

# Auricular cartilage graft for nasal reconstruction after Mohs micrographic surgery

Enxerto de cartilagem auricular para reconstrução nasal após cirurgia micrográfica de Mohs

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## ABSTRACT

**Introduction:** Successful restoration of form and function of the nose after Mohs surgery requires thoughtful reconstructive planning. Nasal defects that are deep and extensive, especially those located on the ala, may require a cartilage graft to help restore nasal function, anatomy, and cosmesis.

**Objectives:** To evaluate the usefulness of auricular cartilage grafts in nasal reconstruction after Mohs micrographic surgery, as well as to describe a cartilage graft harvesting technique.

**Methods:** Retrospective study of patients with nasal defects following Mohs surgery who were submitted to an auricular cartilage graft.

**Results:** Ten patients were included in the study. The cartilage graft was harvested from the scaphoid fossa/antihelix in six (60%) patients, and from the concha in four (40%) patients. All scaphoid fossa/antihelix cartilage grafts were harvested through anterior incision, while conchal grafts were removed through posterior incision. One patient developed a hematoma, which drained spontaneously.

**Conclusions:** auricular cartilage grafts are a versatile, reliable, and predictable method of providing structural support in nasal restoration. It is crucial to identify patients who can benefit from this technique. Through careful planning and adequate execution, ear cartilage grafts help to improve nasal reconstructions results in selected cases.

**Keywords:** mohs surgery; ear cartilage; surgical flaps; nose neoplasms; basal cell carcinoma

## RESUMO

**Introdução:** a restauração da forma e função nasais após cirurgia de Mohs requer planejamento cirúrgico adequado. Defeitos nasais extensos e profundos, principalmente localizados na asa, podem demandar enxerto de cartilagem para ajudar a restaurar a função, a anatomia e a estética nasais.

**Objetivos:** avaliar a utilidade de enxertos de cartilagem em reconstrução nasal após cirurgia micrográfica de Mohs, assim como descrever uma das técnicas para sua realização.

**Métodos:** estudo retrospectivo de pacientes com defeitos cirúrgicos nasais decorrentes de cirurgia de Mohs submetidos a enxerto de cartilagem auricular.

**Resultados:** dez pacientes foram incluídos no estudo. O enxerto de cartilagem foi retirado da anti-hélice/fossa escafoide em seis pacientes (60%) e da concha em quatro pacientes (40%). Todos os enxertos de cartilagem da anti-hélice/fossa escafoide foram retirados através de incisão anterior, enquanto os da concha foram retirados por excisão posterior. Houve uma complicação, hematoma, que drenou espontaneamente.

**Conclusões:** Enxertos de cartilagem constituem método versátil, confiável e previsível de fornecer suporte estrutural em reconstrução nasal. É fundamental identificar os pacientes que podem se beneficiar da técnica. Mediante planejamento cauteloso e execução adequada, enxertos de cartilagem auricular melhoram significativamente os resultados de reconstruções nasais em casos selecionados.

**Palavras-chave:** cirurgia de mohs; cartilagem da orelha; retalhos cirúrgicos; neoplasias nasais; carcinoma basocelular

## Original Article

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## INTRODUCTION

The restoration of nasal shape and function after Mohs surgery requires adequate surgical planning. Extensive and deep nasal defects, especially those located in the nasal ala, may require a cartilage graft to help restore function, anatomy, and nasal aesthetics.<sup>1,2</sup> In dermatologic surgery, the most common donor site for a cartilage graft is the ear. When selecting the donor subunit – anti-helix/scaphoid fossa or concha – the differences in the cartilage of these locations, as well as the morbidity and ease of removal of the graft should be considered.<sup>3</sup> Cartilage grafts are usually performed with interpolation flaps.<sup>1,2</sup> However, they can also be associated with single stage flaps, skin grafts, and healing by secondary intention.<sup>4-6</sup> The main functions of the cartilage graft are to prevent tissue contraction and distortion, to

support “heavy” flaps in order to avoid the collapse of the nasal ala, to keep the nasal valve open, and to provide support for a better contour. The purpose of the present study was to evaluate the usefulness of auricular cartilage grafts in nasal reconstruction after Mohs micrographic surgery, as well as to describe a cartilage graft harvesting technique.

