Exploring the potential of allogenic platelet-rich plasma in joint pathologies: A scoping review of existing literature

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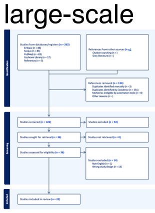
INTRODUCTION: Allogenic platelet-rich plasma(PRP) has emerged as a promising alternative to autologous PRP for treating joint pathologies, offering potential advantages in consistency, cost, and applicability across patient demographics. This scoping review aims to firstly, examine the basic science of allogenic PRP and secondly, assess its efficacy and safety in joint diseases.

METHODS: A systematic literature search was conducted following PRISMA guidelines, encompassing studies from 2010 to 2024, across databases such as Embase, PubMed, and SCOPUS. The selection criteria included controlled laboratory studies, cohort studies, and randomized controlled trials focusing on the basic science, safety profile, and clinical outcomes of allogenic PRP.

RESULTS: A total of 22 studies were included. In vivo and in vitro, allogenic PRP demonstrates anti-inflammatory and pro-regenerative properties. Clinically, it showed consistent patient-reported outcome improvements, significantly reducing pain by up to 25% and improving joint function scores such as WOMAC, IKDC in knees and DASH and SPADI in shoulders. Clinician-reported outcomes such as range of motion and imaging were similarly improved; ultrasonography-detected effusion in knee OA improved by 30% and femoral cartilage thickness by 22%. The safety profile was generally favourable, with mild, transient adverse events and no severe complications reported. Transient intra-articular pain was noted in 10-15% of patients, while 8-10% of patients experienced mild swelling.

DISCUSSION AND CONCLUSION: Allogenic PRP demonstrates promise as a treatment for joint pathologies, with favourable efficacy and safety profiles, logistical advantages, and a cost-effective alternative to autologous PRP. Further, large-scale studies are needed to confirm its long-term efficacy and standardize preparation methods.


Identification
Studies from databases/registers (n = 262)
Embase (n = 88)
Scopus (n = 85)
PubMed (n = 69)
Cochrane Library (n = 17)
References (n = 3)
References from other sources (n =)
Citation searching (n =)
Grey literature (n =)
References removed (n = 134)
Duplicates identified manually (n = 3)
Duplicates identified by Covidence (n = 131)
Marked as ineligible by automation tools (n = 0)
Other reasons (n =)
Screening
Studies screened (n = 128)
Studies excluded (n = 92)
Studies sought for retrieval (n = 36)
Studies not retrieved (n = 0)
Studies assessed for eligibility (n = 36)
Studies excluded (n = 14)
Non-English (n = 1)
Wrong study design (n = 13)
Included
Studies included in review (n = 22)

Author, year	Study type	Assessed Parameters	Key findings
Araya 2020	In vivo	Fibrosis, cell infiltration CGRP, a-SMA	Inhibits fibrosis and inflammatory cell infiltration into synovial tissue in a rat arthritis model CGRP-positive fibres, a–SMA positive cells found to be lower in knees injected with pure PRP
Kanwat 2017	In vivo	Synovitis scores, synovial vascularity	Significantly lower mean synovitis scores and synovial vascularity compared controls at both 3 and 6 months in a guinea pig model
Choudhan 2019	In vivo	Synovitis score	Multiple injections achieve a lower synovitis score
Lee 2021	In vitro	IL-1b, TNF2a, IL-6, cyclooxygenase-2, microsomal prostaglandin E synthase21, MMP21, 23, and 213, disintegrin VIP	Reduces inflammatory cytokines (IL-1b, TNF2a, IL-6, cyclooxygenase-2, and microsomal prostaglandin E synthase21) and decreased matrix enzymes (MMP21, 23, and 213, disintegrin) Allogenic PRP raises anti-inflammatory cytokines (VIP)
Jo 2018	In vitro	IL-1b, IL-6, Cox-2, and mPGES-1 IL-4 and VIP	Induced inflammation in the absence of inflammation and ameliorated IL-1b induced inflammation

Table 1. Summary of studies examining anti-inflammatory mechanism

Author, year	Study type	Assessed Parameters	Key findings
Araya 2020	In vivo	OARSI scores Safranin-O Staining	OARSI scores for cartilage degeneration significantly lower in the pure allogenic PRP intervention Dyeability of articular cartilage via Safranin-O staining maintained past 14 days
Kanwat 2017	In vivo	OARSI scores	OARSI scores for cartilage degeneration significantly lower in the pure allogenic PRP intervention
Patel 2022	In vivo	Caspace-3 Collagen	Reduced mean IHC scores for Casapace-3 up to 6 months, better mean IHC score for collagen
Gilbertie 2018	In vitro	Synoviocyte proliferation HA production	Stimulate the proliferation of unstimulated synoviocytes, rescue the growth of synoviocytes stimulated by IL-1β or LPS Increases HA production in both naïve and inflamed synoviocytes
Wang 2022	In vivo	BMP-2 and Sox9 Bone redundancy Joint effusion	Activates BMP-2 and Sox9 expression Decreases bone redundancy, joint effusion Efficacy was inferior to autologous PRP

