

Effect of BMP-12, TGF-b1 and autologous conditioned serum on growth factor expression in Achilles tendon healing

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Abstract

Purpose Achilles tendon ruptures are devastating and recover slowly and incompletely. There is a great demand for biomolecular therapies to improve recovery, yet little is understood about growth factors in a healing tendon. Here, the role of growth factors during tendon healing in a rat model and their reaction to single and multiple growth factor treatment are explored.

Methods

Rat tendons were transected surgically and resutured. The expression of bFGF, BMP-12, VEGF and TGF-b1 was assessed by immunohistochemical analysis one to 8 weeks after surgery. Paracrine effects of TGF-b1 or BMP-12 added by adenoviral transfer, as well as the effect of autologous conditioned serum (ACS) on growth factor expression, were evaluated.

Results

bFGF, BMP-12 and VEGF expression was highest 1 week after transection. bFGF and BMP-12 declined during the remaining period whereas VEGF expression persisted. TGF-b1 expression dramatically increased after 8 weeks.

ACS treatment increased bFGF ($P = 0.007$) and BMP-12 ($P = 0.004$) expression significantly after 8 weeks. Also, overall expression of bFGF, BMP-12 and TGF-b1 regardless of time point was significantly greater than controls with ACS treatment ($P < 0.05$). Both BMP-12 and TGF-b1 treatments had no significant effect. No effect was observed in VEGF with any treatment.

Conclusion

bFGF, BMP-12, VEGF and TGF-b1 are differentially expressed during tendon healing. Additional BMP-12 or TGF-b1 has no significant influence, whereas ACS generally increases expression of all factors except VEGF. Staged application of multiple growth factors may be the most promising biomolecular treatment.

Keywords Growth factors - Tendon healing - Biological repair - Animal model