## METHODS

### Patients

A retrospective study was performed with 10 patients whose nasal defects resulting from Mohs micrographic surgery needed cartilage graft. The cases were selected from a public hospital, from August 2014 to March 2015.

**CHART 1:** Removal and attachment of a cartilage graft from the anti-helix/scaphoid fossa – Steps and comments.

STEPS	COMMENTS
1. Create a template for the cartilage graft	1. Use the suture package as a template. Cartilage grafts must be longer than the horizontal extent of the defect in order to be appropriately attached (Figure 1A).
2. Transfer the template to the anti-helix/scaphoid fossa	2. Figures 1B-1C. Preferably ipsilateral.
3. Anesthesia	3. Inject anterior and posterior donor area to hydro-dissect the skin of the cartilage, along the perichondrium plane.
4. Decide on the incision site (anterior X posterior)	4. If posterior, suture the middle portion of the helix in the pre-auricular region or ask your assistant to traction the ear (with hooks) in order to facilitate the removal.
5. Incise the skin	5. Incise the skin (it can be slightly curved) equidistantly from the helix's rim and the concha's lateral rim (Figure 1D). Incising too close to the helix's rim increases the risk of tissular contraction and subsequent deformity.
6. Dissect the cartilage	6. Dissect the auricular skin of the cartilage in the supraperichondrial plane. Visualization can be enhanced with the use of hooks (Figures 1E-1F).
7. Incise the cartilage	7. Incise the anterior perichondrium and cartilage, followed by the posterior perichondrium, but do not incise the posterior auricular skin (or the opposite when removing the graft posteriorly). A second incision with the same depth is performed parallel to the first (Figures 1E-1F). The distance between them corresponds to the graft's width. The ends are then incised in a rectilinear – and not conical – manner. Straight ends retain the shape and position of the helix. Elliptical (conical) ends may allow the contraction of the helix's rim, and distortion secondary to contractile healing forces.
8. Keep the cartilage in saline solution	8. Keep the cartilage in saline solution up until it is attached on the nose.
9. Ear closure + dressing	9. The ear is a common site of hematoma after the removal of the cartilage graft. Suture it first placing a temporarily fixed dressing before incising the flap. At the end of the surgery, check the donor area's hemostasis and suture a definitive fixed dressing (48-72 hours). A small dental cotton roll allows greater hemostasis than a gauze. The borders of the ear cartilage should not be reapproximated. The suture is performed in a continuous manner with 5.0 mononylon thread. Internal sutures are not required.
10. Prepare the cartilage graft	10. If necessary, trim the graft in order to obtain the desired thickness, shape, borders, and contour. For this step, use a razor blade or a scalpel blade number 15. The razor blade allows the cartilage to be sculpted in a more delicate manner (Figure 2B).
11. Suture cartilage graft on the nose	11. Create “pockets” on each side of the defect with a scalpel blade. The cartilage must be inserted in these pockets (Figure 2C). A Pfigure-8 suture helps to stabilize the free end of the cartilage. The U-suture or a simple interrupted suture help to stabilize the graft over the underlying cartilage (e.g. a graft for the tip of the nose) or to stabilize the cartilage at the alar rim (Figure 2D).

Based on the review and analysis of medical records and extensive photographic documentation, the following demographic and surgical data were analyzed: age, gender, tumor characteristics, subunits involved, number of Mohs stages, additional measures for patient comfort, type of repair performed, cartilage donor area (auricular subunit and location of incision), use of anticoagulants, smoking habits, complications, follow-up and results. Before or after surgery, all patients signed a free and informed term of consent authorizing the publication of the photographs in scientific journals. All procedures (Mohs surgery to remove the tumor and subsequent reconstruction) were performed under local anesthesia. Local nerve blocks supplemented local anesthesia in some cases. Patients received oral benzodiazepines for comfort when required, before or during the procedure. All patients were restored with interpolated flaps, with a second stage being necessary three to four weeks after the first surgery.

