Unveiling the Clinical Response to Platelet-Rich Plasma in Knee Osteoarthritis: A Preliminary Analysis

Orthopedics
Anschutz Medical Campus
University of Colorado

Evangelia P. Constantine,[1] Qian He[1], Kaitlyn E.Whitney,[1] Ruth McCarrick-Walmsley,[1] Veronica Butler,[1] Kyle Williams,[1] Sydney Fry,[1] Jason Dragoo, MD[1,2*]

[1]University of Colorado School of Medicine, Anschutz Medical Campus, Department of Orthopedics, Aurora, CO
[2]UCHealth Steadman Hawkins Clinic, Denver, CO

Steadman Hawkins Clinic
Denver
University of Colorado

BACKGROUND

Leukocyte-poor platelet-rich-plasma (LP-PRP) is an autologous biologic that has been shown to decrease inflammation and pain in knee osteoarthritis (OA) similar to conventional pharmacologic therapies. Current literature lacks appropriate power to drive clinical decisions on when it is appropriate to use LP-PRP and who will have a positive response to treatment.

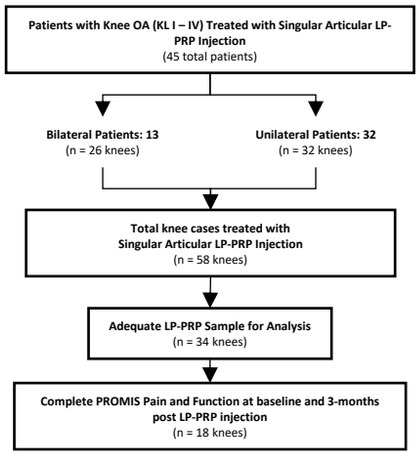
PURPOSE

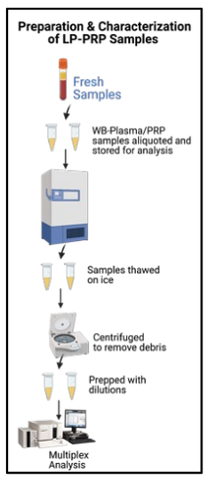
The purpose of this study is to identify the following factors that will influence better PROMIS pain and function outcomes in patients treated for symptomatic knee OA (grades I-IV):

- Patient demographics and injury details n, such as gender, BMI, age, injury chronicity, Kellgren Lawrence (KL) OA grade (I-IV), etc.
- Molecular profiles of LP-PRP samples, such as IL1-RA, VEGF, PDGF, IL-1B, etc.

METHODS

- De-identified data from 45 patients ages 30 – 85 with knee OA (KL grades I – IV) with symptomatic knee pain treated with a single, intra-articular PRP injection.
- Validated patient reported outcome (PRO) questionaries data, including PROMIS Pain and Function were collected at baseline and 3-months retrospectively accessed using a HIPAA compliant database, patient IQ (PIQ).
- 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 immunoassays were conducted using a Human XL Cytokine 46-plex Luminex assay to measure protein concentrations and correlations were calculated (Spearman's Test), displayed as a heat map where red denotes positive and blue denoted negative relationships between markers. An independent T-Test was performed to determine significance between mean differences of factors in responders and non-responders.
- Autologous LP-PRP prepared using Arthrex® or Zimmer Biommet® systems and immediately injected into supralateral knee following sterile prep with chlorhexidine.





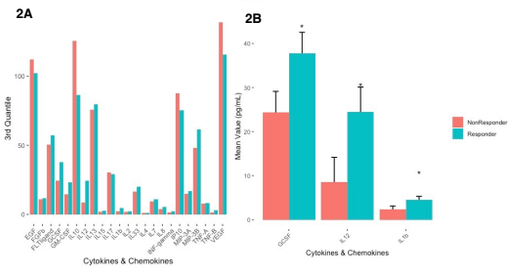
Flow Diagrams: (1) Eligibility and (2) process of obtaining, storing, and testing PRP samples.

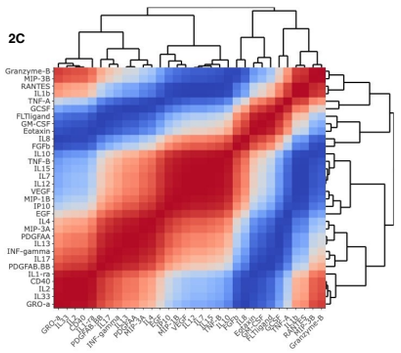
RESULTS

Age		
	Mean (SD)	**60.3** (± 13.6)
	Median	**62**
	Range	**[34 – 81]**
BMI		
	Mean (SD)	**27.2** (± 11.5)
	Median	**24**
	Range	**[17 – 42]**
Gender		
	Female	**24** (53%)
	Male	**21** (47%)
OA Grade (Total knees)		
	I – II	**27** (47%)
	III – IV	**31** (53%)
Injury Type		
	Chronic	**42** (72%)
	Acute	**16** (28%)

Table 1. Patient Demographics

- 18 patients of the original 58 with complete PRO data at follow-up, 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-injection compared to baseline (mean: 12.9% ± 8.4), while 2 subjects responded negatively to LP-PRP (mean: -6.7% ± 5.2) (**Fig.1**)
- Protein levels were detectable in 8 positive and 2 negative responders (**Fig.2A**).
- 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) concentrations compared to patients who did not respond (**Fig.2B**)
- GCSF positively correlated with RANTES (ρ=0.71) and PDGF AB/BB (ρ=0.74). IL-1b was positively correlated with IL-13 (ρ=0.77)(**Fig.2C**).





CONCLUSION

- A significant reduction in PROMIS Pain observed in 8 joints from 7 subjects' treatment with a single intra-articular LP-PRP injection.
- Of the responders, there was a significant increase in GCSF, I-1b, and IL12. Further investigation is necessary to determine the association between these inflammatory factors in knee OA.
- Limitations include heterogeneity of donor, including grade of OA and other biological factors (e.g., amount of sleep, physical activity, eating habits) which could transiently affect the collected LP-PRP sample, as well as unanticipated decreased patient follow-up over time.
- The molecular analysis of the clinical responder's LP-PRP will help provide data necessary to personalize PRP formulations in the future to improve treatment efficacy of KOA.

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