Augmentation of Meniscal Repair With Platelet-Rich Plasma

A Systematic Review of Comparative Studies

John W. Belk,*† BA, Matthew J. Kraeutler,‡ MD, Stephen G. Thon,† MD, Connor P. Littlefield,† BA, John H. Smith,† BA, and Eric C. McCarty,† MD

Investigation performed at Department of Orthopedics, University of Colorado School of Medicine, Aurora, Colorado, USA

Background: The effect of platelet-rich plasma (PRP) augmentation for meniscal repair (MR) is unclear, as current evidence is limited to small, mostly nonrandomized studies.

Purpose: To systematically review the literature to evaluate the efficacy and safety of MR with PRP augmentation.

Study Design: Systematic review; Level of evidence, 3.

Methods: A systematic review was performed by searching PubMed, the Cochrane Library, and Embase to identify studies (level of evidence 1-3) that compared the clinical efficacy of MR performed with versus without PRP. The search phrase used was *platelet-rich plasma meniscus.* Patients were assessed based on the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), the visual analog scale (VAS) for pain, the Lysholm score, the Knee injury and Osteoarthritis Outcome Score (KOOS), the subjective International Knee Documentation Committee (IKDC) score, and treatment failure.

Results: We identified 6 studies (2 studies with level 1 evidence; 4 studies with level 3 evidence) that met inclusion criteria, for a total of 309 patients undergoing MR with PRP (mean age, 31.9 years) and 445 patients without PRP augmentation (mean age, 29.6 years). The mean follow-up was 32.8 months (range, 12-72 months). Overall, 17.0% of PRP patients experienced MR failure compared with 22.1% of non-PRP patients. No differences in VAS, Lysholm, or subjective IKDC scores were found between groups except in 1 study, in which postoperative subjective IKDC scores were significantly better in the PRP group ($P < .01$). Another study found significantly better postoperative WOMAC scores among PRP patients, and 2 studies found significantly better KOOS subscores among PRP patients.

Conclusion: There are a limited number of high-quality studies comparing outcomes and healing rates between patients undergoing MR with versus without PRP augmentation. Based on the available evidence, patients undergoing MR with PRP augmentation experience similar clinical outcomes at midterm follow-up when compared with conventional MR, and additional studies are needed to determine the efficacy of MR augmented with PRP.

Keywords: meniscal repair; platelet-rich plasma; augmentation; knee

Meniscal tears are among the most common injuries in orthopaedics and are a leading cause of decreased knee function, because the menisci are responsible for providing joint stability and shock absorption and help to prevent articular cartilage degeneration.[25] It has been estimated that nearly 4 million arthroscopies are performed worldwide each year for meniscal conditions.[18] The loss of meniscal tissue due to injury, surgery, or degenerative processes can substantially alter the biomechanics of the knee and cause considerable limitations in load distribution and joint lubrication.[3,41,46,53] One treatment option for the injured meniscus is partial or total meniscectomy, although multiple studies have demonstrated that decreased meniscal tissue leads to increased contact stresses in the knee.[4,8,29] As a result, there has been a recent shift to limit meniscectomies and perform meniscal repair (MR) whenever indicated, with more than an 11% increase in the incidence of MR in recent years.[1]

Recent efforts to enhance the success of MR during surgery include the addition of platelet-rich plasma (PRP).[11,29,31,35] PRP has been widely used to treat tendon-, muscle-, ligament-, and cartilage-based conditions,[28,39] although its effect in the context of meniscal injuries is not well documented. Despite this, the clinical efficacy of MR with PRP augmentation has recently gained significant attention as a viable treatment option in the orthopaedic

The Orthopaedic Journal of Sports Medicine, 8(6), 2325967120926145
DOI: 10.1177/2325967120926145

sports medicine community,[21,33,42,47] even though its clinical indications remain unclear.[9,52] The purpose of this study was to systematically review the literature in an effort to compare the efficacy of MR with and without PRP. We hypothesized that there would be no difference in clinical outcomes between patients undergoing MR with versus without PRP augmentation.