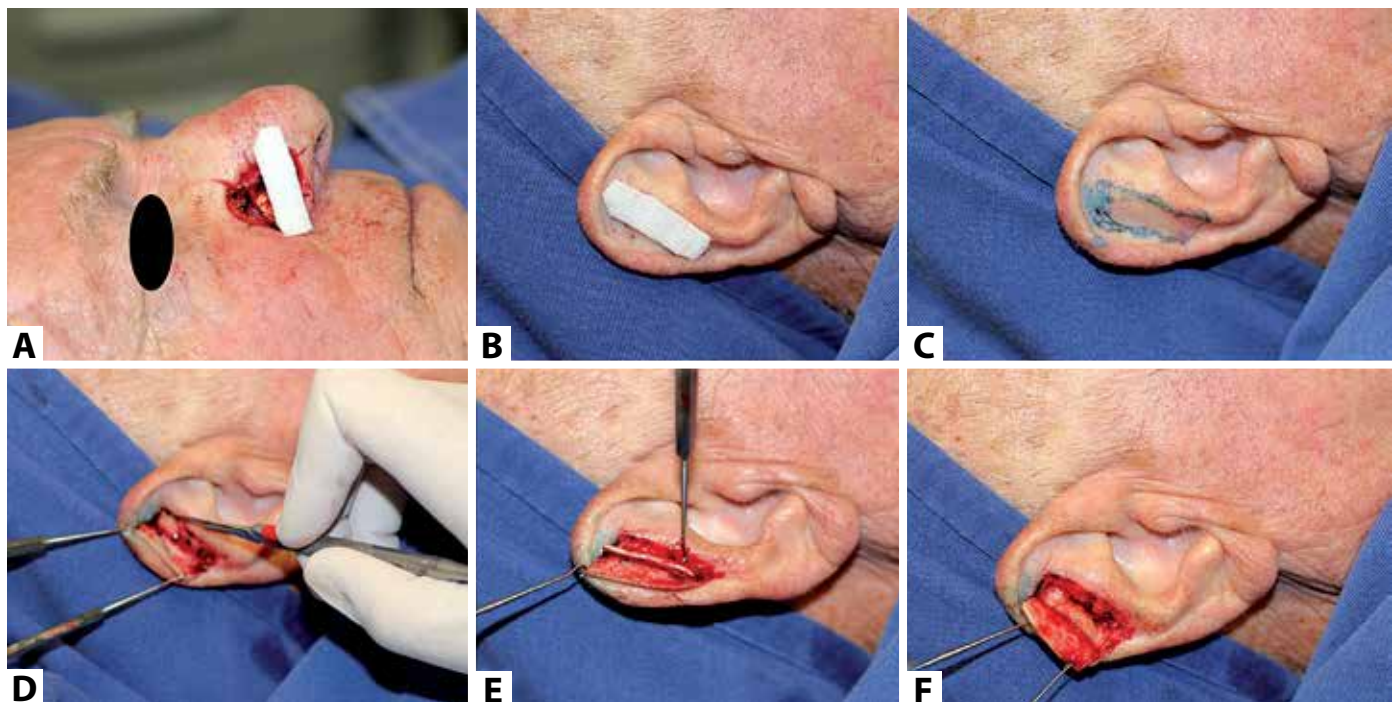
*Harvesting technique*

Chart 1 describes step-by-step how to perform the removal and attachment/fixation of the anti-helix/scaphoid fossa cartilage graft. If harvesting from the conchal bowl, technique is similar. The entire concha can be removed without significant risk of auricular distortion. However, removing the graft too close to the ear canal should be avoided due to the risk of late post-operative retraction. (Figures 1-3)

