

## Review Articles

### Autores:

Bhertha M. Tamura<sup>1</sup>  
Ana Carolina Junqueira Ferolla<sup>1</sup>  
Cândida Naira L. e L. Santana<sup>2</sup>

<sup>1</sup> Pontifícia Universidade Católica de Campinas - (PUC - Campinas) - Campinas(SP), Brazil.

<sup>2</sup> Hospital do Servidor Público Municipal - São Paulo (SP), Brazil.

### Correspondence:

Bhertha M. Tamura  
Av. Ministro Gabriel de Rezende Passos, 500 Conj. 1506  
04521 022 - São Paulo - SP,  
Brasil  
E-mail: bhertha.tamura@uol.com.br

Received on: 11/11/2017

Approved on: 18/02/2018

Study conducted at the Department of Dermatology, Barradas Outpatient Clinic of Specialties - São Paulo (SP), Brazil

Financial support: None

Conflict of interests: None



# Literature review: Auricular disorders Part 1- physical and thermal change related traumas

*Revisão da literatura: afecções auriculares parte 1: traumas físicos e por alteração térmica*

DOI: <http://www.dx.doi.org/10.5935/scd1984-8773.201810102>

## ABSTRACT

The ear is a structure with anatomical peculiarities. It is located in an area exposed to trauma and susceptible to a series of dermatoses that are often underdiagnosed by dermatologists and deserve attention. A literature review was carried out including the embryology and anatomy of the auricular pavilion, as well as the diagnosis and treatment of traumatic lesions of physical nature and due to changes in temperature, among others.

**Keywords:** Anatomy; Ear; Ear diseases

## RESUMO

*A orelha é estrutura com peculiaridades anatômicas, localizada em área exposta a traumas e suscetível a uma série de dermatoses que merecem atenção, muitas vezes subdiagnosticadas pelos dermatologistas. Realizou-se revisão de literatura incluindo a embriologia e a anatomia do pavilhão auricular, bem como diagnóstico e tratamento das lesões traumáticas de natureza física e por alterações de temperatura, entre outras.*

**Palavras-chave:** Anatomia; Orelha; Otopatias

## INTRODUCTION

The ear is divided into three main parts: outer ear, middle ear and inner ear. The outer ear comprehends the pinna and the ear canal.<sup>1</sup>

The pinna or auricle arises from the second pharyngeal arch and can be seen for the first time in the 6<sup>th</sup> week of gestation. The lining of the external auditory canal is contiguous with the skin and with the external surface of the tympanic membrane, is ectodermal in origin<sup>1</sup> and has modified apocrine glands known as ceruminous glands and sebaceous glands, both associated to hair follicles.<sup>2</sup>

Due to its anatomical location, the auricle is subject to trauma and exposed to temperature changes, besides presenting many signs associated to different cutaneous and systemic conditions.

## THE EAR

The pinna develops from the first pharyngeal arch and is composed primarily of cartilage and skin, which are firmly adhered to the anterior region and, in lesser degree, to the posterior. Due to its anatomical location, the pinna is commonly exposed to the sun the cold. Neoplasms of the cartilage are rare in the pinna; most of them occur in the skin or annexes.

The external auditory canal measures 2-3 cm in length and is made by a cartilaginous portion in a bony portion. Only

the cartilaginous portion has hair follicles, sebaceous and ceruminous glands. In the upper and posterior portion of the canal, the cartilage is incomplete and filled by fibrous tissue. The temporomandibular joint and the parotid gland are found in the anterior region of the auditory canal, and the mastoid bone and the facial nerve are located posteriorly.

The innervation of the pinna and the external auditory canal comes from the great auricular nerve, through the auricular branch of the vagus nerve, auriculotemporal branch of the trigeminal nerve and lesser occipital nerve.<sup>1</sup>

### EMBRYOLOGY

The development of the outer ear begins at the end of the 4<sup>th</sup> week of gestation from six auricular hillocks. Congenital malformations during the fusion of the hillocks are not rare because of their complex development.

The first ones appear on the lower cervical region and elongate towards the skull with the development of the mandible, changing the position of the conchae to the same level as the eye. The lower position of the conchae is frequently associated to malformations, most of them chromosomal.

The external auditory canal is formed from the posterior portion of the first pharyngeal groove inwards as a funneled tube until it reaches the endodermal lining of the tympanic cavity. In the beginning of the 9<sup>th</sup> week, the epithelial cells of the floor of the ear canal proliferate and form a plaque of the ear canal. This plaque degenerates in in the 7<sup>th</sup> month, and when it remains, congenital deafness develops.<sup>1,2</sup>

### EAR ANATOMY

The outer ear comprises the earlobe inferiorly, a soft and round structure. The outer frame contiguous to the earlobe is a firm structure known as helix. Superior to the helix is the scapha, medially the antihelix (frame opposite to the helix) and in its caudal end the antitragus. Medially to the antihelix, the cartilage forms the concha, and superiorly another concavity known as triangular fossa. The tragus is found medially in the area of attachment of the ear to the cephalic segment around the auditory canal (formed by the tympanic portion of the temporal), which it protects, in the shape of an "S" (Figure 1).