METHODS

This systematic review was conducted according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines through use of a PRISMA checklist. Two independent reviewers (J.W.B., J.H.S.) searched the PubMed, Embase, and Cochrane Library databases up to October 26, 2019. The electronic search phrase used was *platelet-rich plasma meniscus*. A total of 190 studies were reviewed by title and/or abstract to determine study eligibility based on inclusion criteria. In cases of disagreement, a third reviewer (S.G.T.) made the final decision. The inclusion criteria were nonoverlapping, comparative studies that assessed the use of PRP augmentation for MR, studies that were published in English, and studies with a minimum 12-month follow-up. Exclusion criteria included nonhuman studies, noncomparative studies, studies that focused on procedures other than MR, and studies unrelated to the knee.

We identified 6 studies[15,19,24,36,38,50] that met inclusion criteria (Figure 1). Data extraction from each study was performed independently and then reviewed by a second author (J.W.B.). No funding or third party was needed to obtain any of the collected data. Risk of bias for 2 randomized studies[36,38] was assessed according to the Cochrane Collaboration risk of bias tool,[27] which incorporates an assessment of randomization, blinding, completeness of outcome data, selection of outcomes reported, and other sources of bias. For the remaining 4 nonrandomized studies,[15,19,24,50] risk of bias was assessed according to the Risk Of Bias In Non-Randomized Studies–of Interventions (ROBINS-I) risk of bias tool,[54] which incorporates an assessment of bias due to confounding, selection of participants, deviations from intended interventions, completeness of outcome data, selection of outcomes reported, and other sources of bias. A Cohen kappa score was calculated to determine the level of intraobserver agreement between reviewers. A score of less than 0.20 indicates poor agreement; 0.21-0.40, fair agreement; 0.41-0.60, moderate agreement; 0.61-0.80, good agreement; 0.81-1.00, very good agreement.[44]

Reporting Outcomes

Outcomes assessed included patient-reported outcomes (PROs) and reintervention. PRO measures included the visual analog scale (VAS) for pain, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC),[5] the subjective International Knee Documentation Committee (IKDC) score,[26] the Knee injury and Osteoarthritis Outcome Score (KOOS),[51] and the Lysholm score.[43] We noted that 3 studies[15,36,38] used the VAS, 2 studies[36,38] used the WOMAC score, 3 studies[24,36,38] used the subjective IKDC score, 3 studies[36,38,50] used the KOOS scale, and 2 studies[15,24] used the Lysholm score. All 6 studies reported on treatment failure rates.

Study Methodologic Assessment

The Modified Coleman Methodology Score (MCMS)[13] was used to evaluate study methodologic quality. The MCMS has a scaled potential score ranging from 0 to 100. Scores of 85-100 are excellent, 70-84 are good, 55-69 are fair, and less than 55 are poor.

Statistical Analysis

A weighted average was calculated for numerical demographics (age, follow-up). Weighted averages were calculated for VAS, Lysholm, WOMAC, KOOS, and subjective IKDC scores.

RESULTS

The 6 studies that met inclusion criteria included a total of 754 patients (PRP, n = 309; non-PRP, n = 445). The mean patient age at the time of surgery was 31.9 and 29.6 years in the PRP and non-PRP groups, respectively, and the mean follow-up time overall was 32.8 months (range, 12-72 months). The overall percentage of males was 62.8% and 64.4% in the PRP and non-PRP groups, respectively (Table 1).