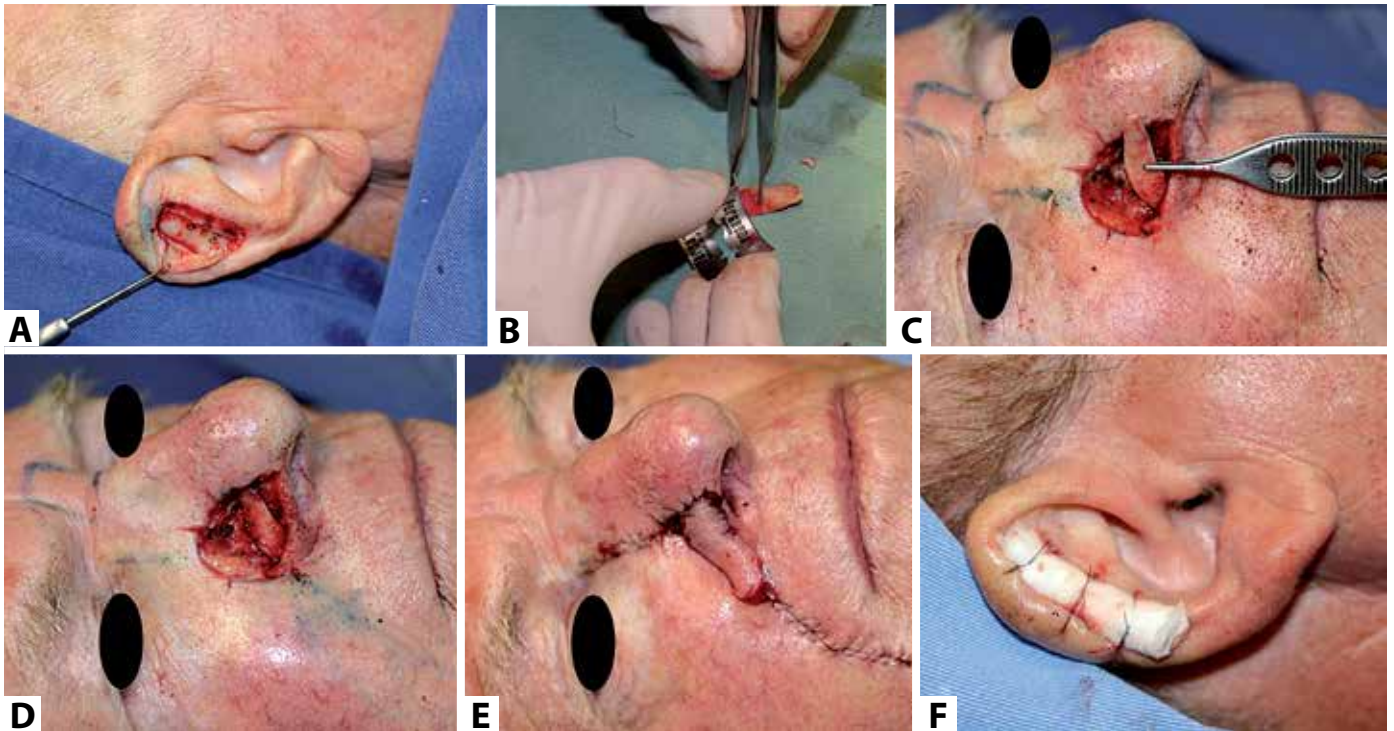
**RESULTS**

Ten patients were included in the study. Demographic and surgical data are shown in Table 1. The patients' ages ranged from 39 to 78 years (mean = 66 years) and most were men (eight men and two women). All tumors were basal cell carcinoma and the most common subtypes were infiltrative (n = 4) and nodular (n = 4). The remaining patients had mixed basal cell carcinoma, with infiltrating and nodular components. The number of Mohs surgery stages needed to obtain free margins ranged from 1 to 4 (mean = 1.7). Regarding additional measures for patient comfort, 3 (30%) received oral benzodiazepines (0.5 mg to 1.0 mg lorazepam) as adjuvants for local anesthesia. Infraorbital nerve block was performed in 5 patients (50%). Seven patients (70%) had defects located mainly on the nasal ala, and were repaired with a nasolabial interpolation flap alone or combined with other closure methods. Three (30%) patients had more extensive defects affecting multiple nasal subunits and were repaired with paramedian forehead flaps. The cartilage graft was removed from the antihelix/scaphoid fossa (n = 6) or concha (n