Table 2. Summary of studies examining cartilage degeneration

Author, year	Study type	Assessed Parameters	Key findings
Hilber 2017	In vitro	Tenocytes proliferation	Stimulates the proliferation of tenocytes in a dose-dependant manner Compensates for effect of prednisolones incubation
Vinod 2019	In vitro	CP cell viability Adipogenic, osteogenic, chondrogenic differentiation	Able to sustain CP cell viability Induce adipogenic, osteogenic ,chondrogenic lineage differentiation
Elder 2014	In vitro	Chondrogenesis TGF-β3	Allogenic PRP alone mildly stimulates chondrogenesis from marrow stromal cells, TGF-β3 greatly augments PRP's chondroinductive effect

Table 3. Summary of studies examining cell proliferation and differentiation

Knee					
Author, year	**Study type**	**N**	**Comparator**	**Assessed Parameters**	**Key findings**
Caiaffa 2021	Cohort	25	NA	WOMAC, KOOS, IKDC, VAS	Significant improvement between baseline and each follow-up (4,8,12 weeks and 6months)
Bottegoni 2016	Cohort	60	NA	KOOS, IKDC	Significant improvement between baseline and 2 month follow-up Significant deterioration from 2-month to the 6-month follow-up visit
El-Gohary	RCT	31	Non-intervention	WOMAC, VAS	Total WOMAC scores improved by 22% at 6 months Pain and functional scores improved by 25% and stiffness scores improved by 12% at 6 months
Zhu 2024	RCT	80	Saline	WOMAC	Significant improvement in all three WOMAC subscales at 3 months meeting MCID Improvement at 12 months did not meet MCID
Shoulder					
Author, year	**Study type**	**N**	**Comparator**	**Assessed Parameters**	**Key findings**
Jo 2017	Cohort	17	Autologous PRP	ASES,UCLA, DASH, SST, SPADI, reoperation, retear, VAS	Clinical parameters comparable at 24 months in patients with rotator cuff disease
Jo 2018	Cohort	17	Corticosteroid	ASES, Constant, UCLA, DASH, SST, SPADI, VAS	Clinical parameters comparable at 6 months in patients with rotator cuff disease
Jo 2020	RCT	60	Corticosteroid	DASH, overall function	DASH score, overall function, were significantly better in the PRP group than in the corticosteroid group at 6 months patients with rotator cuff disease Other clinical outcomes did not show significant differences
Lee 2021	Matched Cohort	30	NA	ASES, DASH, UCLA, SST, VAS	Clinical parameters comparable at 6 months in patients with adhesive capsulitis
El-Sherif 2023	RCT	60	Saline	SPADI, VAS	SPADI and VAS showed significant improvement at 8 weeks in patients with SIS

Table 4. Summary of studies examining PROMs

Functional Assessment					
Author, year	**Study type**	**N**	**Comparator**	**Assessed Parameters**	**Key findings**
El-Sherif 2023	RCT	60	Saline	RoM (Active flexion, active and passive internal rotation, extension)	RoM showed significant improvement at 8 weeks in patients with SIS
Jo 2018	Cohort	17	Corticosteroid	RoM (active forward flexion, abduction, external rotation, internal rotation) Strength (supraspinatus, infraspinatus, subscapularis)	No significant improvement in RoM and strength, comparable to corticosteroid in patients with rotator cuff disease
Jo 2020	RCT	60	Corticosteroid	RoM (external rotation)	External rotation was significantly better in the allogenic PRP group than in the corticosteroid group in patients with rotator cuff disease Effects onset being slower and longer-lasting till the 6 month mark
Imaging Modalities					
Author, year	**Study type**	**N**	**Comparator**	**Assessed Parameters**	**Key findings**
El-Gohary	RCT	31	Non-intervention	(Via ultrasonography) Effusion Femoral cartilage thickness	Effusion in knee OA improved by 30% at 6 months Femoral cartilage thickness by 22%
Zhu 2024	RCT	80	Saline	(Via MRI) Kellgren and Lawrence grade	No significant structural outcomes or Kellgren and Lawrence grades
El-Sherif 2023	RCT	60	Saline	(Via ultrasonography) Supraspinatus tendon thickness	Thickness of supraspinatus tendon is shown to have significant improvement

Table 5. Summary of studies examining clinician-reported outcomes measures

Author, year	Study type	N	Assessed Parameters	Key findings
Bottegoni 2016	Cohort	60	Discomfort, pain	Transitory intra-articular burning sensation immediately after the injection or mild articular pain for a few days were found in 9 patients (15%)
Caiaffa 2021	Cohort	25	Pain, oedema, walking difficulties	Acute and painful synovitis for a mean of 4 days. Local oedema and walking difficulties in 2 patients(8%) which resolved 7 days
El-Gohary	RCT	31	Pain, swelling, warmth	Post-injection pain in all patients in the intervention, lasting for 2.40 ± 0.83 hours. 1 patient reported significant pain knee swelling and warmth, which resolved within a week with cold fomentation and paracetamol. Immediate ultrasonography revealed increased effusion and vascularity.
El-Sherif 2023	RCT	60	NA	No major adverse events were reported.
Jo 2017	Cohort	17	NA	No major adverse events were reported
Jo 2018	Cohort	17	NA	No major adverse events were reported
Jo 2020	RCT	60	NA	No major adverse events were reported
Lee 2021	Matched Cohort	30	NA	No major adverse events were reported
Zhu 2024	RCT	80	(Via MRI) Kellgren and Lawrence grade	4 of 40 patients(10%) in allogenic PRP group experienced mild knee pain, swelling, and stiffness after injection that spontaneously resolved within 48 h.

Table 6. Summary of studies examining adverse outcomes