A Standardized *g*-Force Allows the Preparation of Similar Platelet-Rich Fibrin Qualities Regardless of Rotor Angle

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Abstract

Platelet-rich fibrin (PRF) is an autologous blood concentrate that supports tissue regeneration. The effect of the centrifuge rotor angle in the fabrication of PRF is still not fully elucidated. The hypothesis of this study is: When applying the same *g*-force (relative centrifugal force [RCF]) and centrifugation time, PRF components and bioactivity are not modified using either a swing-out rotor or a fixed angle rotor. For this purpose, peripheral blood samples (from five donors) were used to gain solid (710 ×*g*, 8 min) and liquid (44 ×*g*, 8 min) PRF matrices using three different centrifuges (one fixed angle as a control and two different swing-out rotor centrifuges). The physical characteristics of the solid PRF were measured to evaluate the clot formation and cellular distribution. The liquid PRF was used to evaluate the cell number, bioactivity, and influence on primary human osteoblasts (pOBs) and primary human fibroblasts (pHFs) *in vitro*. Solid PRF clots were significantly larger in the group of fixed rotor centrifuges compared with either of the two evaluated swing-out rotor centrifuges. No differences were observed when evaluating the cellular distribution within the solid PRF. No statistically significant differences were documented in the cell's density in liquid PRF samples (platelets, lymphocytes, neutrophils, eosinophils, and basophils) among the differently gained PRF samples. No statistically significant differences were documented for the released growth factors (vascular endothelial growth factor, epidermal growth factor, and transforming growth factor beta 1) over 7 days. pOBs and pHFs viability after treatment with PRF conditioned media showed no statistically significant differences between the evaluated groups. However, the number of adherent cells treated with PRF

obtained with the use of the fixed angle rotor was significantly higher when compared with those treated with PRF obtained by using the swing-out rotors. The presented results confirm that regardless of the centrifuge rotor used, the components and bioactivity of solid and liquid PRF matrices are modified by the applied RCF and centrifugation time. These findings are of great importance for highlighting the essential role of adapting the centrifugation protocols when using different centrifuges and to correctly report the used centrifugation protocols in scientific research to allow for reproducible results. Impact statement Platelet-rich fibrin (PRF) is prepared from autologous peripheral blood and is widely applied in research and clinical treatments. The centrifugation parameters used during the preparation of PRF directly influence its components and bioactivity. By using a standardized protocol, the present study demonstrated that adapting various centrifuges to a standardized relative centrifugal force and centrifugation protocol resulted in reproducible PRF matrices with similar bioactivity, regardless of the centrifuge rotor angle. These findings underline the necessity to carefully adapt and correctly report the used centrifuge and centrifugation protocols in scientific research to allow reproducible results.

Keywords: LSCC; PRF; blood concentrates; horizontal centrifugation; low-speed centrifugation concept; platelet-rich fibrin.

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