monthly PRP injections (3ml)

Platelets concentration ?

Double centrifugation

6 months follow-up

Table 3 Comparison of WOMAC score at different intervals among the groups

| WOMAC score | NS group |       | PRP group |      | t test | P value |
|-------------|----------|-------|-----------|------|--------|---------|
|             | Mean     | SD    | Mean      | SD   |        |         |
| Baseline    | 78.49    | 6.69  | 81.54     | 7.43 | 4.89   | 0.052   |
| 3 months    | 70.22    | 10.51 | 61        | 7.64 | 21.28  | <0.01*  |
| 6 months    | 70.73    | 10.27 | 60.37     | 8.95 | 24.35  | <0.01*  |

\*Statistically significant

Table 5 Comparison of VAS at different intervals among the groups

| VAS      | NS group |      | PRP group |      | t test | P value |
|----------|----------|------|-----------|------|--------|---------|
|          | Mean     | SD   | Mean      | SD   |        |         |
| Baseline | 7.90     | 1.04 | 8.02      | 1.12 | 0.26   | 0.61    |
| 3 Months | 6.37     | 1.58 | 5.79      | 0.94 | 4.17   | 0.044*  |
| 6 Months | 6.61     | 1.39 | 5.74      | 1.03 | 10.57  | 0.002*  |

\*Statistically significant

### CONCLUSION:

Serial Intra-articular Injections of autologous PRP mildly improve short-term pain and knee function scores in patients of Grade IV KOA without any major complications.

The use of platelet-rich plasma in studies with early knee osteoarthritis versus advanced stages of the disease: a systematic review and meta-analysis of 31 randomized clinical trials

Félix Vilchez-Cavazos<sup>1</sup> · Jaime Blázquez-Saldaña<sup>1</sup> · Augusto Andrés Gamboa-Alonso<sup>2</sup> · Víctor Manuel Peña-Martínez<sup>1</sup> · Carlos Alberto Acosta-Olivo<sup>1</sup> · Adriana Sánchez-García<sup>3</sup> · Mario Simental-Mendía<sup>1</sup> 

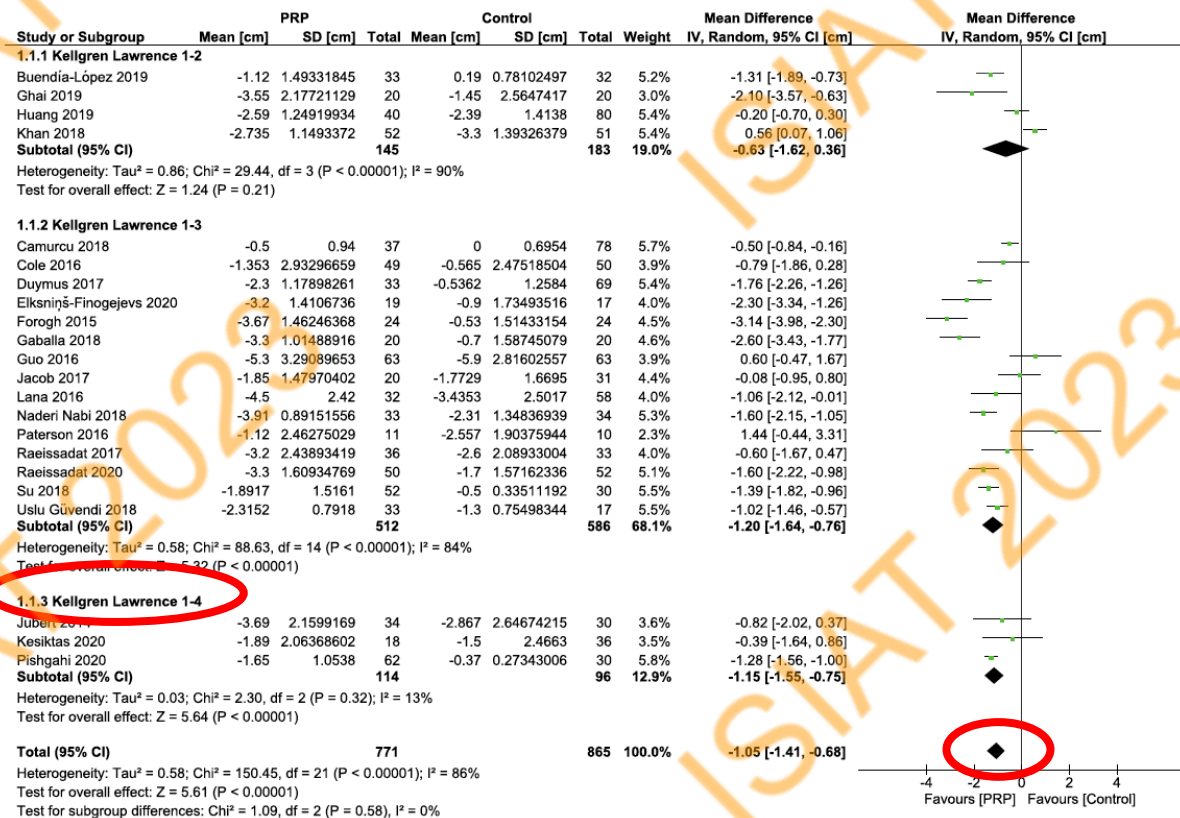


Fig. 3 Forest plot displaying the mean difference and 95% CI for the effect of PRP on pain (visual analog scale) as compared to a control group at different stages of knee osteoarthritis

CONCLUSION:

Our results indicate that including patients **with advanced knee OA** does not seem to affect the outcomes of clinical trials in which the effectiveness of the PRP in knee OA is assessed.

