

Arthrex Angel System™ vs. PEAK™ PRP System – Cellular Concentrations Ratios

Arthrex Research and Development

Objective

The objective of this study was to compare the performance of the Arthrex Angel System’s platelet rich plasma (PRP) to DePuy Synthes’ PEAK PRP and report specific results including concentrations and ratios. Two (2) settings were analyzed for the Angel system: Angel hematocrit (HCT) 2% and 15% setting.

Methods and Materials

From each of three (N=3) blood donors, peripheral blood was drawn via a standard arm venipuncture through the median cubital (basilic) vein. The total anticoagulated whole blood (WBA) volume obtained per donor was approximately 110 mL. Anticoagulant Citrate Dextrose, Solution A (ACD-A) was used as the anticoagulant per the manufacturer’s recommended ratio.

First, from each donor, a small aliquot of WBA was sampled for analysis. For Arthrex Angel (Arthrex Inc., Naples, FL), 40 mL of WBA was processed utilizing equipment and protocol per SOP (Arthrex Angel Concentrated cPRP System with Arthrex Angel cPRP Processing Set). The Angel unit was set to 40 mL whole blood volume and hematocrit of “PRP” product was set to either 2% or 15% as both settings were examined in this study. Once all WBA was introduced to the Angel disposable, the process was initiated on Angel touchscreen.

For DePuy Synthes’ PEAK Platelet Rich Plasma System (Distributed by: DePuy Synthes Mitek Sports Medicine, Raynham, MA; Manufactured by: DSM Biomedical, Exton, PA), 30 mL of WBA was processed utilizing equipment and

protocol per SOP (PEAK PRP Base Centrifuge with PEAK PRP 30 mL Disposable Kit). The PEAK system should deliver a 3 mL volume of PRP. Careful attention must be paid to step #2 of the PEAK system IFU for RBC and subsequent platelet poor plasma (PPP) removal. In this second step, there is a user defined buffy coat line that must be pinpointed manually between two narrow boundary lines on the disposable.

Results

After all processing, final PRP volumes were recorded and aliquots saved for Complete Blood Count (CBC) analysis. CBC data were reported to show cellular concentrations and reductions via capture efficiencies (see formulas below), as well as ratios of PRP:WBA. It should be also noted that the final output of the PEAK PRP system cannot be expanded with platelet poor plasma PPP as this fraction is ejected during PRP extraction and the user may not access that chamber of the device. Upon examination of the device the PPP is trapped within an absorbent material and therefore beneficial proteins with platelet poor plasma are lost during processing with the PEAK PRP system. The PEAK system may also not be used for multiple cycles as with the Angel system.

$$\text{Capture Efficiency}_{\text{Cell}} = \frac{\text{Volume}_{\text{PRP}} \times \text{Cell Concentration}_{\text{PRP}}}{\text{Volume}_{\text{WBA}} \times \text{Cell Concentration}_{\text{WBA}}}$$

$$\text{Cellular Reduction}_{\text{Cell}} = 1 - \text{Capture Efficiency}_{\text{Cell}}$$

Value	Sample	Average ± Standard Deviation		
		Angel @ 2%	Angel @ 15%	PEAK PRP
Volumes (mL)	RBC	20.67 ± 0.58	18.67 ± 3.06	N/A
	PRP	2.47 ± 0.42	3.80 ± 0.35	3.53 ± 0.12
	PPP	18.33 ± 0.58	20.33 ± 4.51	N/A
RBC (M/uL)	WBA	4.36 ± 0.29	4.36 ± 0.29	4.55 ± 0.10
	PRP	0.11 ± 0.04	1.65 ± 0.19	1.58 ± 0.40
	PPP	0.02 ± 0.01	0.03 ± 0.01	N/A
	PRP:WBA	0.03 ± 0.05	0.38 ± 0.07	0.35 ± 0.09
WBC (K/uL)	WBA	6.16 ± 1.62	6.16 ± 1.62	6.24 ± 0.81
	PRP	5.13 ± 1.45	11.95 ± 3.58	24.77 ± 9.93
	PPP	0.06 ± 0.03	0.06 ± 0.04	N/A
	PRP:WBA	0.83 ± 0.01	1.97 ± 0.62	3.97 ± 1.53
NE (K/uL)	WBA	4.06 ± 1.09	4.06 ± 1.09	4.07 ± 0.78
	PRP	0.46 ± 0.59	4.48 ± 4.13	9.10 ± 12.93
	PPP	0.04 ± 0.00	0.06 ± 0.00	N/A
	PRP:WBA	0.11 ± 0.14	1.03 ± 0.98	2.02 ± 2.80
PLT (K/uL)	WBA	184.3 ± 49.0	184.3 ± 49.0	195.3 ± 46.0
	PRP	1145.3 ± 488.4	1319.7 ± 355.9	1424.7 ± 407.8
	PPP	15.0 ± 6.6	20.3 ± 6.1	N/A
	PRP:WBA	6.0 ± 1.0	7.2 ± 0.1	7.3 ± 0.56

