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Experimental study of the use of auricular cartilage with and without Gelfoam® on the nasal dorsum of rabbits☆,☆☆

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KEYWORDS
Rabbits;
Reconstruction;
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Abstract
Introductions: There are several materials for reconstruction of nasal dorsum deformities, which are divided into four categories: autologous, homologous, heterologous, and alloplastic grafts.
Objective: To compare experimental conditions through inflammatory time reactions in ear cartilage grafts with and without Gelfoam® when grafted on the nasal dorsum of rabbits.
Methods: This study included 30 rabbits, divided into two groups of 15 rabbits each (Gelfoam® and cartilage group and cartilage group), and then divided into three sub-groups of 7, 30, and 60 days of follow-up, where the 1.5 cm long and 0.5 wide grafts were placed in the stock grafting on the nasal dorsum of rabbits, half with and half without Gelfoam®. After the specified period, the rabbits in each group were euthanized, and the grafts were then submitted to a histological study.
Results: The experimental group revealed more neovascularization and granulation tissue formation; in terms of the presence of acute and chronic inflammatory process, the results were virtually identical in rabbits from both the control and experimental models in all three groups.
Conclusion: There was no statistical difference to justify the use of Gelfoam® surrounding cartilage graft for nasal dorsum reconstruction.

PALAVRAS-CHAVE
Coelhos;
Reconstrução;
Nariz;
Cartilagem;
Orelha

Estudo experimental da utilização de cartilagem auricular com e sem Gelfoam® em dorso nasal em coelhos

Resumo
Introdução: Existem inúmeros materiais para reconstrução de deformidades do dorso nasal que são divididos em quatro categorias: enxertos autólogos, homólogos, heterólogos e aloplásticos.
Objetivo: Comparar as condições através do tempo das reações inflamatórias do enxerto de cartilagem auricular com e sem Gelfoam® quando colocadas no dorso nasal de coelhos.
Método: Foram estudados 30 coelhos, em dois grupos de 15 coelhos cada (Grupo com cartilagem e Grupo com cartilagem mais Gelfoam®) e em seguida subdivididos em três sub grupos de 7, 30 e 60 dias de seguimento onde os enxertos de 1,5 centímetro de comprimento e 0,5 de largura eram colocados metade com Gelfoam® e outra metade sem Gelfoam® na bolsa de enxertia sobre o dorso nasal de coelhos. Após o período determinado, os coelhos de cada grupo

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foram submetidos à eutanásia e a seguir os enxertos foram submetidos a estudo histológico.
Resultados: O grupo experimental foram os que mais apresentaram neovascularização e formação de tecido de granulação e em relação a presença de processo inflamatório agudo e crônico, os resultados se mostraram praticamente iguais tanto nos coelhos do modelo controle quanto no experimental em todos os três grupos.
Conclusão: Não há diferença estatística entre os grupos.

Introduction

The indications for external graft of the nasal dorsum are to elevate the nasal root and nasofrontal angle, especially in cases of short nasal bones, and to camouflage a defect in the middle third of the medium dorsal dorsum.[1]

The preferred materials for support of the nasal dorsum should provide adequate strength, volume, and shape persistence, as well as sufficient availability and capacity to mimic the natural contour of the dorsum.[2-4]

Several materials have been proposed for use in nasal reconstruction, but there is no current consensus on which is the best. Implants are divided into four categories: autologous, homologous, heterologous, and alloplastic grafts.[5]

Autologous grafts, which are obtained from different locations in the body of the patient and are used for nasal reconstruction, are primarily composed of bone and cartilage. Bone can be obtained from the iliac crest, ribs, tibia, skull, and ulna. The cartilage can be obtained from the nasal septum and the auricle for reconstruction of smaller defects, and from the costal cartilage for the reconstruction of major nasal defects.[6]

Homologous grafts are obtained from other individuals of the same species as the recipient and include both cartilage and bone from cadavers, as well as from patients undergoing other surgeries, and subsequently processed in order to diminish contamination and potential host rejection, for use in other individuals of the same species.[7]

Heterologous grafts are obtained from individuals of a different species than the recipient, and the most frequently used graft in nasal reconstruction is bovine cartilage.[8]

The different types of grafts have advantages and drawbacks. Autologous grafts have the benefit of being biocompatible and show little resorption, but may undergo deformation at a later period.[9]

Alloplastic materials have the advantage of being found in different sizes and formats, and they can be molded or shaped during surgery.[8] Currently, there are several types on the market such as silicone, Mersilene® mesh, polyethylene, Silastic® methyl-methacrylate, Supramid® mesh, Teflon®, Proplast®, hydroxyapatite, and Gore-Tex®.[8]

Of the autologous tissues, cartilaginous tissue demonstrates of low antigenicity, which makes grafting feasibility to be closely associated with higher survival and adaptation of chondrocytes to the recipient site. Its nutrition occurs by direct contact with nutrients in the implant bed, as it does not require a vascular supply to maintain its functional structure. And, when compared with bone, cartilage has a lower absorption rate and can be easily shaped or molded.

Auricular cartilage is elastic, similar to hyaline cartilage, but it includes, in addition to collagen fibrils (mainly type II), an abundant network of continuous elastic fibers together with the perichondrium fibers. Elastic cartilage is specially adapted to withstand repeated flexing, grows by apposition, and is less subject to degenerative processes than the hyaline cartilage. Unlike the latter, the matrix of elastic cartilage does not calcify, except as part of the regenerative process.[10]

This study intended to experimentally compare the inflammatory response over time of ear cartilage graftswith or without Gelfoam®, when grafted on the nasal dorsum of rabbits.

Literature review

Below is a summary of the chronologically retrieved articles, of the properties of Gelfoam® contained in the leaflet regulated by the Brazilian Health Surveillance Agency (Agência Nacional de Vigilância Sanitária – ANVISA),[11] as well as some particular characteristics of biomaterials.

Cottle[12] was the first author to introduce the use of compressed cartilage for reconstruction of the nasal contour.

The graft for the nasal bone can be obtained from the vomer bone, perpendicular lamina of the ethmoid bone, turbinate, and frontal process of the maxilla, according to Kosteck.[13]

Peynègre et al.[14] used a mixed graft consisting of bone powder mixed with tissue glue (Tissucol®) and reinforced with Surgicel® to correct irregularities of the nasal dorsum. The graft was placed and positioned between the osteo-cartilaginous supporting structures and the skin with good cosmetic results.

Guerrerosantos,[15] in his studies, used auricular cartilage to augment the nasal dorsum in rhinoplasties, advocating the maintenance of the posterior surface perichondrium attached to the graft.

Jovanovic and Berghaus[16] believe that auricular grafts are almost ideal because: 1) obtaining the material is a low-risk, fast procedure that can be performed under local anesthesia; 2) the ear cartilage is stable enough to produce support and elastic enough to produce contours; 3) it is easy to mold, 4) it has little tendency to displacement, 5) there is no absorption; and 6) there is little rejection potential. Sheen[17] considers that ear cartilage is well applied to cartilaginous dorsum, tip, and stenotic vestibular areas. It is a malleable material, but not too firm. It is not absorbed with time. It should not be used when structural