Original Article

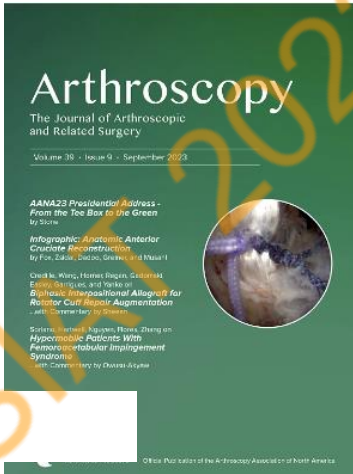
Experts Achieve Consensus on a Majority of Statements Regarding Platelet-Rich Plasma Treatments for Treatment of Musculoskeletal Pathology

Eoghan T. Hurley, M.B., M.Ch., Ph.D., Seth L. Sherman, M.D., Daniel J. Stokes, M.D., Scott A. Rodeo, M.D., Shane A. Shapiro, M.D., Kenneth Mautner, M.D., Don A. Buford, M.D., Jason L. Dragoo, M.D., Bert R. Mandelbaum, M.D., Kenneth R. Zaslav, M.D., Brian J. Cole, M.D., M.B.A., Rachel M. Frank, M.D., and Members of the Biologics Association<sup>1</sup>

Review Article

Platelet-rich Plasma in Patients with Symptomatic Osteoarthritis Knee: An Evidence- and Consensus-based 2023 International Society for Musculoskeletal Ultrasound in Pain Medicine Guidelines

Gautam Das, Kanchan Sharma<sup>1</sup>, Sushpa Das, Ashok Jadon<sup>2</sup>, Karthic Babu Natarajan<sup>3</sup>, Guru Moorthi<sup>4,5</sup>, Kawsar Sardar<sup>6</sup>, Ettayeb Gadiri<sup>6</sup>, Tct Novy<sup>7</sup>, Debiyoti Dutta, Vanmathy R<sup>8</sup>, Chinmoy Roy



Recommendation 4

In patients with advanced OAK, the ISMPM recommends that multiple IA-PRP + HA or IA-PRP injections may be tried in those not willing for arthroplasty or when arthroplasty is contraindicated.

- Grade of recommendation: B
- Level of evidence: II-1
- Strength of consensus: Moderate

Can PRP be used in severe knee OA (KL4)?

PRP treatment could be considered in selected severe knee OA cases (KL4), for example in patients who decline or are not suitable for surgery due to comorbidities, although lower results could be expected and physicians should provide cautious expectations when discussing or suggesting this biological approach. *Grade C*

Questions & Answers

Q: Should PRP be given for Grade IV Knee OA?

A: PRP can be given for Grade IV Knee OA but should be based on other relative indications.

| Agreement | Consensus |
|-----------|-----------|
| 89%       | Consensus |

# 25 RECOMMENDATIONS



- Effectiveness of PRP
- **GENERAL RECOMMENDATIONS**
- Characteristics of PRP
- Contraindications and interactions
- Rules of good practice and adverse effects

# GENERAL RECOMMENDATIONS

| Recommandations   | Expert opinion                      | Median | Distribution |     |     | Level    |
|---|-------------------------------------|--------|--------------|-----|-----|----------|
|   |                                     |        | ≤ 3          | 4-6 | ≥ 7 | Evidence |
| PRP treatment should be offered as a second-line treatment, after failure of oral or non-pharmacological treatment of knee OA | Appropriate with relative agreement | 9      | 0            | 1   | 14  | 5        |
| PRP treatment should not be used during a flare up of knee OA   | Appropriate with relative agreement | 7      | 0            | 6   | 9   | 5        |
| A sequence of PRP treatment in knee osteoarthritis may include 1 to 3 injections  | Appropriate with strong agreement   | 9      | 0            | 0   | 15  | 1A       |
| PRP injections in knee osteoarthritis should be performed under ultrasound or scopic guidance                                 | Lack of consensus                   | 8      | 1            | 1   | 13  | 5        |
| A joint effusion should be systematically drained before the injection of PRP   | Appropriate with strong agreement   | 9      | 0            | 0   | 15  | 5        |
| Symptomatic bilateral knee osteoarthritis can be treated at the same time   | Lack of consensus                   | 8      | 2            | 0   | 13  | 5        |
| After injection of PRP, resting the knee for 48 hours is recommended  | Lack of consensus                   | 9      | 1            | 0   | 14  | 5        |

## 7 RECOMMENDATIONS

- Place of PRP in the management of knee osteoarthritis
- Therapeutic protocol



# GENERAL RECOMMENDATIONS

| Recommandations   | Expert opinion                    | Median | Distribution |     |     |
|---|-----------------------------------|--------|--------------|-----|-----|
|   |                                   |        | ≤ 3          | 4-6 | ≥ 7 |
|   | Appropriée avec accord relatif    | 9      | 0            | 1   | 14  |
|   | Appropriée avec accord relatif    | 7      | 0            | 6   | 9   |
| <b>A sequence of PRP treatment in knee osteoarthritis can include 1 to 3 injections</b> | Appropriate with strong agreement | 9      | 0            | 0   | 15  |
|   | Absence de consensus              | 8      | 1            | 1   | 13  |
|   | Appropriée avec accord fort       | 9      | 0            | 0   | 15  |
|   | Absence de consensus              | 8      | 2            | 0   | 13  |
|   | Absence de consensus              | 9      | 1            | 0   | 14  |

**Evidence level 1A**

*Chou. Int J Clinical Practice. 2021*  
*Kavadar et al. J Phys Ther Sci. 2015*  
*Huang et al. Int J Surg Lond Engl. 2017*  
*Patel et al. Am J Sports Med. 2013*  
*Görmeli et al. Knee Surg Sports Traumatol Arthrosc. 2017*

A sequence of PRP treatment in knee osteoarthritis can include 1 to 3 injections

# WHAT'S NEW SINCE THIS PUBLICATION ?

- 1 RTC : KL grade 1 or 2: 3 groups : 1, 2 or 3 injections ( Subramanyam 2021)
- 2 Systematic review and meta analysis (Chou 2021, Tao 2023)



Arch Rheumatol 2021;36(3):326-334  
doi: 10.46497/ArchRheumatol.2021.8408

ORIGINAL ARTICLE

## Single versus multi-dose intra-articular injection of platelet rich plasma in early stages of osteoarthritis of the knee: A single-blind, randomized, superiority trial

Koushik Subramanyam , Rajkumar Alguvelly , Abhishek Mundargi ,  
Prakash Khanchandani

Department of Orthopaedics, Sri Sathya Sai Institute of Higher Medical Sciences - Prashanthigram, Puttaparthi, Andhra Pradesh, India

ORIGINAL PAPER  
RHEUMATOLOGY

THE INTERNATIONAL JOURNAL OF  
CLINICAL PRACTICE WILEY

## Efficacy of different platelet-rich plasma injections in the treatment of mild-moderate knee osteoarthritis: A systematic review and meta-analysis

Shih-Hsiang Chou<sup>1</sup> | Chia-Lung Shih<sup>2</sup>

### Systematic Review


## Three Doses of Platelet-Rich Plasma Therapy Are More Effective Than One Dose of Platelet-Rich Plasma in the Treatment of Knee Osteoarthritis: A Systematic Review and Meta-analysis