PRP Preparation

All patients underwent harvest of peripheral venous blood, which was then centrifuged to isolate red blood cells from the upper plasma layer. The upper plasma layer was carefully collected through use of a serological pipette and placed into a new centrifuge tube or set aside for injection. In 3 studies,[15,36,38] the remaining upper plasma layer was centrifuged again to separate platelet-poor plasma from PRP. The contents were validated by use of an enzyme-

*Address correspondence to John W. Belk, BA, University of Colorado School of Medicine, Department of Orthopedics, 13001 E 17th Pl, Aurora, CO 80045, USA (email: wilson.belk716@gmail.com).
†University of Colorado School of Medicine, Department of Orthopedics, Aurora, Colorado, USA.
‡St Joseph's University Medical Center, Department of Orthopaedic Surgery, Paterson, New Jersey, USA.
Final revision submitted February 6, 2020; accepted February 19, 2020.
One or more of the authors has declared the following potential conflicts of interest or source of funding: S.G.T. has received educational support from Quest Medical. E.C.M. has received research support from Arthrex, Biomet, Breg, Mitek, Ossur, Smith & Nephew, and Stryker; consulting fees from Zimmer Biomet; and royalties from Elsevier and Zimmer Biomet. AOSSM checks author disclosures against the Open Payments Database (OPD). AOSSM has not conducted an independent investigation on the OPD and disclaims any liability or responsibility relating thereto.

