Comparison of Arthrex ACP Max™ PRP to Apex Biologix XCELL Low-Leukocyte PRP

Arthrex Orthobiologics Research

OBJECTIVE

This study aimed to compare the cellular output of platelet-rich plasma (PRP) created using the Arthrex ACP Max PRP system to the Apex Biologix XCELL PRP system's low-leukocyte protocol.[1]

MATERIALS AND METHODS

Blood Collection

Whole blood was collected from healthy volunteers (N = 6) by CGT Global (Folsom, CA) following informed consent. Blood was processed and evaluated on the day of collection. Blood was drawn using 13.3% acid citrate dextrose solution A (ACD-A) as the anticoagulant. Additional ACD-A was added to 60 mL of whole blood to reach a final concentration of 15% for the XCELL system to meet manufacturer guidelines. A small volume of anticoagulated blood from each donor was aliquoted for baseline complete blood count (CBC) analyses.

PRP Preparation

› **ACP Max PRP System**

60 mL of anticoagulated blood was moved to the ACP Max device. The device was placed into either a Drucker Horizon 24-AH Flex or a Hettich Rotofix 32A, counterbalanced, and centrifuged at 3200 rpm (approximately 1920 xg) for 6 minutes. The device was removed, and the resulting platelet-poor plasma (PPP) was removed from the top of the device using a syringe until the bottom of the ACP Max plunger was two tick marks (4 mL) above the buffy coat. The PPP syringe was removed, and the supplied ACP double syringe was attached to the top of the device. The next 15 mL of fluid was collected into the outer syringe of the ACP double syringe. The double syringe was removed, capped, and gently inverted approximately 20 times before centrifuging at 1500 rpm (approximately 420 xg) for 5 minutes in the same counterbalanced centrifuge. The device was removed from the centrifuge, and the PRP was collected into the inner syringe until the red blood cell layer was reached without collecting red blood cells.

› **XCELL Low-Leukocyte PRP System**

A low-leukocyte PRP was prepared according to the manufacturer's instructions. Briefly, the anticoagulated whole blood was added to the XCELL device using the 45° bent dispensing tip. The device was centrifuged at 3500 rpm (2300 xg) for 10 minutes. After the centrifugation, the XCELL device was uncapped and placed into the benchtop processing station provided with the device, and an empty syringe was attached to the top. The knob on the processing station was turned to move PPP into the empty syringe until the buffy coat reached 6 mL (outlined on the XCELL device). The syringe was removed and replaced with a 12 mL syringe. The remaining PRP was pushed into the syringe until all of the buffy coat had been captured, along with approximately 100 µL of red blood cells.

The volume of the PRP from each system was recorded. A small aliquot of the respective PPPs and PRPs was collected for each device, and a CBC with differential was captured.

Data Analysis

The following analyses were performed on all CBC results, with a focus on the platelet (PLT), red blood cell (RBC), neutrophil (NE), and white blood cell (WBC) groups:

› The average volume and hematocrit (HCT) of each group were determined without any additional processing.

› The fold change of the concentration of each cell type over baseline was determined by dividing the results from the PPP or PRP by the corresponding value from the respective whole blood.