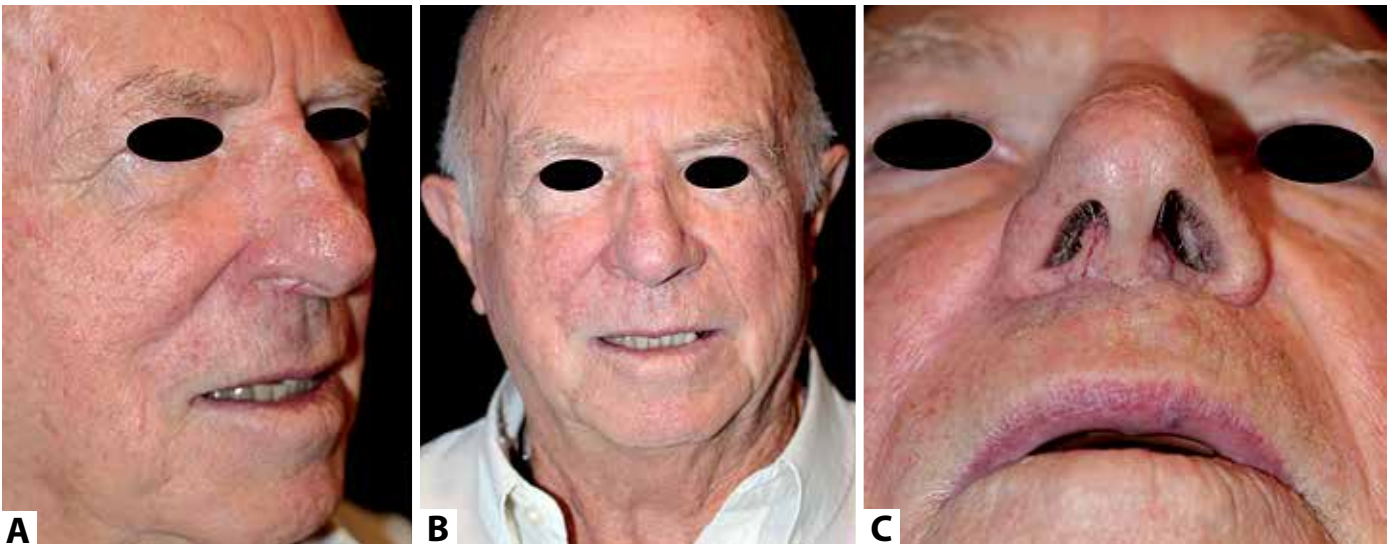
TABLE 1: Demographic and surgical data				
Age (years)	Gender	Tumor	Mohs stages	
39 to 78	2 women	infiltrative BCC	4	1 to 4
(average = 66)	8 men	nodular BCC	4	(average = 1.7)
		mixed BCC	2	



**FIGURE 1:** A) The graft's template must be longer than the horizontal extent of the defect in order for it to be properly fixed; B-C) Template transferred to the antihelix/scaphoid fossa and marked; D) Anterior harvesting of the cartilage graft. The skin is incised and folded in order to allow the visualization of the cartilage; E) Auricular skin is dissected from the cartilage in the supraperichondrial plane; F) Cartilage folded prior to the incision. Note the use of hooks in order to avoid unnecessary trauma.