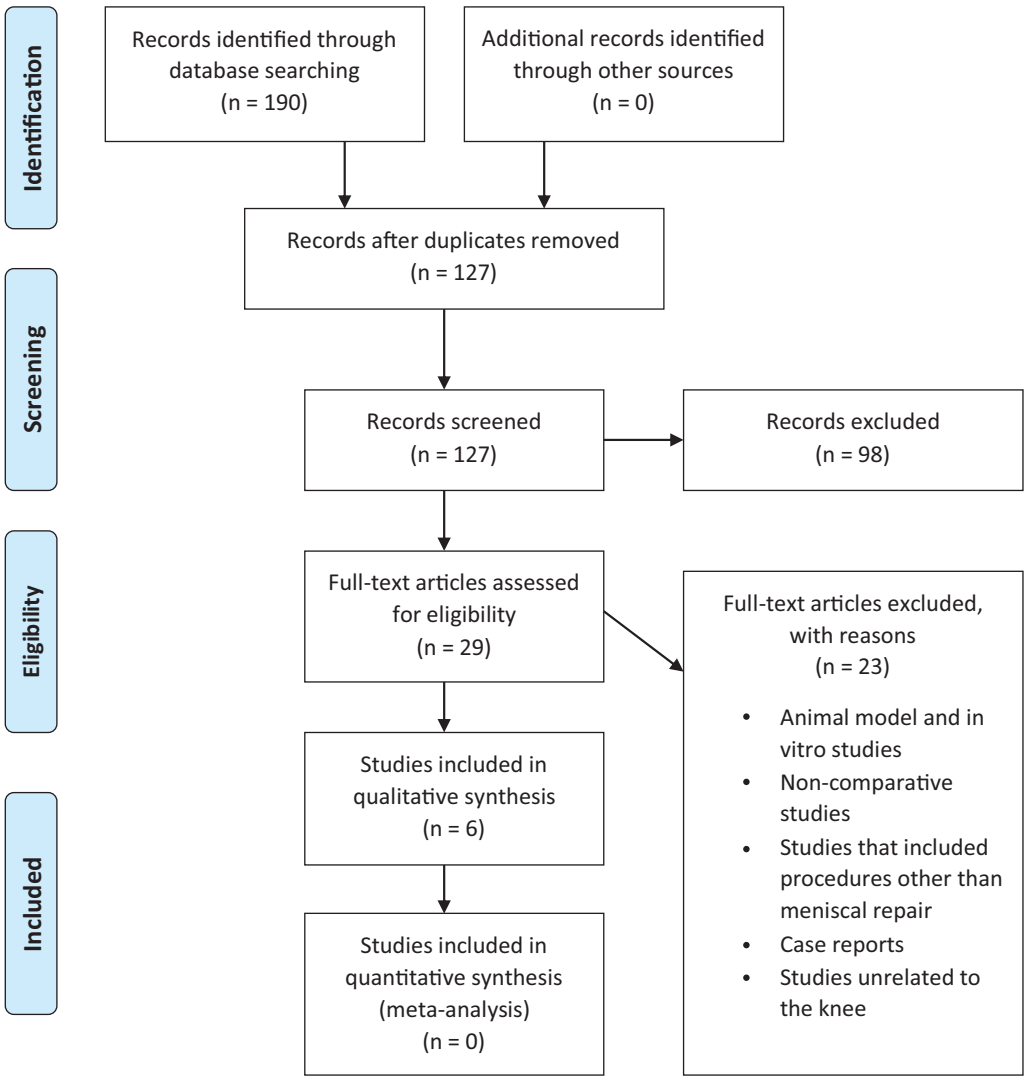

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram.

linked immunosorbent assay and a blood analyzer. In all studies,[15,19,24,36,38,50] the investigators activated the PRP sample by adding calcium chloride through low-level ultraviolet irradiation, and then a 4- to 8-mL sample was used for intrameniscal injection at the repair site.

PRP Leukocyte Content

There were 5 studies[15,19,24,36,38] that used leukocyte-rich PRP; 1 study[50] did not report whether leukocyte-rich or leukocyte-poor PRP was used.

Surgical Technique

In 2 studies,[15,24] the investigators described using an inside-out technique for MR; 1 study[36] described using either an all-inside technique or, in the case of meniscal body repairs, an outside-in technique; 1 study[19] described using either an all-inside or inside-out technique; and 2 studies[38,50] did not describe which technique was used for MR. The MR was performed arthroscopically in all studies.[15,19,24,36,38,50] Once the tear pattern was confirmed, the torn margin of the meniscus and the adjacent synovium were abraded with a rasp and/or shaver to improve vascular supply to the lesion. For inside-out lateral MRs, a posterolateral approach was used, in which an incision was made parallel and just posterior to the lateral collateral ligament. For medial meniscal tears, a posteromedial approach was used, in which an incision was made from the adductor tubercle to the posterior aspect of the tibial plateau. Regardless of tear location, a meniscal retractor was then positioned to aid in the retrieval of sutures and to help protect the neurovascular structures posterior to the joint. A self-delivery gun fitted with a cannula was used to pass double-loaded nonabsorbable sutures into the meniscus, and 4 to 12 sutures were placed 3 to 6 mm apart in a vertical fashion to allow for greater capture of the strong circumferential fibers of the meniscus.

TABLE 1
Studies Included[a]

Lead Author (Year)	Level of Evidence	No. of Patients		Patient Age, y		Patient Sex, % Male		Follow-up, mo
		PRP	Non-PRP	PRP	Non-PRP	PRP	Non-PRP	
Dai (2019)[15]	3	14	15	32.4 (13-52)	30.3 (14-50)	42.9	33.3	20.6 (12-27)
Everhart (2019)[19]	3	203	347	30.0 (NR)	28.1 (NR)	63.5	63.1	36.0 (NR)
Griffin (2015)[24]	3	15	20	26.0 (19-46)	35.0 (19-68)	73.3	85.0	48.0 (24-72)
Kaminski (2018)[36]	1	18	17	30.0 (18-43)	26.0 (19-44)	78.9	83.3	42.0 (45-69)
Kaminski (2019)[38]	1	42	29	44.0 (18-67)	46.0 (27-68)	52.4	63.3	12.0 (12-36)
Pujol (2015)[50]	3	17	17	32.3 (13-40)	28.3 (13-40)	64.7	76.5	32.2 (24-40)
Total	—	309	445	31.9	29.6	62.8	64.4	32.8

[a]Patient age and follow-up are reported as mean (range), and the "Total" row is reported as a weighted mean. NR, not reported; PRP, platelet-rich plasma.