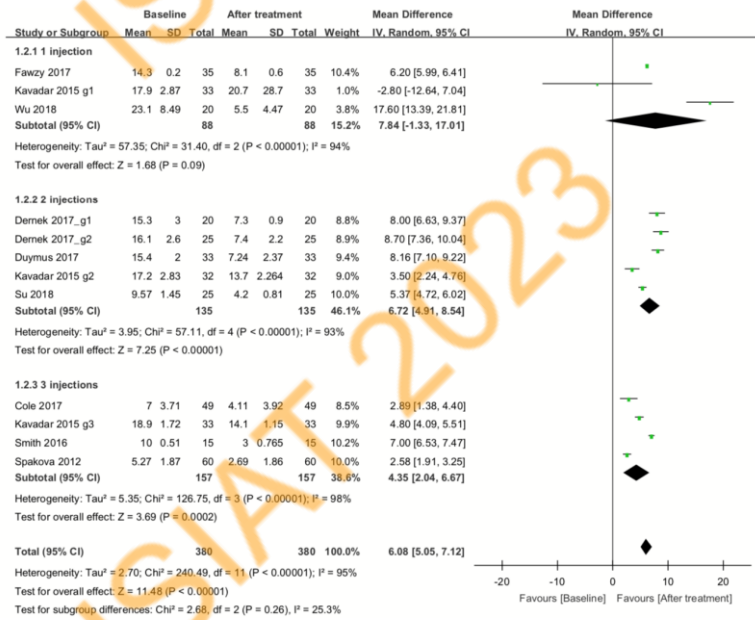
Xinyu Tao, M.B.B.S., Angeline Ai Ling Aw, M.B.B.S., Jun Jie Leeu, M.B.B.S., and Hamid Rahmatullah Bin Abd Razak, M.B.B.S., M.Med.(Orth), F.R.C.S.Ed.(Orth)

# NUMBER OF PRP INJECTIONS

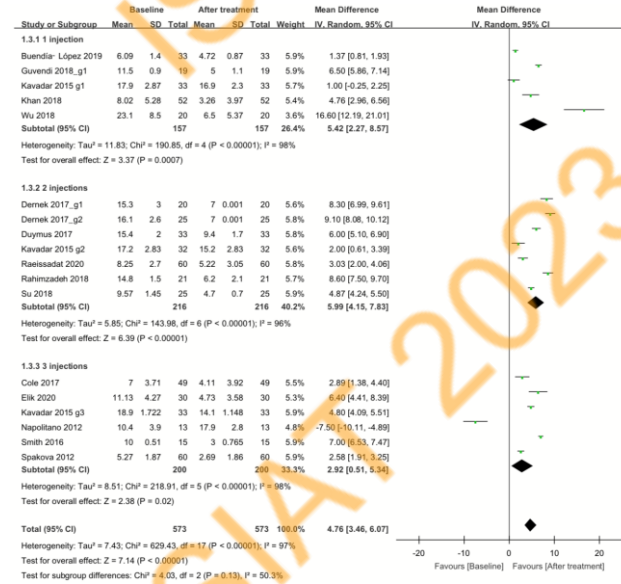
## RECOMMENDATION 7

Efficacy of different platelet-rich plasma injections in the treatment of mild-moderate knee osteoarthritis: A systematic review and meta-analysis

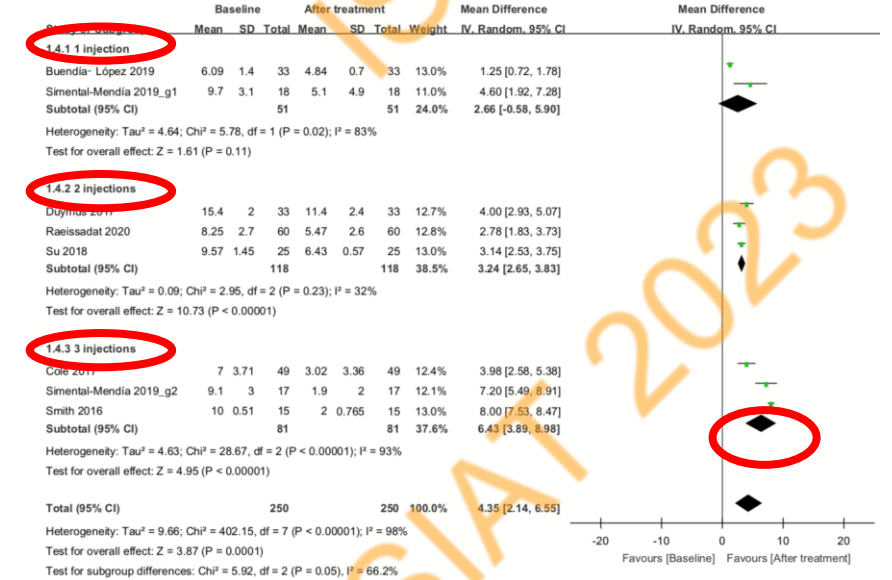
Shih-Hsiang Chou<sup>1</sup> | Chia-Lung Shih<sup>2</sup> 



WOMAC P at M3



WOMAC P at M6



WOMAC P at M12

KL2-3

- VAS PAIN: No differences between the groups at M3, M6 and M12
- WOMAC Pain: 3 inj > 2 inj +/- 1 inj at 12 months
- WOMAC Function: 3 inj > 1 or 2 inj at 12 months

# NUMBER OF PRP INJECTIONS

2021



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## Single versus multi-dose intra-articular injection of platelet rich plasma in early stages of osteoarthritis of the knee: A single-blind, randomized, superiority trial

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Department of Orthopaedics, Sri Sathya Sai Institute of Higher Medical Sciences - Prashanthigram, Puttaparthi, Andhra Pradesh, India

- RCT
- 90 patients
- All KL grade 1 or 2
- 3 groups : 1, 2 or 3 injections
- Outcome : VAS and functional scales
- 12 month follow-up