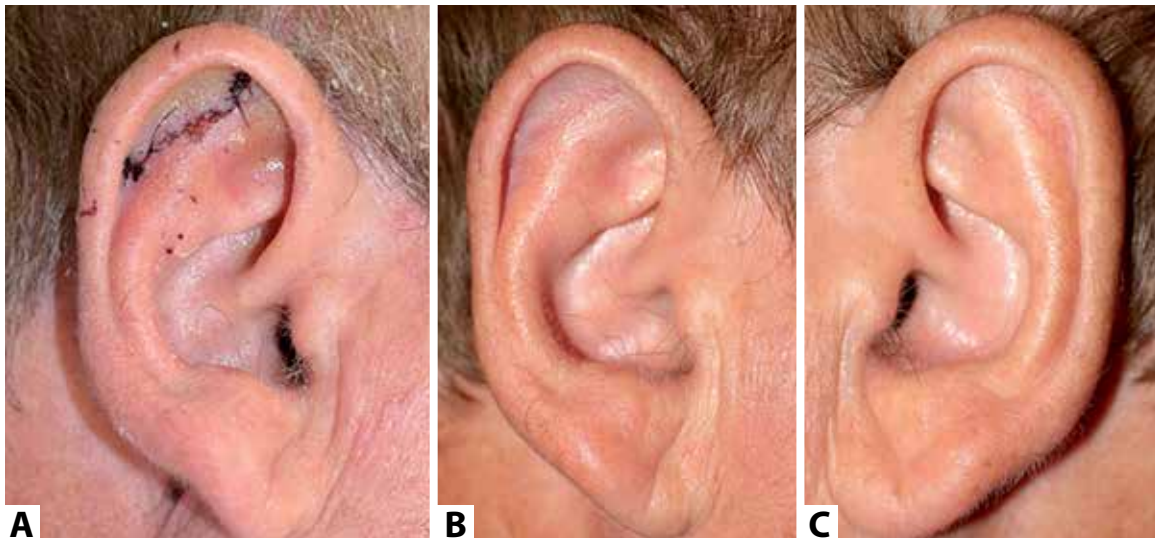
**FIGURE 2:** A) Anti-helix/scaphoid fossa after cartilage graft harvest. The borders of the cartilage are not reapproximated; B) The cartilage can be trimmed if necessary; C) Graft being inserted in the “pockets” created on the nose; D) Sutured cartilage; E) Nasolabial interpolation flap for right nasal ala repair, immediate post-operative period (first stage). The portion of the defect that extended to the nasal sidewall and malar region was closed primarily F) Dressing fixed and sutured in the donor area (the last picture is of a different patient).



**FIGURE 3:** A-C) Two months after surgery; patient from Figures 1 and 2

= 4). All cartilage antihelix/scaphoid fossa grafts were removed via anterior incision, while conchal grafts were removed via posterior incision. Three patients had full-thickness defects. In one of them, the nasal mucosa was recreated with a hinge flap from the nasal sidewall while in the other two, it was closed primarily due to the small size of the mucosal defect. Only one patient was a smoker. No patients were on anticoagulants. One of them, however, had post-operative bleeding and hematoma,

which drained spontaneously. Excellent functional and aesthetic results were achieved in all patients. There was no infection, hypertrophic scarring, keloid, or distortion of the ear in any of the cases, and the donor area has become virtually unnoticeable after a few months. (Figure 4). The follow-up period ranged from two to nine months (average = seven months), without tumor recurrence.



**FIGURE 4:**  
**A)** Cartilage donor area one week after, with proper healing and without functional or aesthetic deformity. Repair performed with a running simple suture, 5.0 nylon. Internal sutures are not necessary  
**B)** One month after surgery, almost imperceptible scar  
**C)** Contralateral ear of the same patient