TABLE 2
Modified Coleman Methodology Score (MCMS)

Lead Author (Year)	MCMS
Dai (2019)[15]	65
Everhart (2019)[19]	69
Griffin (2015)[24]	66
Kaminski (2018)[36]	77
Kaminski (2019)[38]	84
Pujol (2015)[50]	63
Total, mean ± SD	70.7 ± 8.2

All studies[15,19,24,36,38,50] described the process of PRP augmentation similarly. After repair, the tear site was injected with 4 to 8 mL of PRP under arthroscopic visualization. The previously placed meniscal sutures were loosened to increase the contact area between PRP and the lesion. After the PRP gel clot was formed on the lesion, the knee was taken to 90° of flexion, and the sutures were fastened down and tied.

Tear Type

Investigators in 3 studies[19,24,50] did not limit patients based on type of meniscal tear. Further, 1 study[15] included only patients with discoid lateral tears, another study[36] included only patients with vertical bucket-handle tears, and a third study[38] included only patients with horizontal tears.

Modified Coleman Methodology Score

Table 2 shows the MCMS scores from the 6 included studies; 2 studies[36,38] received good scores and 4 studies[15,19,24,50] received fair scores.

Demographics

The authors of 1 study[24] reported a significant difference in age between the PRP and non-PRP groups, in which PRP patients were significantly younger ($P < .05$), and the same study reported a significant difference in body mass index (BMI) between groups, in which PRP patients had a significantly lower BMI ($P < .05$). All studies reported no differences in sex, 5 studies[15,19,36,38,50] reported no differences in age, and 3 studies[19,38,50] reported no significant differences in BMI between groups. All 3 studies[19,38,50] that analyzed tear location found no significant difference in the location of the meniscal tear (medial vs lateral) between groups, and 2 studies[36,50] found no significant difference in the time interval from injury to operation between groups. One study[38] reported no significant difference in osteoarthritis grades between groups using the Kellgren-Lawrence scale. There were 5 studies[15,24,36,38,50] that excluded patients who were undergoing surgery for concurrent ligament injuries, and 4 studies[15,36,38,50] excluded patients with concomitant chondral injuries.

Methodologic Quality Assessment

Figure 2 presents the results of the methodologic quality assessment of the 4 nonrandomized studies[15,19,24,50] using the ROBINS-I risk of bias tool. All 4 studies showed a moderate risk of bias due to confounding, as there were no prognostic variables that predicted baseline intervention and no patients who switched between interventions during the study period. No studies excluded eligible patients or used variable follow-up times based on intervention (low risk of bias), no studies deviated from the intended intervention (low risk of bias), and all studies clearly classified treatment type (low risk of bias). We noted that 2 studies[15,50] using blinded outcome assessors showed no systematic differences in the care provided between treatment groups (low risk of bias), whereas 2 studies[19,24] used nonblinded but identical postoperative protocols (moderate risk of bias). No studies showed bias due to missing data (low risk of bias). Further, 2 studies[15,50] demonstrated low risk of bias in measurement of outcomes through use of blinded outcome assessors, whereas 2 studies[19,24] used physicians not blinded to treatment group (serious risk of bias). Finally, no studies showed bias due to selective reporting (low risk of bias). A Cohen kappa score of 0.84 reflected very good agreement between reviewers.

Figure 2. Risk of bias graph. Risk of bias is presented as a percentage across all included studies (green, low risk; yellow, unclear; red, high risk).