**Table 2.** Comparison of outcome measures across time points within each group and between groups at each time point

|                                  | 1-dose group | 2-dose group | 3-dose group | p†      |
|----------------------------------|--------------|--------------|--------------|---------|
|                                  | Mean±SD      | Mean±SD      | Mean±SD      |         |
| <b>Visual Analog Scale</b>       |              |              |              |         |
| Pre-intervention                 | 7.7±1.0      | 7.4±1.0      | 7.6±1.0      | 0.58    |
| 6 weeks                          | 5.1±1.1      | 5.0±1.0      | 5.0±1.0      | 0.85    |
| 3 months                         | 3.0±1.2      | 2.8±1.2      | 2.7±1.0      | 0.45    |
| 6 months                         | 1.1±0.8      | 1.0±0.8      | 1.0±0.8      | 0.65    |
| 1 year                           | 3.7±1.0      | 3.4±1.3      | 1.5±1.3      | <0.001* |
| p value†                         | <0.001*      | <0.001*      | <0.001*      |         |
| <b>IKDC Score</b>                |              |              |              |         |
| Pre-intervention                 | 48.8±8.6     | 50.3±7.4     | 51.4±7.1     | 0.42    |
| 6 weeks                          | 57.4±8.0     | 58.5±6.9     | 59.9±6.5     | 0.4     |
| 3 months                         | 62.7±7.9     | 63.7±6.4     | 65.2±6.3     | 0.37    |
| 6 months                         | 68.9±8.2     | 69.8±6.9     | 71.5±6.4     | 0.98    |
| 1 year                           | 60.6±8.3     | 61.8±6.9     | 71.7±6.4     | <0.001* |
| p value                          | <0.001*      | <0.001*      | <0.001*      |         |
| <b>KOOS</b>                      |              |              |              |         |
| Pre-intervention                 | 49.0±7.5     | 49.9±6.8     | 50.8±7.0     | 0.61    |
| 6 weeks                          | 55.6±7.7     | 56.4±6.7     | 57.0±6.9     | 0.73    |
| 3 months                         | 62.1±7.0     | 62.9±6.2     | 63.6±6.4     | 0.69    |
| 6 months                         | 68.2±7.4     | 69.4±6.4     | 71.1±7.1     | 0.58    |
| 1 year                           | 59.1±7.3     | 59.9±6.3     | 69.3±6.7     | <0.001* |
| p value                          | <0.001*      | <0.001*      | <0.001*      |         |
| <b>Tegner Lysholm knee score</b> |              |              |              |         |
| Pre-intervention                 | 59.8±8.3     | 60.7±6.7     | 61.4±7.1     | 0.69    |
| 6 weeks                          | 67.0±8.3     | 67.2±7.3     | 67.9±7.1     | 0.89    |
| 3 months                         | 73.7±8.1     | 74.7±7.3     | 75.7±7.2     | 0.61    |
| 6 months                         | 79.5±8.9     | 80.8±7.9     | 81.5±8.2     | 0.68    |
| 1 year                           | 71.9±8.4     | 72.3±7.9     | 80.5±7.9     | <0.001* |
| p value                          | <0.001*      | <0.001*      | <0.001*      |         |

IKDC: International Knee Documentation Committee; KOOS: Knee Injury and Osteoarthritis Outcome Score; † One-way ANOVA; ‡ Repeated measures ANOVA; \* Statistically significant.

3 INJECTIONS BETTER THAN ONE OR TWO INJECTIONS AT 1 YEAR

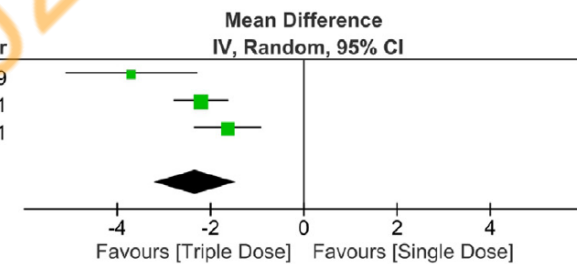
# NUMBER OF PRP INJECTIONS

Systematic Review

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Xinyu Tao, M.B.B.S., Angeline Ai Ling Aw, M.B.B.S., Jun Jie Leeu, M.B.B.S., and Hamid Rahmatullah Bin Abd Razak, M.B.B.S., M.Med.(Orth), F.R.C.S.Ed.(Orth)

| Study or Subgroup  | Triple Dose |      |            | Single Dose |      |            | Weight        | Mean Difference<br>IV, Random, 95% CI | Year |
|--|-------------|------|------------|-------------|------|------------|---------------|---------------------------------------|------|
|  | Mean        | SD   | Total      | Mean        | SD   | Total      |               |                                       |      |
| Simental Mendía 2019   | 0.9         | 1.4  | 17         | 4.6         | 2.7  | 18         | 21.8%         | -3.70 [-5.11, -2.29]                  | 2019 |
| Subramanyam 2021   | 1.5         | 1.3  | 30         | 3.7         | 1    | 30         | 40.9%         | -2.20 [-2.79, -1.61]                  | 2021 |
| Yurtbay 2021   | 4.16        | 2.13 | 63         | 5.79        | 1.99 | 62         | 37.4%         | -1.63 [-2.35, -0.91]                  | 2021 |
| <b>Total (95% CI)</b>  |             |      | <b>110</b> |             |      | <b>110</b> | <b>100.0%</b> | <b>-2.31 [-3.19, -1.44]</b>           |      |
| Heterogeneity: Tau <sup>2</sup> = 0.40; Chi <sup>2</sup> = 6.63, df = 2 (P = 0.04); I <sup>2</sup> = 70% |             |      |            |             |      |            |               |                                       |      |
| Test for overall effect: Z = 5.16 (P < 0.00001)  |             |      |            |             |      |            |               |                                       |      |



**Fig 4.** Forest plot comparing visual analog scale (VAS) scores at 12 months between triple-dose platelet-rich plasma (PRP) and single-dose PRP. (CI, confidence interval; SD, standard deviation; IV, inverse variance.)

- 7 RCT, 575 PATIENTS
- PAUCITY OF LARGE HIGH-QUALITY LEVEL I STUDIES
- 3 INJECTIONS BETTER THAN ONE OR TWO INJECTIONS AT 1 YEAR

**Original Article**

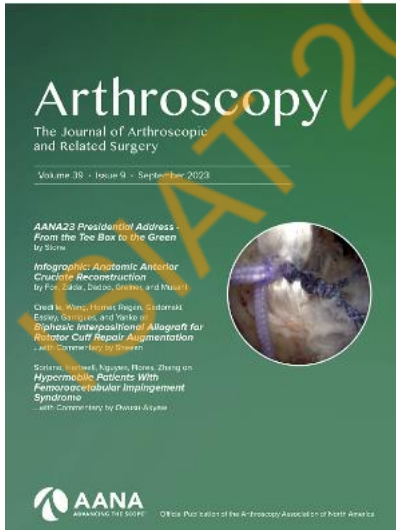
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**Review Article**

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Gautam Das, Kanchan Sharma<sup>1</sup>, Sushpa Das, Ashok Jadon<sup>2</sup>, Karthic Babu Natarajan<sup>3</sup>, Guru Moorthi<sup>4,5</sup>, Kawsar Sardar<sup>6</sup>, Ellayeb Gadir<sup>6</sup>, Tej Novvy<sup>7</sup>, Debijyoti Dutta, Vanmathy R. Chinmoy Roy



**Recommendation 5**

In patients with symptomatic OAK, ISMPM recommends that 3 monthly IA-PRP injections should be administered, irrespective of KL grades.