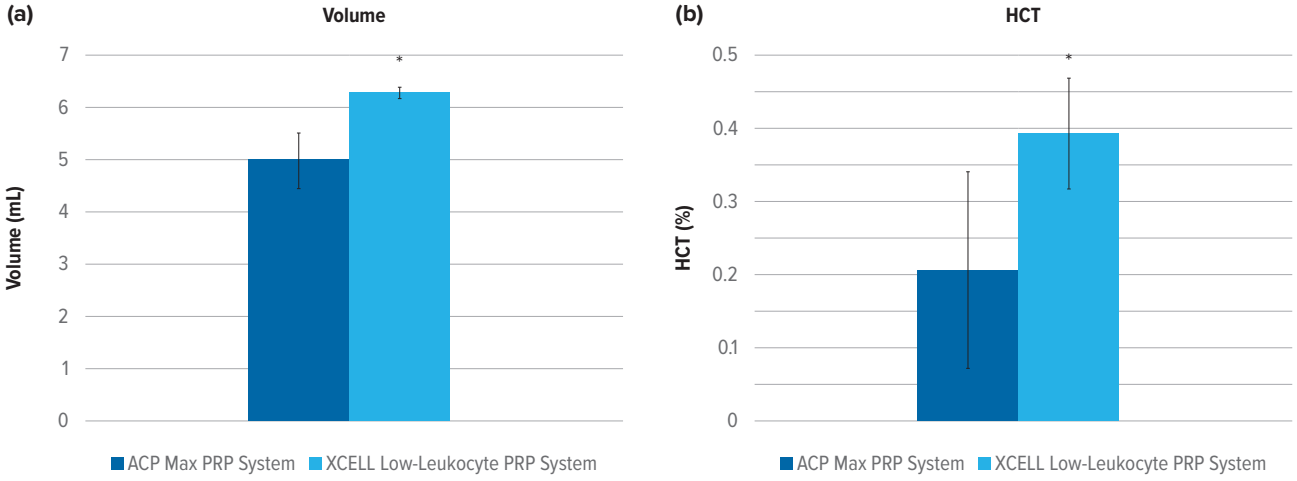
› The dose of each cell type was calculated by multiplying the concentrations by the recovered fluid volume.

› After each device's calculations, the data were averaged across the 6 donors for each group. A *t* test was used to compare the averages of each group. Significance