Outcomes of Meniscus Tears Treated with Platelet-Rich Plasma: A Systematic Review and Meta-Analysis

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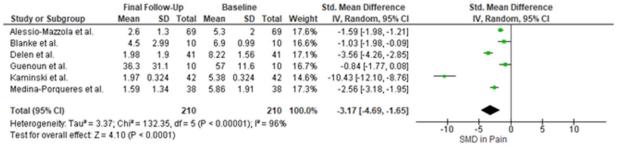
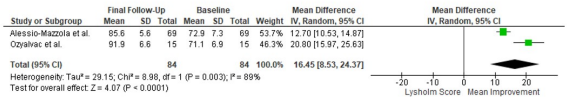
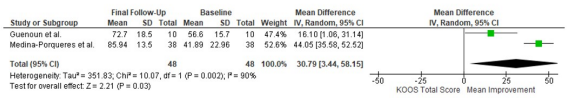
INTRODUCTION: Meniscus tears are a common knee pathology that can result in altered biomechanics, functional impairment, and pain. First-line treatment involves nonsurgical treatment including rest, anti-inflammatory medications, and physical therapy. In patients with symptoms refractory to conservative treatment, meniscus repair versus debridement may be an option to alleviate the persistent symptoms and disability. Orthobiologics are rapidly increasing in popularity, with numerous investigations reporting favorable outcomes of meniscus repair augmented with platelet-rich plasma (PRP). However, outcomes following PRP injections in meniscus tears treated nonsurgically have not been well investigated. The purpose of this systematic review and meta-analysis was to evaluate the current literature regarding outcomes of PRP injections for patients with meniscus tears. We hypothesize that PRP treatment for meniscus tears would result in significant improvement in patient-reported outcome measures and pain, with a low rate of complications.
METHODS: A literature search was performed according to the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines using keywords and Boolean operators in SCOPUS, PubMed, Medline, and the Cochrane Central Register for Controlled Trials. Inclusion criteria were limited to level I-IV human studies reporting on clinical and radiological outcomes of meniscus tears treated nonsurgically with PRP. Exclusion criteria included case reports, biomechanical studies, epidemiological and database studies, studies reporting patients undergoing surgical treatment, studies with patients under the age of 18, studies with overlapping patient data sets, and studies using other orthobiologic treatments such as hyaluronic acid, bone marrow aspirate concentrate, or mesenchymal stem cells. Title and abstract screening, followed by a full-text review, were performed by two independent authors (V.G. and A.K.B), with a third author (D.M.K.) consulted to discuss and resolve any disagreements. Study information and patient demographics were extracted and analyzed. Pain and patient-reported outcome measures were analyzed through random-effect models with 95% confidence intervals.
RESULTS:
The initial search identified 610 articles, with 253 remaining following removal of duplicates. Following title and abstract screening, 12 articles remained, of which 5 were removed following full-text review. A total of 7 studies consisting of 225 patients were identified. The mean patient age was 46.1 ± 7.7 years, with 64% (n=143/225) of patient being female. The right knee (55.7%, n=73/131) was more commonly treated than the left, while the medial meniscus (95.7%, n=157/164) was treated in the vast majority of patients. Mean follow up was 10.9 ± 10.4 months. Meniscus tears were described as chronic, degenerative, or intrasubstance. Three studies administered one PRP injection, three studies administered three injections (one week apart), and one study administered four injections (one week apart). Rehabilitation typically included weight-bearing as tolerated, physical therapy, and a gradual increase in activity and exercise.
Magnetic resonance imaging (MRI) revealed improvement in meniscus grade or partial/complete healing of the meniscus in 50.9% (n=29/57) of patients. Six studies reported improvement in pain, with a standardized mean difference of -3.17 (95% CI; -4.69, -1.65). Random effects models demonstrated significant improvement from baseline to final follow up in Lysholm score (16.45, p<.0001) and KOOS total score (30.79, p=.03), but no significant improvement in Tegner score (0.45, p=.37). Successful return to sport was reported in 75% (n=12/16) of patients, with 90.7% (n=97/107) of patients reported to be either very satisfied or satisfied following treatment. Complications were reported in 0% (n=0/169), while 1.7% of (4/225) patients required surgical management for persistent knee pain.
DISCUSSION AND CONCLUSION: The most important conclusions from this systematic review and meta-analysis are that at short-term follow up, the use of PRP for the treatment of meniscus tears led to radiologic improvement in 50.9% of patients, with significant improvements in pain, Lysholm, and total KOOS scores. The use of PRP injections led to overall high patient satisfaction with no major complications. The major limitations of this study are the small patient sample size, short-term follow up, and lack of comparative control group. The mediocre radiological outcomes despite the significant improvements in pain and clinical outcomes may forecast the limited long-term durability of PRP injections for meniscus tears. As such, further high-level studies at long-term follow up are necessary to establish PRP injections for meniscus tears as an effective option.


