

Can Platelet-Rich Plasma Enhance Tendon Repair?

A Cell Culture Study

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Background: Autologous platelet-rich plasma (PRP) application appears to improve tendon healing in traumatic tendon injuries, but basic knowledge of how PRP promotes tendon repair is needed.

Hypothesis: Platelet-rich plasma has a positive effect on cell proliferation and collagen production and induces the production of matrix-degrading enzymes and endogenous growth factors by human tenocytes.

Study Design: Controlled laboratory study.

Methods: Human tenocytes were cultured 14 days in 2% fetal calf serum medium complemented with 0%, 10%, or 20% vol/vol platelet-rich clot releasate ([PRCR] the active releasate of PRP) or platelet-poor clot releasate (PPCR). At day 4, 7, and 14, cell amount, total collagen, and gene expression of collagen I α 1 (COL1) and III α 1 (COL3), matrix metalloproteinases ([MMPs] MMP1, MMP3, and MMP13), vascular endothelial-derived growth factor (VEGF)-A, and transforming growth factor (TGF)- β 1 were analyzed.

Results: Platelet numbers in PRP increased to 2.55 times baseline. Growth-factor concentrations of VEGF and platelet-derived growth factor (PDGF)-BB were higher in PRCR than PPCR. Both PRCR and PPCR increased cell number and total collagen, whereas they decreased gene expression of COL1 and COL3 without affecting the COL3/COL1 ratio. PRCR, but not PPCR, showed upregulation of MMP1 and MMP3 expression. Matrix metalloproteinase 13 expression was not altered by either treatment. PRCR increased VEGF-A expression at all time points and TGF- β 1 expression at day 4.

Conclusion: In human tenocyte cultures, PRCR, but also PPCR, stimulates cell proliferation and total collagen production. PRCR, but not PPCR, slightly increases the expression of matrix-degrading enzymes and endogenous growth factors.

Clinical Relevance: In vivo use of PRP, but also of PPP to a certain extent, in tendon injuries might accelerate the catabolic demarcation of traumatically injured tendon matrices and promote angiogenesis and formation of a fibrovascular callus. Whether this will also be beneficial for degenerative tendinopathies remains to be elucidated.

Keywords: platelet-rich plasma; tendon; growth factors; collagen; matrix metalloproteinases