**DISCUSSION**

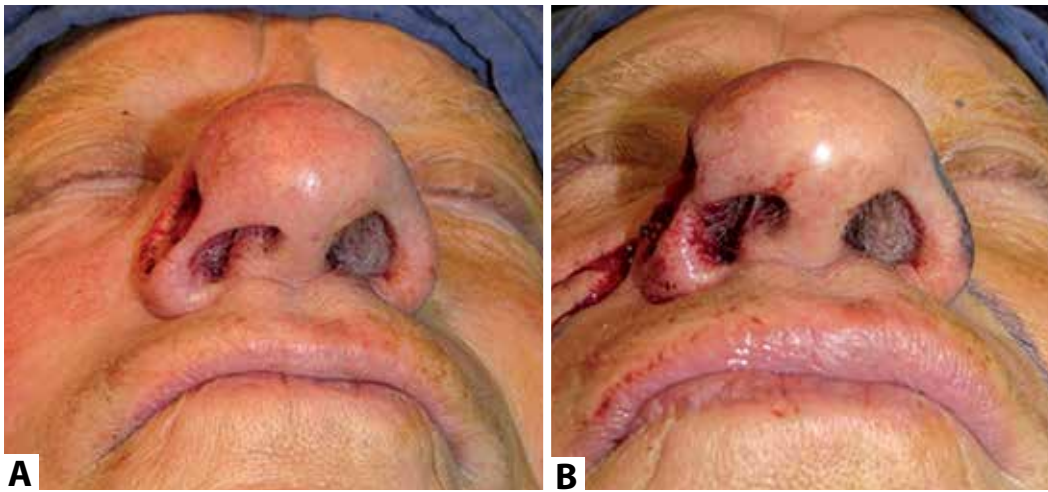
Many factors must be taken into consideration when planning a nasal reconstruction. In most patients, soft tissue restoration is sufficient to obtain optimal functional and aesthetic results. However, in certain cases an auricular cartilage graft can be necessary for the proper restoration of the nasal ala and valve.<sup>4</sup> It is crucial to recognize those patients who will benefit from the cartilage graft. Signs that help to identify them include the spontaneous collapse of the nasal ala/valve or during the inspiration after the removal of the tumor, or retraction of the nasal rim. In some cases, even without retraction of the rim during surgery, it may occur later due to scarring. The precise location for the fixation of the graft, as well as its size and shape, will result in different benefits. If the objective is only to avoid or correct the retraction of the nasal rim, the cartilage graft can be smaller and should be inserted considerably close to the alar rim (Figure 5). If, however, there is a major collapse of the nasal valve/ala (Figure 6), the cartilage graft should be

larger and be placed in the middle and upper thirds of the ala. For the projection of the nasal tip, the grafts should be directly placed on it. Cartilage grafts can be structural (native cartilage is present but there is a need for additional cartilage to support) or restorative (replacement of removed cartilage). Cartilage grafts for the nasal ala are usually structural and non-restorative, since there is no cartilage in most of the nasal ala, but only fibrofatty tissue. Structural functions of the cartilage include: 1) to prevent tissue contraction and distortion, 2) to support “heavy” flaps, 3) to maintain the nasal valve open, and 4) to provide support for the contour.<sup>7</sup> Cartilage donor areas include the anti-helix/scaphoid fossa and the auricular concha.<sup>4,8</sup> Cartilage from the anti-helix/scaphoid fossa is ideal for long, flexible, and straight segments, while that of the concha is ideal for grafts that require more curvature, substance, and stiffness.

In the present study, 6 patients (60%) had a cartilage graft removed from the antihelix/scaphoid fossa, while 4 patients



**FIGURE 5:** **A)** Retraction of the alar rim (arrow) after Mohs surgery for basal cell carcinoma removal in the left nasal ala  
**B)** Improvement of the retraction after cartilage graft (arrow) **C)** Two months after surgery



**FIGURE 6:** A) Collapse of the nasal ala after the resection of a BCC in the right nasal ala, even without removal of the alar cartilage; B) Opening of the ala after fixation of the auricular cartilage graft

(40%) had it removed from the concha. Of these, 3 patients had large defects that were repaired with a paramedian forehead flap (Figure 7).