- Grade of recommendation: B
- Level of evidence: II-1
- Strength of consensus: Moderate.

**How many injections of PRP are recommended for the treatment of knee OA?**

While the literature is not conclusive with regards to the optimal number of injections per PRP treatment cycle for knee OA, the majority of articles reports that protocols with >1 injection provide better clinical improvement, at least with early OA.

The consensus group realizes that factors such as injection volume and platelet concentration may largely differ between available PRP products and may influence the effect of an injection.

The consensus group recommends a range of 2-4 injections. *Grade B*

**Q: Is there a preferred PRP administration protocol (including the number and timing of injections) for those with knee osteoarthritis?**

**A: At least 2 injections may be required, but the optimal PRP administration protocol is unclear.**



# 25 RECOMMENDATIONS



- Effectiveness of PRP
- General recommendations
- **CHARACTERISTICS OF PRP**
- Contraindications and interactions
- Rules of good practice and adverse effects

# CHARACTERISTICS OF PRP

| Recommandations   | Experts opinion                     | Median | Distribution |     |     | Level Evidence |
|---|-------------------------------------|--------|--------------|-----|-----|----------------|
|   |                                     |        | ≤ 3          | 4-6 | ≥ 7 |                |
| The characteristics of the injected PRP influence the outcome in knee osteoarthritis        | Appropriate with relative agreement | 8      | 0            | 2   | 13  | 4              |
| Leukocyte-poor PRPs should be preferred in knee osteoarthritis                              | Appropriate with relative agreement | 8      | 0            | 1   | 14  | 5              |
| The effectiveness of PRP in knee osteoarthritis depends on the number of platelets injected | Appropriate with relative agreement | 8      | 0            | 1   | 14  | 5              |
| The volume of a PRP injection in knee osteoarthritis should be 4-8 ml                       | Appropriate with strong agreement   | 8      | 0            | 0   | 15  | 4              |

## 4 RECOMMENDATIONS

- Role of cell composition
- Impact of injected volume



# CHARACTERISTICS OF PRP

| Recommandations   | Experts opinion                     | Mediane | Distribution |     |     |
|---|-------------------------------------|---------|--------------|-----|-----|
|   |                                     |         | ≤ 3          | 4-6 | ≥ 7 |
|   | Appropriée avec accord relatif      | 8       | 0            | 2   | 13  |
| <b>Leukocyte-poor PRPs should be preferred in knee osteoarthritis</b> | Appropriate with relative agreement | 8       | 0            | 1   | 14  |
|   | Appropriée avec accord relatif      | 8       | 0            | 1   | 14  |
|   | Appropriée avec accord fort         | 8       | 0            | 0   | 15  |

**Evidence level 5**

*Filardo et al. Knee Surg Sports Traumatol Arthrosc. 2012*  
*Riboh et al. Am J Sports Med. 2016*

# WHAT'S NEW SINCE THIS PUBLICATION ?

- One systematic review and meta analysis  
(*Kim 2021*)
- One Network meta analysis  
(*Abbas 2021*)
- One RCT (*Zhou 2023*)

## Adverse Reactions and Clinical Outcomes for Leukocyte-Poor Versus Leukocyte-Rich Platelet-Rich Plasma in Knee Osteoarthritis

### A Systematic Review and Meta-analysis

Jun-Ho Kim,\* MD, PhD, Yong-Beom Park,<sup>††</sup> MD, PhD, Chul-Won Ha,<sup>§</sup> MD, PhD, Young Ju Roh,<sup>||</sup> MD, and Jung-Gwan Park,<sup>†</sup> MD

Investigation performed at Chung-Ang University Hospital, Chung-Ang University, Seoul, Republic of Korea

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## The Effect of Leukocyte Concentration on Platelet-Rich Plasma Injections for Knee Osteoarthritis

### A Network Meta-Analysis

Aazad Abbas, HBSc, Jin Tong Du, BMSc, and Herman S. Dhotar, MD, MPH, FRCSC

1-40

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### CLINICAL ARTICLE

## Clinical Efficacy of Intra-Articular Injection with P-PRP Versus that of L-PRP in Treating Knee Cartilage Lesion: A Randomized Controlled Trial

Yiqin Zhou, MD<sup>1,2</sup>, Haobo Li, MD<sup>2</sup>, Shiqi Cao, PhD<sup>3,4</sup>, Yaguang Han, PhD<sup>2</sup>, Jiahua Shao, PhD<sup>2</sup>, Qiwei Fu, MD<sup>2</sup>, Bo Wang, MD<sup>2</sup>, Jun Wu, PhD<sup>2</sup>, Dong Xiang, MD<sup>2</sup>, Ziyue Liu, MD<sup>2</sup>, Huang Wang, MD<sup>2</sup>, Jun Zhu, MD<sup>2</sup>, Qirong Qian, PhD<sup>2</sup>, Xiaolei Yang, MD<sup>2</sup>, Song Wang, PhD<sup>1</sup>

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Jun-Ho Kim,\* MD, PhD, Yong-Beom Park,†† MD, PhD, Chul-Won Ha,§ MD, PhD, Young Ju Roh,|| MD, and Jung-Gwan Park,¶ MD

Investigation performed at Chung-Ang University Hospital, Chung-Ang University, Seoul, Republic of Korea