TABLE 3
Treatment Failure Rates[a]

Lead Author (Year)	PRP	Non-PRP	Total	*P*
Dai (2019)[15]	1/14 (7.1)	2/15 (13.3)	3/29 (10.3)	.58
Everhart (2019)[19]	24/164 (14.6)	50/294 (17.0)	74/458 (16.2)	.51
Griffin (2015)[24]	4/15 (26.7)	5/20 (25.0)	9/35 (25.7)	.91
Kaminski (2018)[36]	3/18 (15.8)	9/17 (50.0)	12/35 (32.4)	.02
Kaminski (2019)[38]	13/42 (31.0)	19/30 (63.3)	32/72 (44.4)	.01
Pujol (2015)[50]	1/17 (5.8)	2/17 (11.8)	3/34 (8.8)	.54
Total	46/270 (17.0)	87/393 (22.1)	133/663 (20.0)	—

[a]Failures are reported as number of failures/total number of patients (%). PRP, platelet-rich plasma.

The remaining 2 randomized studies[36,38] were assessed for methodologic quality by use of the Cochrane Collaboration risk of bias tool. Sequence generation and allocation were adequately reported by both studies (low risk of bias), and both studies were deemed to be at low risk for detection bias because of the blinding of the outcome assessor. Patients in both studies were blinded to their intervention group (low risk of bias). Neither study reported significant loss of follow-up (low risk of bias), and neither study was deemed to be at risk of bias for selective reporting or incomplete outcome data (low risk of bias).

Treatment Failure

In 4 studies,[15,19,24,50] the investigators defined treatment failure as the need for a reoperation. In 2 studies,[36,38] treatment failure was defined as no visible healing during a second-look arthroscopy or less than 50% healing of the tear width versus an unstable repair on magnetic resonance imaging review. Overall, 20.0% of patients experienced treatment failure, including 17.0% in the PRP group and 22.1% in the non-PRP group (Table 3). When specifically evaluating meniscal tears in the red-white zone, 1 study[36] found that at the 18-week follow-up, 3 of 18 patients (16.7%) in the PRP group experienced treatment failure compared with 9 of 17 patients (52.9%) in the non-PRP group ($P = .02$). In 5 studies,[15,19,24,38,50] treatment failures were not stratified by meniscal tear zone.

Patient-Reported Outcomes

The VAS score was used in 3 studies,[15,36,38] none of which found significant differences in scores at latest follow-up between groups (Table 4). The Lysholm score was reported in 2 studies,[15,24] neither of which found significant differences in scores at latest follow-up between groups (Table 5). The subjective IKDC score was used in 3 studies[24,36,38]; 1 study[36] found significantly better scores at latest follow-up in the PRP group ($P < .01$) (Table 6). The authors of 2 studies[36,38] reported using the WOMAC score. Of these, 1 study[36] found significantly better scores at latest follow-up in the PRP group ($P < .01$) (Table 7). Finally, 3 studies[36,38,50] reported using the KOOS. Of these, 1 study[36] found significantly better scores in every KOOS subcategory in the PRP group ($P < .05$). Another study[50] found significantly better scores in the Pain and Sport subcategories in the PRP group ($P < .05$) (Table 8).

DISCUSSION

This systematic review points to an overall lack of high-quality studies on the topic of MR with PRP augmentation.

TABLE 4
Visual Analog Scale Scores[a]

	PRP		Non-PRP		
Lead Author (Year)	Preoperative	Postoperative	Preoperative	Postoperative	*P* Value
Dai (2019)[15]	4.1 ± 1.0	1.2 ± 1.0	3.4 ± 1.3	1.6 ± 1.1	.32
Kaminski (2018)[36]	6.2 ± 0.1	0.8 ± 0.1	5.1 ± 0.1	0.9 ± 0.1	.15
Kaminski (2019)[38]	5.4 ± 0.1	2.0 ± 0.1	4.4 ± 0.1	2.1 ± 0.1	.39
Total	5.4	1.5	4.4	1.6	—

[a]Scores are reported as a mean ± SD at latest follow-up. The "Total" row is reported as a weighted mean. The *P* values are based on a comparison of postoperative scores between groups. PRP, platelet-rich plasma.