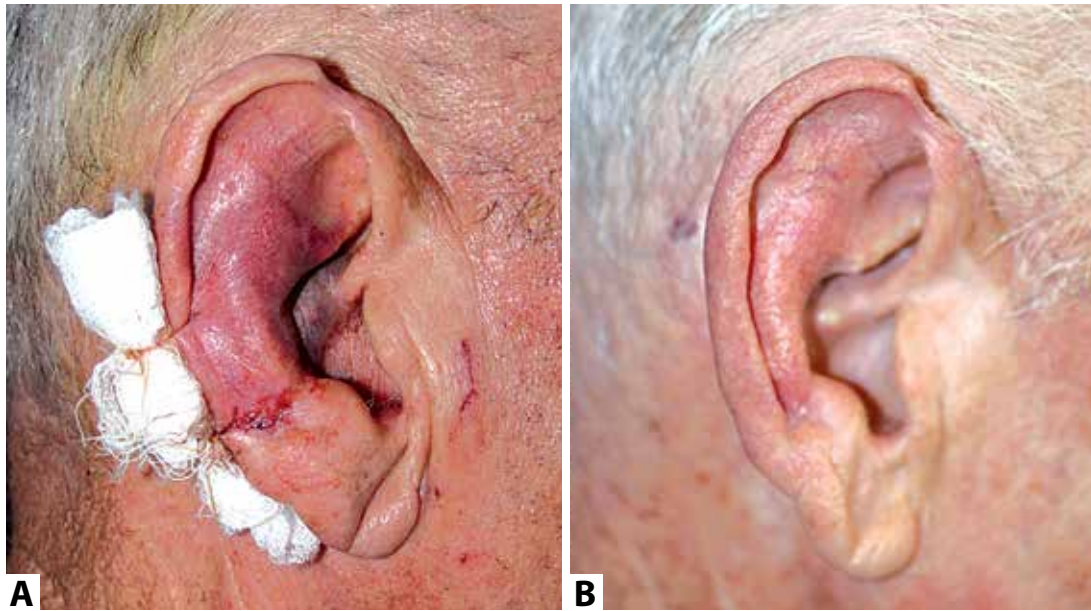
The incisions for removing the cartilage can be performed anteriorly or posteriorly. Anterior incisions are easier to access, however they result in more visible scars.<sup>1,2</sup> Although grafts from the antihelix/scaphoid fossa were removed anteriorly, the incision healed well and was hardly noticeable in all patients. It may be necessary to sculpt the graft to obtain the desired thickness, shape, borders, and contour. This must be done

carefully, since the cartilage is a fragile structure and may fracture during the process. A scalpel blade 15 is traditionally used to carve, however a razor blade allows the graft's contours to be sculpted more gently. Cartilage grafts can be safely harvested under local anesthesia with low complication rates.<sup>1-3,9</sup> Post-operative pain at the cartilage donor site can be significant, therefore adequate analgesia (non-steroidal anti-inflammatory/powerful analgesic) must be provided to all patients.<sup>1,2</sup>

The primary disadvantage of the cartilage graft is the additional morbidity of creating a second surgical site. Although



**FIGURE 7:** A) Auricular conchal graft harvested through posterior incision B) Cartilage sutured (arrow) in order to support the paramedian forehead flap and prevent the collapse of the nasal ala and valve C) Five months after surgery



**FIGURE 8:** **A)** Hematoma following cartilage graft harvest from the concha by a posterior incision, probably due to the improper placement of the fixed dressing. **B)** Three months after surgery without compromising the final result of the donor area

rare, hematoma, infection, non-infectious chondritis, and anatomical distortion can occur in the donor ear.<sup>10</sup> Careful hemostasis and a bolster dressing placed for 48 to 72 hours help to prevent the formation of hematomas. The only patient who developed post-operative hematoma had the dressing placed inappropriately, too far from the real donor area. Therefore, bolster dressings should be placed in the precise location of the incision. If necessary, they can even be fixed anterior and posteriorly. None of the patients developed infection or non-infectious chondritis in the present study. However, all were given oral antibiotics post-operatively due to the length of the surgery, the performance of a cartilage graft and the location of the defect (nose) – though this recommendation is controversial.

In a recent study by Sage *et al.*,<sup>3</sup> the donor area's complication rate (3%) was lower than in the present study (10%, corresponding to one hematoma). The reduced number of cases in the present study, however, results in a single complication having a greater statistical impact. (Figure 8)

## CONCLUSION

Ear cartilage grafts are a versatile, reliable, and predictable method of providing structural support in nasal reconstruction. They can be easily, quickly, and safely harvested, without harming the donor area. It is crucial to identify patients who can benefit from the technique. Through careful planning and proper execution, auricular cartilage grafts significantly improve the results of nasal reconstructions in selected cases. ●

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