### Meta-analysis

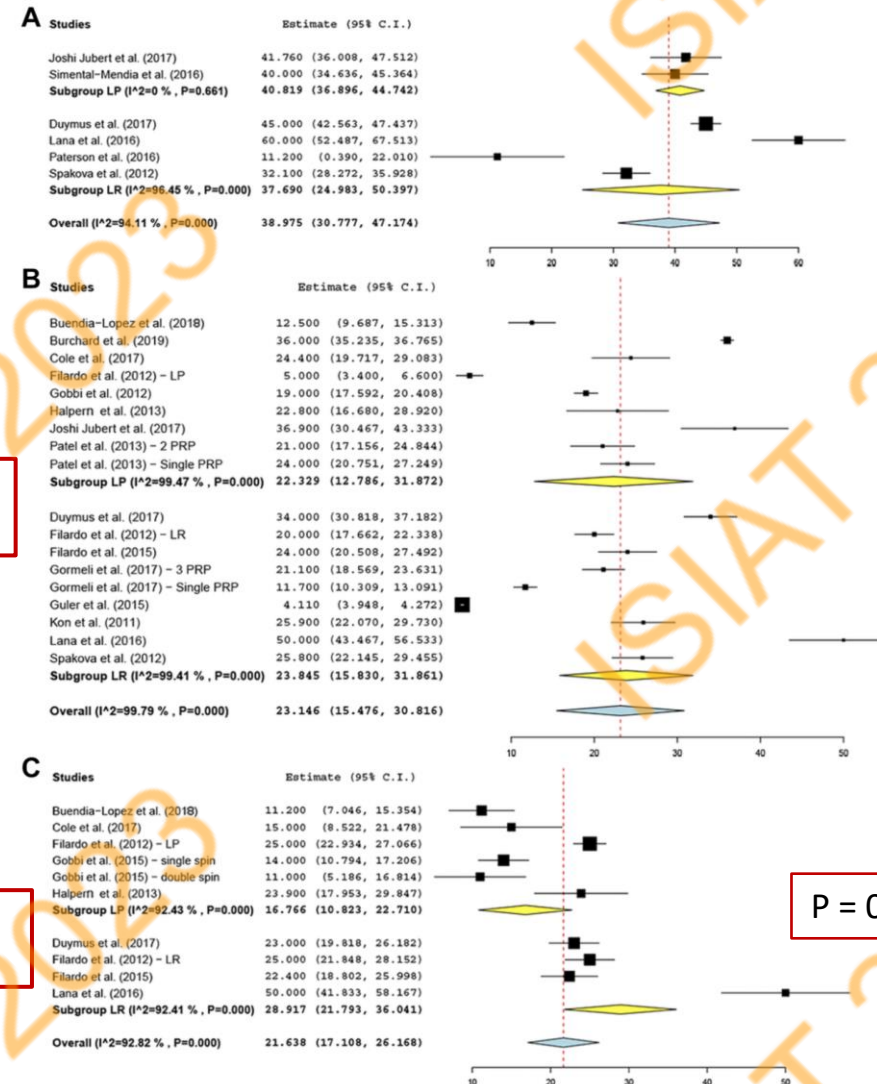
- 32 studies

- WOMAC and IKDC :
- No difference at 3, 6 and 12 months

3 month

6 month

12 month



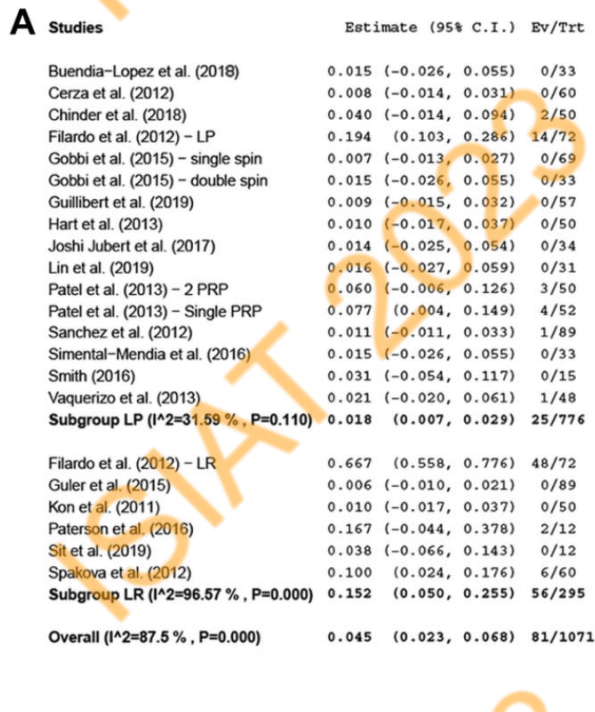
VAS

P = 0.06

# EFFECTIVENESS OF PRP DEPENDING ON THE PROTOCOL

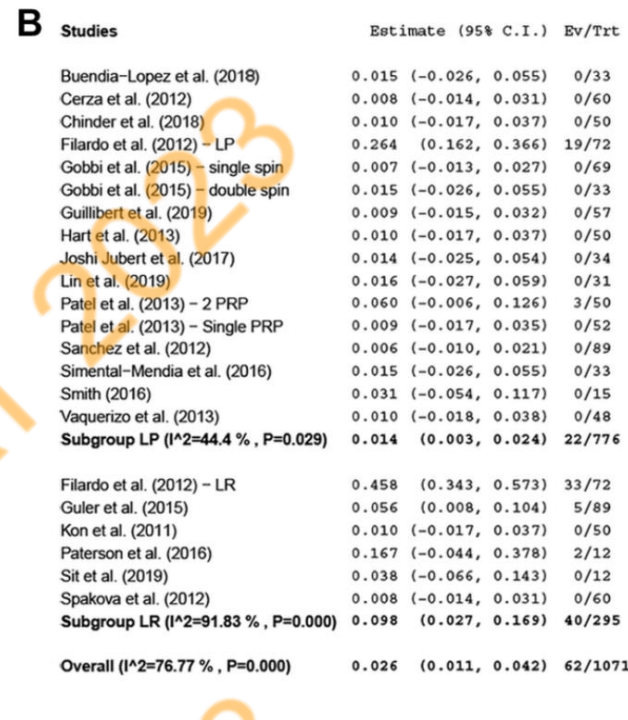
## LR vs LP PRP

RECO 13



PAIN

OR LR vs. LP = 1.64; p<0.05



Swelling

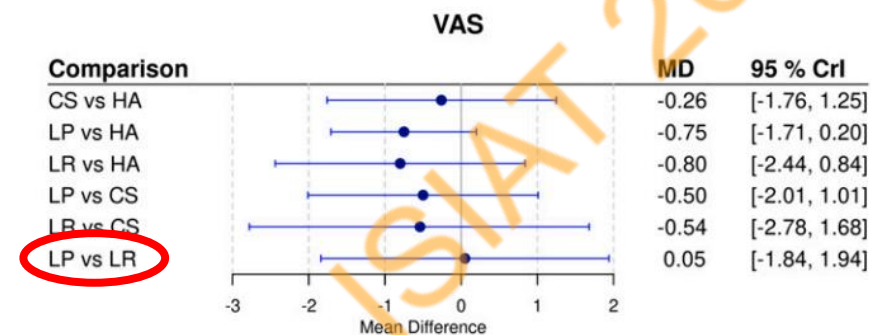
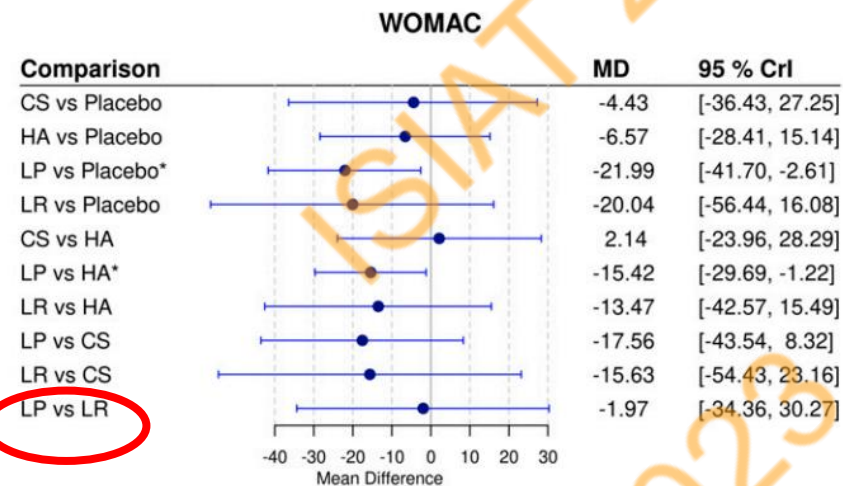
OR LR vs. LP = 1.56; p<0.05

# The Effect of Leukocyte Concentration on Platelet-Rich Plasma Injections for Knee Osteoarthritis

A Network Meta-Analysis

Aazad Abbas, HBSc, Jin Tong Du, BMSc, and Herman S. Dhotar, MD, MPH, FRCSC

## b) 12 months follow-up



### CONCLUSION:

- **Leukocyte concentration of PRP does not play a significant role** in patient-reported outcome measures for knee OA.
- LP-PRP is preferred to LR-PRP according to SUCRA rankings, but this preference may not be important in clinical practice

# EFFECTIVENESS OF PRP DEPENDING ON THE PROTOCOL LR vs LP PR

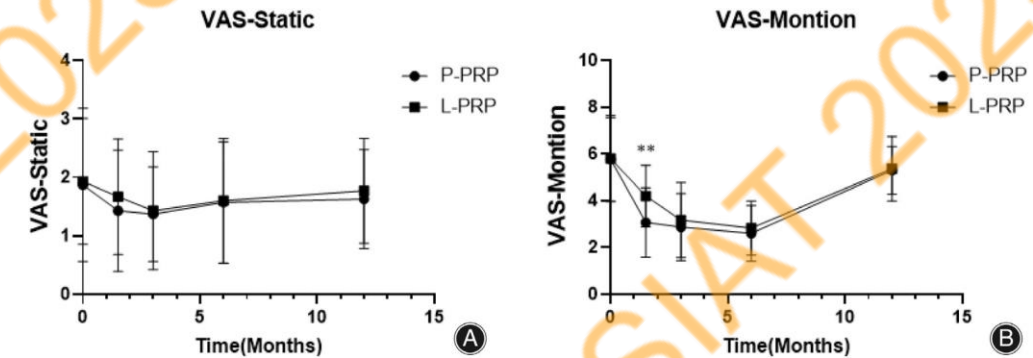
- RCT
- 60 patients
- LR-PRP vs Pure –PRP
- VAS and WOMAC
- Follow-up 12 months

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## CLINICAL ARTICLE