TABLE 5
Lysholm Scores[a]

	PRP		Non-PRP		
Lead Author (Year)	Preoperative	Postoperative	Preoperative	Postoperative	*P* Value
Dai (2019)[15]	53.3 ± 12.7	79.8 ± 9.6	55.0 ± 9.3	74.6 ± 11.6	.31
Griffin (2015)[24]	NR	66.0 ± 31.9	NR	89.0 ± 9.7	.07
Total	53.3	72.7	55.0	82.8	—

[a]Scores are reported as a mean ± SD (if available) at latest follow-up. The "Total" row is reported as a weighted mean. The *P* values are based on a comparison of postoperative scores between groups. NR, not reported; PRP, platelet-rich plasma.

TABLE 6
Subjective International Knee Documentation Committee Scores[a]

	PRP		Non-PRP		
Lead Author (Year)	Preoperative	Postoperative	Preoperative	Postoperative	*P* Value
Griffin (2015)[24]	NR	69.0 ± 26.0	NR	76.0 ± 17.0	.29
Kaminski (2018)[36]	40.9 ± 0.9	97.6 ± 0.6	41.7 ± 0.8	84.8 ± 0.9	<.01
Kaminski (2019)[38]	51.2 ± 0.3	86.0 ± 0.5	54.9 ± 0.5	88.1 ± 0.9	.36
Total	48.0	85.4	50.0	83.7	—

[a]Scores are reported as a mean ± SD (if available) at latest follow-up. The "Total" row is reported as a weighted mean. The *P* values are based on a comparison of postoperative scores between groups. NR, not reported; PRP, platelet-rich plasma.

TABLE 7
Western Ontario and McMaster Universities Osteoarthritis Index Total Score[a]

	PRP		Non-PRP		
Lead Author (Year)	Preoperative	Postoperative	Preoperative	Postoperative	*P* Value
Kaminski (2018)[36]	32.3 ± 0.9	1.0 ± 0.1	41.7 ± 0.8	4.0 ± 0.3	<.01
Kaminski (2019)[38]	34.4 ± 0.4	9.7 ± 0.3	28.9 ± 0.6	7.5 ± 0.6	.21
Total	33.7	7.0	33.7	6.2	—

[a]Scores are reported as mean ± SD (if available) at latest follow-up. The "Total" row is reported as a weighted mean. PRP, platelet-rich plasma.

Of all clinical outcomes assessed in this systematic review, none demonstrated superiority in the non-PRP group. The existing evidence, although limited, suggests that patients undergoing MR with PRP augmentation may experience slightly improved clinical outcomes and healing rates when compared with conventional MR.

The prevalence of meniscal injuries continues to increase due to the increasing life expectancy and physical activity

TABLE 8
Knee injury and Osteoarthritis Outcome Score (KOOS)[a]

Lead Author (Year)	KOOS Subscales									
	Symptoms		Pain		ADL		Sport		QOL	
	PRP	Non-PRP	PRP	Non-PRP	PRP	Non-PRP	PRP	Non-PRP	PRP	Non-PRP
Kaminski (2018)[36]	96.2 ± 0.3[b]	92.3 ± 0.5[b]	96.1 ± 0.2[b]	92.9 ± 0.4[b]	98.2 ± 0.1[b]	95.1 ± 0.4[b]	89.4 ± 0.9[b]	77.7 ± 1.3[b]	80.9 ± 1.1[b]	66.2 ± 1.2[b]
Kaminski (2019)[38]	92.0 ± 0.3	90.4 ± 0.6	87.2 ± 0.4	89.0 ± 0.6	89.4 ± 0.4	92.4 ± 0.6	69.5 ± 0.8	79.0 ± 1.1	67.1 ± 0.6	68.2 ± 1.1
Pujol (2015)[50]	90.9	86.1	93.3[b]	78.4[b]	97.2	93.8	88.8[b]	74.4[b]	78.3	74.6
Total	92.8	89.8	90.7	87.3	93.2	93.5	78.6	77.4	72.9	69.3