was set as $\alpha = .05$ for all analyses.

RESULTS

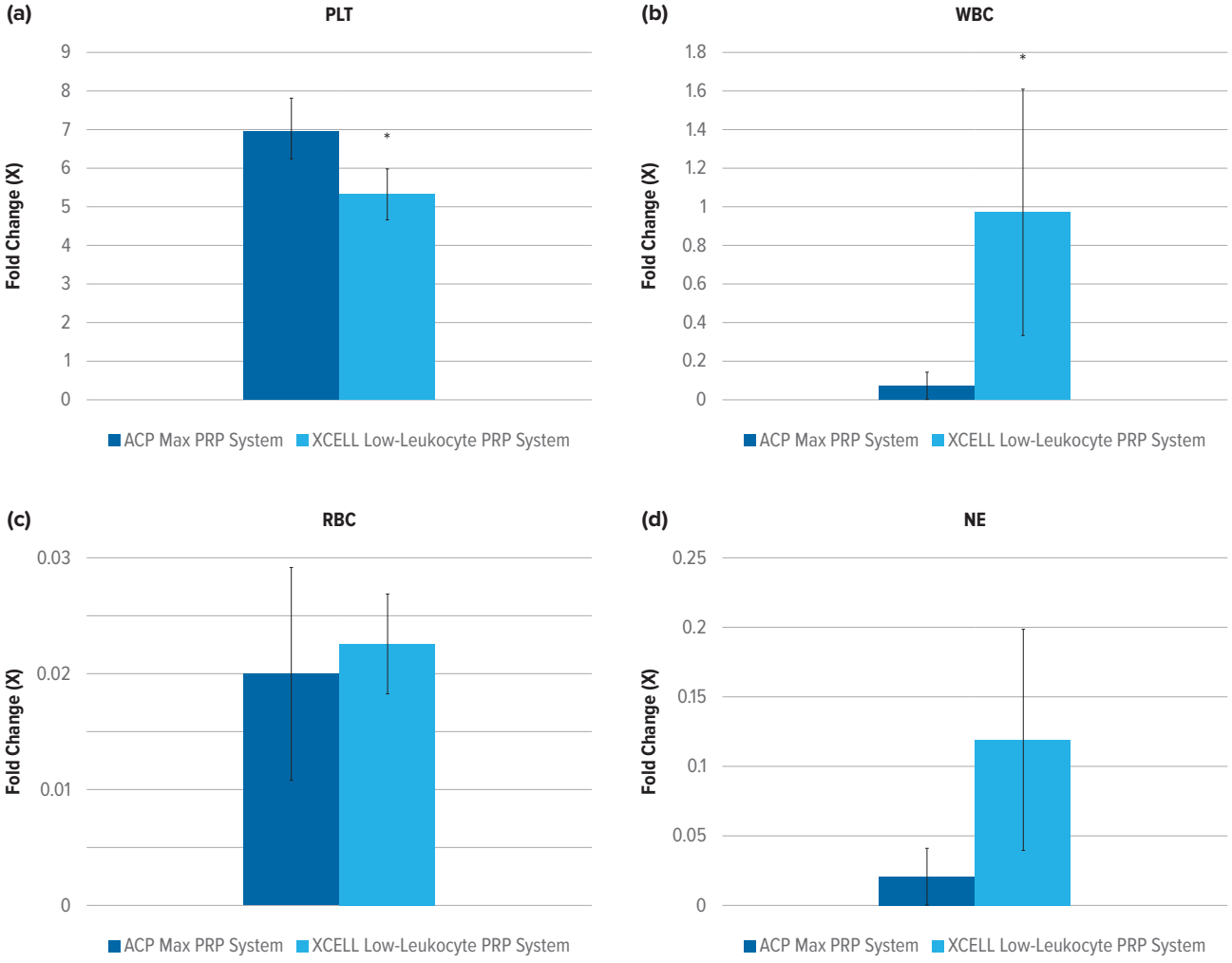
The average volume and HCT of the PRP products were recorded (Figure 1). There was a significant difference in both volume ($P < .001$) and HCT ($P = .040$) when comparing the ACP Max™ PRP system and Apex device.