### Clinical Efficacy of Intra-Articular Injection with P-PRP Versus that of L-PRP in Treating Knee Cartilage Lesion: A Randomized Controlled Trial

Yiqin Zhou, MD<sup>1,2</sup>, Haobo Li, MD<sup>2</sup>, Shiqi Cao, PhD<sup>3,4</sup>, Yaguang Han, PhD<sup>2</sup>, Jiahua Shao, PhD<sup>2</sup>, Qiwei Fu, MD<sup>2</sup>, Bo Wang, MD<sup>2</sup>, Jun Wu, PhD<sup>2</sup>, Dong Xiang, MD<sup>2</sup>, Ziyue Liu, MD<sup>2</sup>, Huang Wang, MD<sup>2</sup>, Jun Zhu, MD<sup>2</sup>, Qirong Qian, PhD<sup>2</sup>, Xiaolei Yang, MD<sup>2</sup>, Song Wang, PhD<sup>1</sup>



**Fig. 3** VAS scores were evaluated pre-operation, 6 weeks, 12 weeks, 6 months, 12 months after intervention. (a) VAS static scores; (b) VAS motion scores (\*\*p < 0.01)

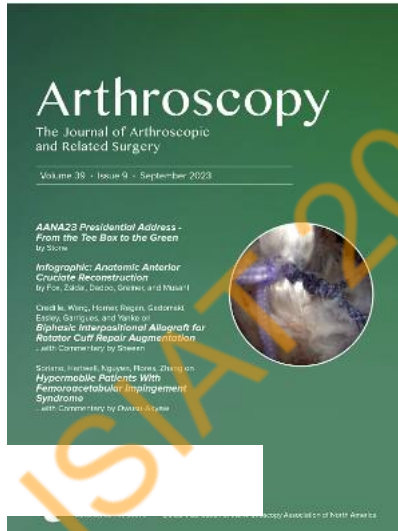
## CONCLUSIONS:

- Short-term : positive effect on pain and function in patients in the two groups.
- P-PRP injection showed better clinical efficacy in the early phase and resulted in fewer adverse events,
- Long-term follow-up showed similar and weakened efficacy after 12 months.

Original Article

Experts Achieve Consensus on a Majority of Statements Regarding Platelet-Rich Plasma Treatments for Treatment of Musculoskeletal Pathology

Eoghan T. Hurley, M.B., M.Ch., Ph.D., Seth L. Sherman, M.D., Daniel J. Stokes, M.D., Scott A. Rodeo, M.D., Shane A. Shapiro, M.D., Kenneth Mautner, M.D., Don A. Buford, M.D., Jason L. Dragoo, M.D., Bert R. Mandelbaum, M.D., Kenneth R. Zaslav, M.D., Brian J. Cole, M.D., M.B.A., Rachel M. Frank, M.D., and Members of the Biologics Association<sup>1</sup>



epicondylus.

Q: What are the indications for LP-PRP over LR-PRP?