[a]Scores are reported as mean ± SD (if available) at latest follow-up. The "Total" row is reported as a weighted mean. ADL, Activities of Daily Living; PRP, platelet-rich plasma; QOL, Quality of Life.
[b]$P < .05$.

of the population.[18] As a result, biologic augmentation techniques including PRP have gained significant interest as viable treatment options to enhance repair healing following MR. Due to limited evidence, the efficacy of PRP in the context of MR remains a topic of controversy. Multiple studies have attributed improved outcomes with PRP to its autologous makeup, high concentration of growth factors, and ability to promote angiogenesis and soft tissue healing,[12,33,55] although many studies have demonstrated MR without biologic augmentation to be just as effective.[15,22,24,48]

In the current review, 2 studies[36,38] found PRP patients to experience significantly decreased rates of treatment failure compared with non-PRP patients. Overall, there was a 5.1% decrease in the incidence of treatment failure for PRP patients compared with non-PRP patients. Additionally, all PROs that showed a significant difference between groups favored the PRP group.

The influence of PRP on joint homeostasis is multifaceted. Studies have shown that PRP can decrease catabolism while simultaneously increasing anabolic activity, and it has been previously demonstrated that catabolic activity in human meniscal tissue plays a significant role in the progression of osteoarthritis.[10,40] Furthermore, increased production of type II collagen, matrix molecules, and prostaglandins has been observed in hyaline cartilage following treatment with PRP,[17,49] and other processes such as chondral remodeling and soft tissue healing can be accelerated with the introduction of PRP to the injury site both in vivo and in vitro.[32,34]

When used to augment MR, PRP involves the modulation of the meniscal environment by introducing autologous blood products into the targeted tissue, which can lead to reduced inflammatory distress and promote chondrogenesis.[6,15,20] By supplying the injury site with a wide range of growth factors such as platelet-derived growth factor, vascular endothelial growth factor, and transforming growth factor β1, PRP promotes chemotaxis, angiogenesis, and collagen matrix synthesis and can help provide a scaffold for migrating cells.[2,23,34] Multiple studies have demonstrated the antinociceptive and cell proliferative properties of PRP to successfully increase extracellular matrix production and enhance meniscal tissue regeneration in vitro.[7,32,33,45] Additionally, PRP has been shown to significantly increase meniscal cell viability and compression resistance through the elevated mRNA expression of various proteoglycans in several animal studies.[14,30,33] This may explain the improved outcomes of PRP augmentation in some of the studies included in this review. Previous studies[16,37] have compared the efficacy of isolated MR versus other biologic augmentation techniques, such as MR augmented with a bone marrow venting (BMV) procedure (ie, microfracture of the lateral intercondylar notch), and have demonstrated significantly improved meniscal healing rates and improved PROs in the BMV group at short-term and midterm follow-up, respectively.

The strengths of the current study include a comprehensive systematic review performed by 2 independent reviewers. This is also the first systematic review to evaluate the efficacy of PRP augmentation for MR. The limitations of this study should be noted. In particular, only 6 studies were included in this review, of which only 2 studies provided level 1 evidence. No additional search phrases were used other than what is described in the Methods section, and other than the 3 search engines used, no additional reference lists were searched to identify eligible studies. MR and PRP preparation techniques were not identical across all studies, making direct comparison difficult. One study did not report the PRP composition used, and not all studies used the same PROs, thereby preventing us from performing a meta-analysis. Finally, the included studies varied in the type of meniscal tears treated, the definition of treatment failure, patient distribution, and follow-up times.

CONCLUSION

A limited number of high-quality studies are available comparing outcomes and healing rates between patients undergoing MR with PRP augmentation versus without PRP augmentation. The available evidence indicates that patients undergoing MR with PRP augmentation experience similar clinical outcomes at midterm follow-up compared with conventional MR, and additional studies are needed to determine the efficacy of MR augmented with PRP.

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