

Dual Growth Factor Loaded Bioactive Injection Material for the Enhanced Treatment of Vocal Fold

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Background

The demand for the treatment of glottal insufficiency is increasing. Several injection materials have been examined for this purpose, however, biologic reabsorption, particle migration, and ongoing degradation of the injected materials, and thus the need to perform multiple injections still remain as major clinical problems. In this study, the two different (single basic fibroblast growth factor (bFGF), single hepatocyte growth factor (HGF), and dual bFGF/HGF) growth factor (GF) immobilized microbeads were investigated for their potential use as an bioactive injection laryngoplasty agent.

Methods

bFGF, HGF and dual GF were bound to heparin-immobilized PCL/F127 microbeads. Each growth factors were found to be continuously released over 35 days on a ELISA assay. Human Vocal Fold Fibroblast(hVFF) proliferated significantly more on bFGF and dual GF-immobilized microbeads. GF-immobilized microbeads (bFGF, HGF, and dual) were injected to the paralyzed vocal folds of New Zealand's white rabbit, and four weeks later, rabbits were sacrificed and tissue around the injected vocal fold were dissected for

RT-PCR and histology.

Results

There was no significant inflammatory sign on endoscope and H&E staining. Microbeads remained at the injection site, leading to the constant volume augmentation of paralyzed vocal fold without significant inflammation. The expression of extracellular matrix (ECM) gene related with the synthesis of collagen which are main substances of vocal fold was upregulated and collagen and HA deposition was enhanced by dual GF loaded microbeads which was confirmed by Masson's Trichrome staining and Alcian Blue staining.

Conclusion

In conclusion, Dual GF loaded microbeads augmented the volume of the paralyzed vocal fold passively and induced the collagen and HA synthesis actively at the injected vocal fold. Dual GF loaded microbeads could be a new promising injection material for paralyzed vocal fold.

Keywords

Injection laryngoplasty, Growth factor, Collagen, Hyaluronic acid, Extracellular matrix, Lamina propria