112

PATCH TRACHEOPLASTY USING COLLAGENOUS CONNECTIVE TISSUE MEMBRANES PRODUCED BY INBODY-TISSUE-ARCHTECTURE TECHNOLOGY IN A DOG MODEL

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Aim of the study: Although a variety of artificial tracheas have undergone assessment, none have been proven satisfactory for clinical use. In-body tissue architecture technology, which utilizes the tissue-encapsulation phenomenon of foreign materials in living bodies, has enabled us to produce a wide range of shapes and sizes of autologous collagenous tissues to meet the needs of individual recipients. The aim of this study was to investigate the feasibility of patch tracheoplasty using the *in vivo* tissue-engineered collagenous connective tissue membrane termed “biosheet” in a dog model.

Methods: Adult female beagles (n=8) were used. Biosheets were prepared by embedding rod-like moulds covered with slitting tubes into canine dorsal subcutaneous pouches for 2 months. After histological assessment of the biosheets, patch tracheoplasty using biosheets was performed. Briefly, a midline longitudinal tracheotomy (10 × 20 mm) was created and heterologous, rectangular-shaped biosheets (10 × 20 mm) were implanted into the defect. Endoscopic evaluation was performed at 1 and 3 months after tracheoplasty. Tracheas including biosheets were harvested for histological evaluation at 1 (n=3) and 3 months (n=4) after tracheoplasty.

Main Results: During the observation period, all animals survived. In addition, endoscopic findings showed that the anastomotic part and the internal surface of the biosheet were smooth, suggesting sufficient re-epithelialization. Histological analysis at 1 month after tracheoplasty demonstrated that ciliated columnar epithelium was regenerated into the internal surface of the biosheet. Interestingly, chondrocyte migration into the biosheet was confirmed at 3 months after tracheoplasty by Safranin-O staining (Figure). At present, one dog remains alive 8 months after tracheoplasty.

Conclusion: Ciliated columnar epithelium and chondrocytes were well regenerated into biosheets, suggesting that the biosheet has the ability to self-organize in a dog model of patch tracheoplasty. We will report the long-term outcome, including the results at 12 months, after tracheoplasty.