Table 1: Average ± standard deviation of volumes and CBC cellular concentration data

System	RBC Reduction	NE Reduction
Angel 2%	100%	99%
Angel 15%	96%	90%
PEAK	96%	74%

Table 2: RBC and NE reduction percentages of PRP from Angel and PEAK systems

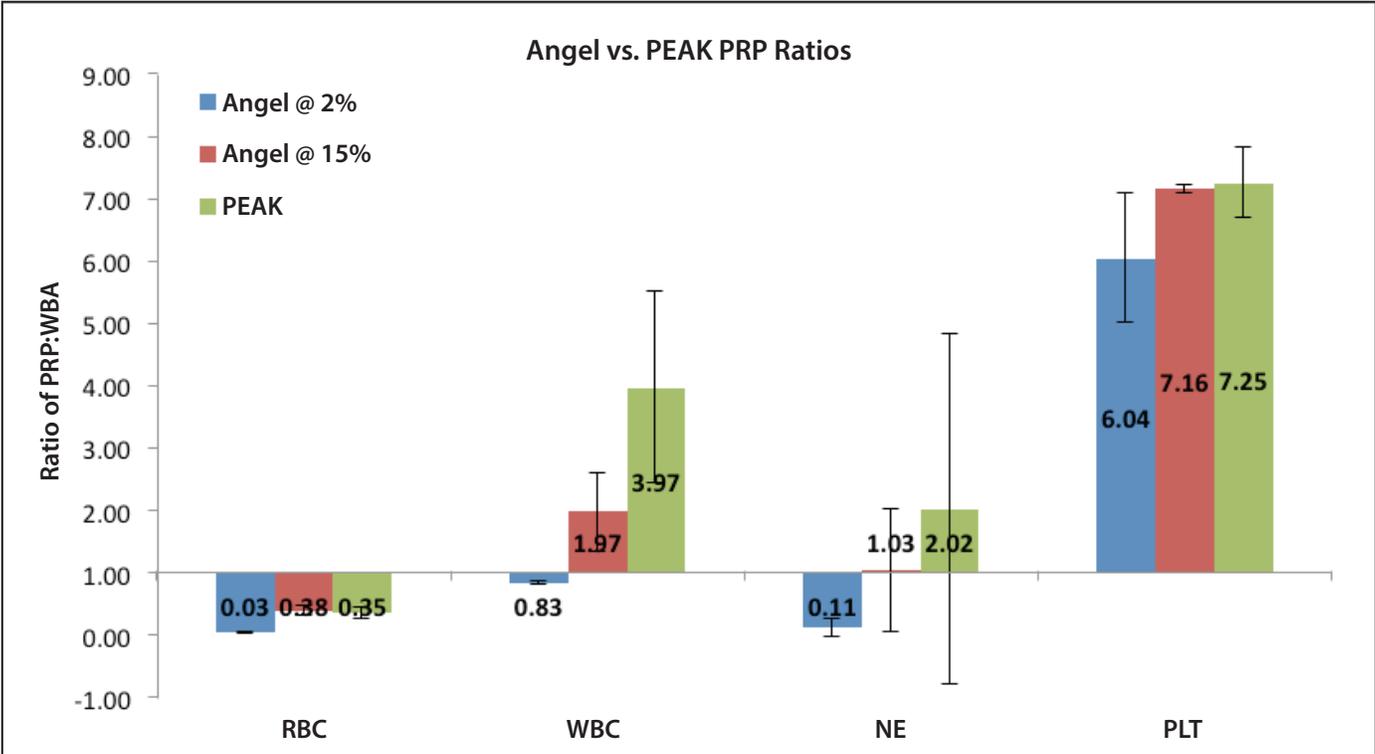


Figure 1: Angel versus PEAK PRP cellular ratios (PRP:WBA)

Each system’s PRP, within each cellular ratio category, was statistically compared via t-test ($\alpha=0.05$). Angel 2% HCT setting was significantly lower in RBC and WBC fold increase than PEAK, both Angel 15% HCT setting and PEAK (for RBC, $p=0.001$ and $p=0.004$, respectively; for WBC, $p=0.033$ and $p=0.024$, respectively).