Title: **Guided cartilage generation using prefabricated microvascular flaps of perichondreum and PLDLA 96/4 non woven scaffolds.**

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Introduction: It has been demonstrated (Ruuskanen, Takato) that cartilage can be grown by using free perichondreal transfers as well as microsurgical perichondreum flaps in muscle tissue. The size of such grown cartilage pieces is however in non-microvascular flaps limited by the ability of nutrients and oxygen to diffuse into the cartilage because the lack of vascularity to supply the tissue to be grown. In previous experiments with microvascular flaps no scaffolds have been used and only irregular pieces of cartilage have been grown (Takato). Growth factors have been tried to correct this but none have been successful so far to induce permanent vascularity to the transfer.

Aim: The aim of this experiment is to demonstrate if it is possible to grow definitely larger and eventually thicker pieces of cartilage by using a composite prefabricated grafts. These would provide vascularity and favourable environment for the chondrocytes to grow migrate into and grow.

Materials and methods: We used rabbits as experimental animals. As the source of perichondrium we used dorsal ear perichondrium with central artery and vein. For biodegradable scaffold we used PLDLA 96/4 (polylactic acid D and L stereoisomeric forms 96/4%) in non-woven form 1 mm thick 80 x 30 mm size pieces. The perichondreal flap was raised and the pedicular vessels were dissected free and separated. The scaffold was cut to size of the flap and rounded at the corners. The flap was placed under the ventral skin of the rabbit. The pedicular vessels were anastomosed to the femoral vessels, artery end-to-end and vein side-to-end. The ear skin was closed over the existing cartilage and the inquinal incision over the anastomose area. The follow-up groups were 1 month, 3 months and five months. As controls we used three animals, one with biodegradable scaffold only, one with perichondreal flap and scaffold without microvascular method and one with microvascular pericohndreal flap without biodegradable scaffold. The controls were all in the 5-month group.

Results: One flap was lost due to mechanical failure of the anastomosis, in the others the vessels were open. In the one month group macroscopically there was scaffold present in the flaps, in the three-months-group there was cartilage like tissue and in the five-months-group the scaffold was macroscopically replaced by tissue that resembled rabbit ear cartilage. The specimens are undergoing microscopic examination at present. In about half of the samples the fabricated tissue had retained the size and form of the original scaffold

Conclusions: The experimental model seems to work well and produces pieces of cartilage of predictable size and shape. It is laboursome but can be used by a competent microsurgeon. One must prepare for eventual complications as always in surgery.

Key words: tissue engineering, cartilage, microsurgery, biodegradable scaffolds