A: The indication for LP-PRP over LR-PRP is osteoarthritis.

86%

Consensus

Review Article

Platelet-rich Plasma in Patients with Symptomatic Osteoarthritis Knee: An Evidence- and Consensus-based 2023 International Society for Musculoskeletal Ultrasound in Pain Medicine Guidelines

Gautam Das, Kanchan Sharma<sup>1</sup>, Sushpa Das, Ashok Jadon<sup>2</sup>, Karthic Babu Natarajan<sup>3</sup>, Guru Moorithi<sup>4,5</sup>, Kawsar Sardar<sup>6</sup>, Eltayeb Gadi<sup>4</sup>, Tot Novy<sup>7</sup>, Debjyoti Dutta, Vanmathy R<sup>8</sup>, Chinmoy Roy

Recommendation 2

In patients with symptomatic OKA, both leukocyte-poor (LP) and leukocyte-rich (LR) PRP are equally effective, and ISMPM recommends that either IA-LP-PRP or IA-LR-PRP may be used.

- Grade of recommendation: B
- Level of evidence: I
- Strength of consensus: Strong



Which PRP is preferred for knee OA: LR-PRP or LP-PRP?

Several meta-analyses and network meta-analyses have compared the effectiveness of LP-PRP compared to LR-PRP for knee OA with overall inconclusive results.

The consensus group acknowledges that the effectiveness of PRP is likely multifactorial and therefore the dependence on the presence of leukocytes alone might be overestimated as other factors may also have a contribution. Therefore, the consensus group currently does not support one type of PRP over the other and considers both LP-PRP and LR-PRP valid options for the management of knee OA when PRP is considered. *Grade B*

# 25 RECOMMENDATIONS



- Effectiveness of PRP
- General recommendations
- Characteristics of PRP
- **CONTRAINDICATIONS AND INTERACTIONS**
- Rules of good practice and adverse effects



# CONTRAINDICATIONS AND INTERACTIONS

| RecommandationsL   | Experts opinion                     | Median | Distribution |     |     | Level Evidence |
|--|-------------------------------------|--------|--------------|-----|-----|----------------|
|  |                                     |        | ≤ 3          | 4-6 | ≥ 7 |                |
| PRPs should not be mixed with anesthetic or CS IA  | Appropriate with relative agreement | 9      | 0            | 1   | 14  | 5              |
| Treatment of knee osteoarthritis with PRP should not be done soon after an IA injection of cortisone                             | Appropriate with relative agreement | 8      | 0            | 1   | 14  | 5              |
| Anti-inflammatory treatment should be avoided in the days preceding and following PRP treatment                                  | Appropriate with strong agreement   | 9      | 0            | 0   | 15  | 5              |
| Antiplatelet treatment is not a contraindication to PRP injections, but could alter the result by preventing platelet activation | Appropriate with strong agreement   | 9      | 0            | 0   | 15  | 5              |
| A recent neoplasia (malignant tumours, hemopathies) can be a contraindication to PRP injections in gonarthrosis                  | Appropriate with relative agreement | 7      | 0            | 6   | 9   | 5              |
| The presence of radiographic articular chondrocalcinosis is not a contraindication to IA injections of PRP                       | Appropriate with strong agreement   | 8      | 0            | 0   | 15  | 5              |

## 6 RECOMMENDATIONS

- Combination with other injectable products
- Drug co-prescriptions
- Associated pathologies

# 25 RECOMMENDATIONS



- Effectiveness of PRP
- General recommendations
- Characteristics of PRP
- Contraindications and interactions
- **RULES OF GOOD PRACTICE AND ADVERSE EFFECTS**

# RULES OF GOOD PRACTICE AND ADVERSE EFFECTS

| Recommandations  | Experts opinion                     | Median | Distribution |     |     | Level Evidence |
|--|-------------------------------------|--------|--------------|-----|-----|----------------|
|  |                                     |        | ≤ 3          | 4-6 | ≥ 7 |                |
|  | Appropriée avec accord relatif      | 8      | 0            | 2   | 13  |                |
|  | Appropriée avec accord fort         | 9      | 0            | 0   | 15  |                |
| PRP injections in knee osteoarthritis are a locally well tolerated treatment   | Appropriate with strong agreement   | 8      | 0            | 0   | 15  | 1A             |
| PRP injections in knee osteoarthritis are a generally well-tolerated treatment | Appropriate with relative agreement | 9      | 0            | 1   | 14  | 1A             |

**Evidence level 1A**

## Review Article

## Platelet-rich Plasma in Patients with Symptomatic Osteoarthritis Knee: An Evidence- and Consensus-based 2023 International Society for Musculoskeletal Ultrasound in Pain Medicine Guidelines

Gautam Das, Kanchan Sharma<sup>1</sup>, Sushpa Das, Ashok Jadon<sup>2</sup>, Karthic Babu Natarajan<sup>3</sup>, Guru Moorthi<sup>4,5</sup>, Kawsar Sardar<sup>5</sup>, Eltayeb Gadir<sup>6</sup>, Tct Novy<sup>7</sup>, Debjyoti Dutta, Vanmathy R<sup>3</sup>, Chinmoy Roy

### *Recommendation 9*

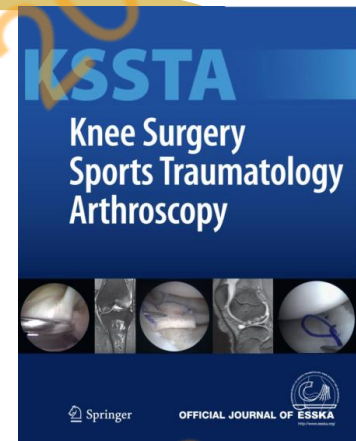
In patients with symptomatic OAK, ISMPM consensus suggests that IA-PRP is well tolerated both locally and systemically.

- Grade of recommendation: A
- Level of evidence: I
- Strength of consensus: Strong

# CONCLUSION: **PRP and KNEE OA**

25 recommendations based on "evidence-based medicine" and clinical experience

- Harmonizing the use of IA injections of PRP in knee osteoarthritis
- Draw guidelines for the design of future clinical research
- **THE UPDATING OF THE LITERATURE in 2023 DOES NOT JUSTIFY SUBSTANTIAL MODIFICATIONS OF THESE RECOMMENDATIONS.**



# THANK YOU FOR YOUR ATTENTION!



**Athens**  
**5-7 October 2023**

Dr Martin Lamontagne, Physiatrist, CANADA

Dr Florent Eymard, Rhumatologist, FRANCE