Figure 1. Average volume and HCT, with standard deviation (N = 6) (* indicates a statistically significant difference between the systems).



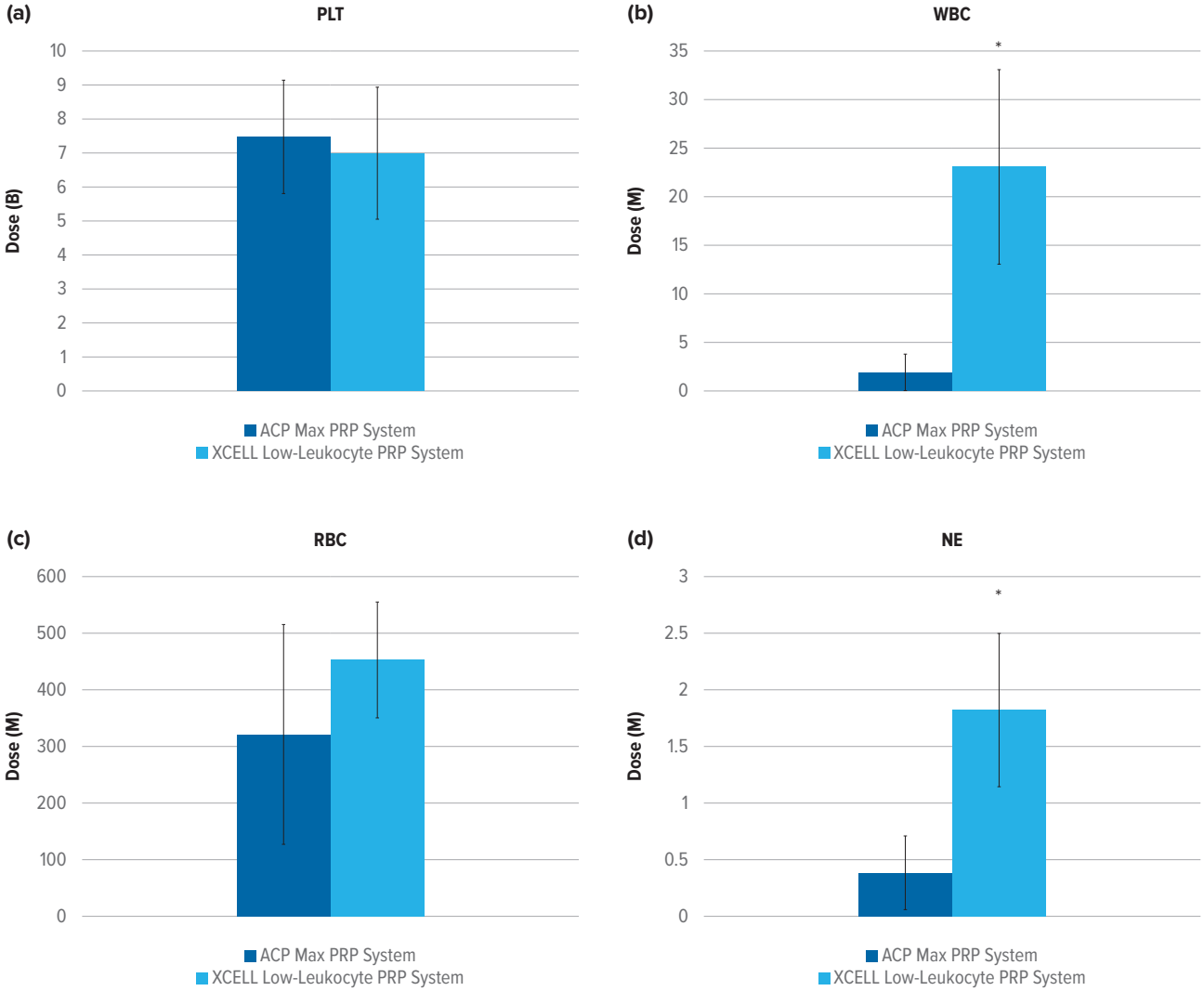
The fold change of each cell type was calculated from the baseline of the respective donor (Figure 2). When comparing the groups, there was a significant difference in PLT ($P = .004$) and WBC fold changes ($P = .009$), while RBC ($P = .664$) and NE fold changes ($P = .089$) were not significantly different.

Figure 2. Average fold change, with standard deviation, of PLT, WBC, RBC, and NE (N = 6) (* indicates a statistically significant difference between the systems).



Once the fold changes were calculated, the total dose of cells contained within each treatment was determined (Figure 3). When comparing the groups, there was a significant difference in WBC ($P < .001$) and NE ($P = .013$) doses, while PLT ($P = .702$) and RBC ($P = .234$) doses were not significantly different between groups.

Figure 3. Total dose of PLT, WBC, NE, and RBC (N = 6) (* indicates a statistically significant difference between the systems).



DISCUSSION

The ACP Max device concentrated PLTs more than the Apex device; however, the Apex device produced greater volume than the ACP Max device, leading to similar doses and percent recovery of PLTs. The biggest difference between the two devices was in the WBC content, which remained close to the baseline for the Apex device but was significantly reduced with the ACP Max device.

It is known that WBCs, especially NEs, can promote inflammation and cause pain.[2,3] These results show that when attempting to create a leukocyte-reduced PRP, the ACP Max device creates a product that has significantly fewer WBCs while delivering the same number of platelets as the XCELL device in a smaller volume.

References

1. Arthrex, Inc. Data on file (APT 06807). Naples, FL; 2024.
2. Wright HL, Moots RJ, Bucknall RC, Edwards SW. Neutrophil function in inflammation and inflammatory diseases. *Rheumatology (Oxford).* 2010;49(9):1618-1631. doi:10.1093/rheumatology/keq045
3. Mócsai A. Diverse novel functions of neutrophils in immunity, inflammation, and beyond. *J Exp Med.* 2013;210(7):1283-1299. doi:10.1084/jem.20122220