Biovance® Dehydrated Decellularized Human Amniotic Membrane Absorbs and Releases Higher Concentrations of Autologous Growth Factors Than a Competitive Membrane

Arthrex Research and Development

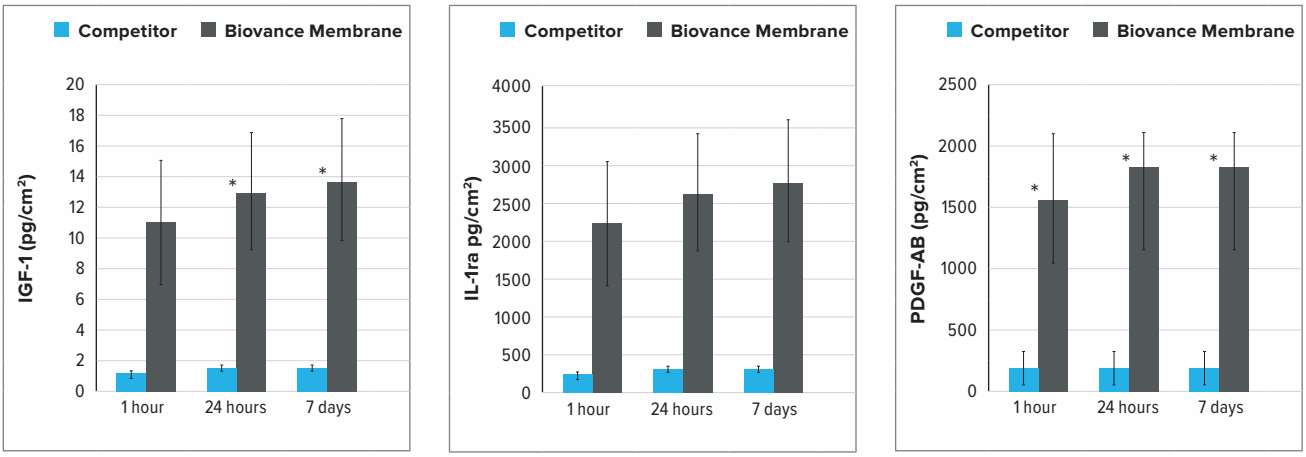

Figure 1. Cumulative release of IGF-1, IL-1ra, and PDGF-AB normalized to surface area from Biovance membrane and a competitor human amniotic matrix allograft after rehydration with platelet-rich plasma (PRP). Data reported as average ± standard deviation. An asterisk (*) indicates a significant difference ((p=<0).[1]

Background

Biovance® human amniotic membrane allograft is derived from the placenta of healthy, full-term pregnancies. It is intended for use as a biological membrane to support the repair of damaged tissue. Unlike other placental-based allografts, Biovance allografts are completely devoid of cells, hormones, growth factors, and cytokines. Decellularizing the human amniotic membrane has been shown to decrease the chance of an inflammatory response or graft rejection, with minimal effect on graft performance.[2] A matrix devoid of potentially denatured growth factors and cellular remnants leaves a clean scaffold that can be populated with autologous cells and growth factors after application to a surgical site or tissue. The purpose of this study was to evaluate absorption and release of growth factors (IGF-1, IL-1ra, and PDGF-AB) from 2 placentally derived membrane allografts following rehydration with PRP.

Materials and Methods

Human whole blood from 3 donors was collected by a trained phlebotomist and anticoagulated with ACD-A to a final concentration of 13%. The whole blood was processed at 7% hematocrit and standard settings to produce PRP.

Three lots of Biovance membranes and a competitor amnion allograft were cut into <1 cm^2 squares. The membranes were weighed, placed individually into microcentrifuge tubes, and rehydrated with either sterile DPBS or PRP for 10 minutes. The rehydrated membranes were weighed, transferred to new microcentrifuge tubes, and submerged in DPBS. At time points of 1 hour, 24 hours, and 7 days, the DPBS was collected and replaced. The DPBS was analyzed via ELISA for IGF-1, IL-1ra, and PDGF-AB concentrations.

The cumulative release of each growth factor (pg/cm^2) from the PRP-rehydrated Biovance membrane and competitor membranes was calculated at each time point and compared with a paired t-test (α=0.05,

SigmaPlot 14.0). Any endogenous growth factors from the membranes were excluded from analysis by subtracting the background release from the DPBS-rehydrated membranes. However, concentrations of these growth factors were not detected the majority of the time.

Results

Biovance® membrane absorbed more PRP per surface area than the competitive amnion membrane (160.5 ± 31.6 mg/cm^2 compared to 32.7 ± 5.8 mg/cm^2).

Cumulative growth factor release of the 3 factors measured was 10-15 times higher from Biovance membranes compared to the competitive membrane (Figure 1). Cumulative IGF-1 release of Biovance membranes was significantly higher at 24 hours and 7 days (p=0.0404, p=0.0348), whereas cumulative PDGF-AB release was significantly higher at all time points (p=0.0338, p=0.0226, p=0.0226).

Discussion and Conclusions

The Biovance human amniotic membrane allograft was capable of higher absorption of PRP by mass per surface area compared to the competitor allograft. As a result, the Biovance membranes released more growth factors associated with plasma, platelets, and white blood cells following rehydration. The Biovance membrane is an excellent choice for tissue repair because it can absorb plasma and autologous growth factors at the surgical site, which can then elute over time.

References

1. Arthrex, Inc. Data on file (APT-05458). Naples, FL; 2021.
2. Gholipourmalekabadi M, Farhadihosseinabadi B, Faraji M, Nourani MR. How preparation and preservation procedures affect the properties of amniotic membrane? How safe are the procedures?. *Burns.* 2020;46(6):1254-1271. doi:10.1016/j.burns.2019.07.005

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