

Effect of platelet-rich plasma on healing tissues in acute ruptured Achilles tendon: a human immunohistochemistry study

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Abstract

Background Platelet-rich plasma (PRP), an autologous derivative of whole blood that contains a supraphysiological concentration of platelets, is thought to invoke an earlier and improved tissue healing response. This notion has been supported by in-vitro and animal studies in bone, cartilage, tendon, and muscle. To our knowledge no published study exists of the effects of PRP in human tissues in vivo. The aim of our study was to investigate the response of ruptured Achilles tendon treated with PRP.

Methods Tendon tissue biopsy samples were obtained from 20 patients with ruptured Achilles tendon by means of ultrasound-guided needle biopsies from the healing area of the Achilles tendon 6 weeks after treatment with PRP or placebo controls (10 patients each). All samples were embedded in paraffin wax, sectioned, and stained with haematoxylin and eosin and alcian blue. Immunohistochemistry markers were used to identify collagen I and III, lymphocytes (CD45), proliferation (KI67), and blood vessels (CD34). All images were masked and analysed with Image J software.

Findings Cellularity and glycosaminoglycans content were significantly higher in PRP-treated tendons than in controls ($p=0.01$ and $p<0.001$, respectively). Fibre structure of the tissue was significantly better in the PRP group than in the control tissue ($p<0.001$). Although both groups showed high collagen I staining, content of collagen I was significantly higher in PRP-treated tendons than in control tendons ($p=0.0079$), whereas collagen III content was not different ($p=1.0$). The ratio of collagen III to collagen I was significantly lower in PRP samples ($p=0.007$). There was no significant difference in CD45 expression ($p=0.33$). However, PRP samples had fewer blood vessels than did control samples ($p=0.023$). The overall modified Bonar score was significantly lower in PRP samples, which indicates improved early tendon healing.

Interpretation This is the first study, to our knowledge, to report the immunohistochemical response of ruptured human Achilles tendon to PRP. The findings reveal that locally applied PRP enhanced the maturity of the healing tendon tissues by promoting better collagen I deposition, decreased cellularity, less vascularity, and higher glycosaminoglycan content when compared with control samples. Further work is required to determine the longer term effects of the use of PRP in musculoskeletal diseases.

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Contributors

JA is the main author and contributor. MT and KW supervised the study. PH was responsible for PRP preparation and supervision. SF supervised laboratory work and wrote the abstract.

Declaration of interests

We declare no competing interests.

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Poster 48

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