# Laryngeal Reconstruction Using Allogeneic Cartilages

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**Preserved allogeneic cartilage has been used to reconstruct laryngeal defects. The most important problem with this approach has been graft resorption, which seems to be caused by devitalization of the grafts as a consequence of preservation. In this study, the authors compared the in vivo behavior of vital and nonvital preserved cartilage used to reconstruct the larynx of New Zealand white rabbits. The vital cartilage grafts were stored using organ culture procedures, and the nonvital grafts were stored in formaldehyde. While the formaldehyde-preserved cartilage showed inflammatory changes, the transplanted vital cartilage was well accepted and showed no evidence of immune cell infiltrations. The authors concluded that viable cartilage grafts are preferable to grafts of chemically preserved cartilage.**

## INTRODUCTION

Surgical treatments for cancer of the larynx, including radical resection, are well documented. Increased attention is now being given to reconstructive surgery to restore laryngeal function. Various authors[1–3] have used preserved homologous cartilage to rebuild the larynx and trachea.

Both autologous and allogeneic cartilage have been stored by several preservation methods, with varied success. Chemical preservatives, such as formaldehyde, Merthiolate, and Cialit, are associated with a loss of both the antigenicity[4] and vitality of grafts.[5]

Cartilage grafting—especially the grafting of allogeneic tissues—is associated with rejection and, more frequently, resorption. Rasi[6] reported partial resorption of human allografts stored in Merthiolate or alcohol or preserved by deep freezing. Lamont[7,8] reported no appreciable resorption of homografts preserved in Merthiolate. Mowlem[9] and Gibson, *et al.*[10] found that no resorption occurred following transplantation of fresh human allografts, while Brown[11] reported partial resorption of grafts. Because of these differing observations, the method of preserving human cartilage allografts that is most favorable to the physical persistence of the implanted material is still undecided.

All preservation procedures are characterized by a loss of the viable properties of tissue. However, Bujia, *et al.*[12] recently demonstrated that viable cartilage tissue can be successfully stored for several months using tissue culture procedures. The present study was conducted to analyze the in vivo behavior of cartilage grafts that had been stored for an extended period using tissue culture procedures. For comparison, formaldehyde-preserved cartilage grafts were used as controls.

## MATERIALS AND METHODS

### *Experimental Design*

The study subjects were 18 New Zealand white rabbits, with males and females used randomly. The 9 animals in group I received cartilage grafts that had been stored for 10 days in formaldehyde. The 9 animals in group II were implanted with vital cartilage grafts that had been stored in RPMI-1640 (Roswell Park Memorial Institute 1640) medium. Follow-up examinations were performed at 45, 90, and 180 days (Fig. 1). At each time point, samples were taken and immediately snap-frozen in liquid nitrogen for histological and immunohistological processing.

### *Storage of Cartilage Grafts*

Thyroid cartilage samples were obtained from New Zealand white rabbits. Half of the surgical specimens were placed in the culture medium RPMI-1640 with L-glutamine (Seromed, Berlin) supplemented with 10% fetal calf serum (FCS; Boehringer, Mannheim, Germany) and antibiotics (penicillin, 100 µg/mL; streptomycin, 100 µg/mL; and amphotericin B, 2.5 µg/mL), as described previously.[12] The other half of the surgical specimens were placed in 4% buffered formaldehyde.[4] After the storage period, cellular viability was assessed using the previously detailed procedure.[12]

### *Operative Procedure*

The animals were anesthetized with pentobarbital

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