

Unveiling the Clinical Response to Platelet-Rich Plasma in Knee Osteoarthritis

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Purpose: Leukocyte-poor platelet-rich-plasma (LP-PRP) is an autologous biologic that decreases pain in knee osteoarthritis (KOA). Current PRP literature lacks power to drive clinical decisions, due to poor preparation standardization and mechanistic uncertainty. This study identifies demographic factors and molecular components of LP-PRP that influence better PROMIS Pain and Function outcomes.

Methods: This retrospective cohort study used de-identified data from 45 patients ages 30 - 85 with KOA (KL grades I - IV) and symptomatic knee pain treated with a single, intra-articular PRP injection. Of the 45 patients, there were 58 cases (n=58 knees), 34 of which had adequate PRP for molecular analysis. 13 patients bilateral injections (n=26 knees), 32 were unilateral. There were 18 cases with PROMIS Pain and Function scores collected at baseline and 3-months following LP-PRP. The delta change between baseline and 3-month PROMIS Pain and Function scores were calculated with an MCID threshold of 10-points, those with 10% difference from baseline were defined as responders. Multiplex Human XL Cytokine 46-plex Luminex assay measured protein concentrations. For each injection, blood from patient's arm was spun down in a centrifuge, LP-PRP was injected into the supralateral aspect of knee. Statistics performed using Wilcoxon-Ranked Test and t-test. $P < 0.05$ determined significance.

Results: Of the 58 cases, 27 had OA grades I-II, and 31 had III-IV. BMI ranged from 17 to 42 (mean 26.8). 38 cases reported chronic injuries, while 16 were acute. Of the 18 patients with follow-up scores, there was a significant difference in PROMIS Pain between baseline and 3-months post LP-PRP (baseline: 55.0 ± 6.3 , 3-month: 61.6 ± 7.2 , $p < 0.05$). Of completed cases, 8 subjects were positive responders at 3-months post LP-PRP compared to baseline (mean: $12.9\% \pm 8.4$), while 2 subjects responded negatively (mean: $-6.7\% \pm 5.2$). Molecular factors were detectable in 8 positive and 2 negative responders, there was a significant increase in GCSF (mean = 37.8 ± 9.48 , $p = 0.03$), IL-12 (mean = 24.5 ± 11.3 , $p = 0.03$), and IL-1b (mean = 4.5 ± 1.55 , $p = 0.004$) compared to non-responders. GCSF positively correlated with RANTES ($\rho = 0.71$) and PDGF AB/BB ($\rho = 0.74$). IL-1b positively correlated with IL-13 ($\rho = 0.77$).

Conclusions: Key findings were a significant reduction in PROMIS Pain following LP-PRP and the significant increase in GCSF, IL-1b, and IL-12 in positive responders. Further investigation can determine the association between these markers in KOA. Limitations include donor heterogeneity and limited follow-up. Analysis of the responder LP-PRP will further personalize and improve KOA treatment efficacy.