Final Follow-Up
Baseline
Std. Mean Difference
Std. Mean Difference
Study or Subgroup Mean SD Total Mean SD Total Weight IV, Random, 95% CI
IV, Random, 95% CI
Alessio-Mazzola et al. 2.6 1.3 69 5.3 2 69 17.6% -1.59 [-1.98, -1.21]
Blanke et al. 4.5 2.99 10 6.9 0.99 10 16.6% -1.03 [-1.98, -0.09]
Delen et al. 1.98 1.9 41 8.22 1.56 41 17.1% -3.56 [-4.26, -2.85]
Guenoun et al. 36.3 31.1 10 57 11.6 10 16.7% -0.84 [-1.77, 0.08]
Kaminski et al. 1.97 0.324 42 5.38 0.324 42 14.6% -10.43 [-12.10, -8.76]
Medina-Porqueres et al. 1.59 1.34 38 5.86 1.91 38 17.3% -2.56 [-3.18, -1.95]
Total (95% CI) 210 210 100.0% -3.17 [-4.69, -1.65]
Heterogeneity: Tau² = 3.37; Chi² = 132.35, df = 5 (P < 0.00001); I² = 96%
Test for overall effect: Z = 4.10 (P < 0.0001)
-10 -5 0 5 10
SMD in Pain

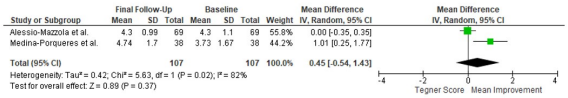
A


Final Follow-Up
Baseline
Mean Difference
Mean Difference
Study or Subgroup Mean SD Total Mean SD Total Weight IV, Random, 95% CI
IV, Random, 95% CI
Alessio-Mazzola et al. 85.6 5.6 69 72.9 7.3 69 53.7% 12.70 [10.53, 14.87]
Ozyalvac et al. 91.9 6.6 15 71.1 6.9 15 46.3% 20.80 [15.97, 25.63]
Total (95% CI) 84 84 100.0% 16.45 [8.53, 24.37]
Heterogeneity: Tau² = 29.15; Chi² = 8.98, df = 1 (P = 0.003); I² = 89%
Test for overall effect: Z = 4.07 (P < 0.0001)
-20 -10 0 10 20
Lysholm Score Mean Improvement

B


Final Follow-Up
Baseline
Mean Difference
Mean Difference
Study or Subgroup Mean SD Total Mean SD Total Weight IV, Random, 95% CI
IV, Random, 95% CI
Guenoun et al. 72.7 18.5 10 56.6 15.7 10 47.4% 16.10 [1.06, 31.14]
Medina-Porqueres et al. 85.94 13.5 38 41.89 22.96 38 52.6% 44.05 [35.58, 52.52]
Total (95% CI) 48 48 100.0% 30.79 [3.44, 58.15]
Heterogeneity: Tau² = 351.83; Chi² = 10.07, df = 1 (P = 0.002); I² = 90%
Test for overall effect: Z = 2.21 (P = 0.03)
-50 -25 0 25 50
KOOS Total Score Mean Improvement

C


Final Follow-Up
Baseline
Mean Difference
Mean Difference
Study or Subgroup Mean SD Total Mean SD Total Weight IV, Random, 95% CI
IV, Random, 95% CI
Alessio-Mazzola et al. 4.3 0.99 69 4.3 1.1 69 55.8% 0.00 [-0.35, 0.35]
Medina-Porqueres et al. 4.74 1.7 38 3.73 1.67 38 44.2% 1.01 [0.25, 1.77]
Total (95% CI) 107 107 100.0% 0.45 [-0.54, 1.43]
Heterogeneity: Tau² = 0.42; Chi² = 5.63, df = 1 (P = 0.02); I² = 82%
Test for overall effect: Z = 0.89 (P = 0.37)
-4 -2 0 2 4
Tegner Score Mean Improvement