The muscles of the ear are rarely appreciated because of their rudimentary features but need to be known and described. They can be considered muscles of facial expression belonging to a system of sphincters, which in many animals is quite distinct with functions of movement of the ears or closure of the auditory canal during hibernation.<sup>1,2</sup> The ear is intensely vascularized, particularly in the lobe, and the vessels can be found at its base.

### TRAUMA/HEMATOMA

Trauma of the pinna frequently occurs due to contusion, laceration or loss of the whole pinna. In some cases, the pinna can be resutured successfully. The reconstructive technique must follow the basic principles of plastic surgery. The cutaneous suture should be performed cautiously with meticulous control of bleeding, because the skin is juxtaposed to the underlying

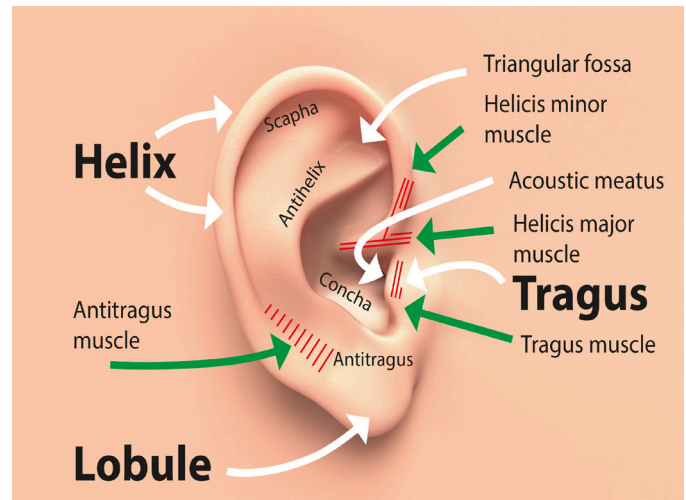


FIGURE 1: Schematic representation of the surface anatomy of the ear

cartilage. Areas that are extremely macerated should be removed with the aim of minimizing deformities and scars.

Hematoma (Figure 2) of the pinna occurs not only in wrestlers, boxers, rugby, soccer players and other sports, but it is also common in children. Hematomas are common in contact sports such as wrestling, due to the exposure of the ears. When the ear is struck, a detachment between the perichondrium and the cartilage can occur, creating a space filled with blood, forming a hematoma. Since the cartilage does not have its own blood supply, this space can lead to necrosis or infection.

Trauma is the most common cause of hematomas although blood dyscrasias can lead to small hemorrhages. The external region of the pinna is the most affected area due to its exposed location. Blood builds up quickly after a trauma, dissecting the tissue between the perichondrium and the cartilage, originating a purple collection involving the whole pinna. If this collection is not treated early, the blood rearranges into a fibrous mass, leading to cartilage necrosis by regional ischemia. The cicatricial mass, particularly after repetitive trauma, creates a deformity known as "cauliflower ear".<sup>3</sup>

Treatment is based on prompt drainage of the accumulated blood. Due to the possibility of developing perichondritis, it must be done under sterile conditions. Large-spectrum antibiotics are used, including those with action against *Pseudomonas aeruginosa* pre- and post-operatively. The incision should be parallel to the helix, in the scapha, and must be large enough to allow complete aspiration of the hematoma, as early as possible to avoid its rearrangement. In this case, curettage would be needed. Small drains can be inserted to prevent a new collection of blood or serum forming, however, they must not be left for longer than 48 hours because of the risk of infection.

A pressure dressing must be adapted to the shape of the ear over the area of the hematoma and another in the posterior region of the pinna, and a suture that runs through the whole pinna can be used. It should be kept in place for at least 48 hours. Small residual collections should be drained according to sterile



FIGURE 2: Hematoma



FIGURE 3: Edge of the debrided wound after rupture of the earlobe

techniques. Antibiotic is used for 5 to 7 days, and perichondritis should be treated immediately.

### LACERATIONS AND ABRASIONS

Pinna lacerations require meticulous and thorough closure, realigning the fragments and maintaining its outline. A comparison with the opposite ear should be made so as to maintain symmetry as much as possible. Lacerations and abrasions should be treated under local anesthesia, however, in children and in severe or extensive cases general anesthesia is the best option. Cases of laceration and rupture of the earlobe are common due to trauma of earring piercings.<sup>4</sup>

The wound should be inspected and thoroughly and insistently washed to remove any foreign or necrotic material. A debridement must be performed (Figure 3) in the most conservative way possible. Simple skin lacerations are generally closed with 6-0 nylon sutures and the cartilage with absorbable sutures. It might be necessary to remove a small strip of cartilage along the laceration to facilitate closure of the perichondrium. The original shape of the border of the helix must be maintained.

Pressure dressings are required for 24 hours, and oral antibiotics for 1 week. When the laceration extends to the auditory canal, a dressing is applied inside the canal to help mold it after suturing, keeping it in place for several weeks in order to avoid stenosis.

Abrasions should be cleaned and covered with gauze, antibiotic and occlusive dressing for 24 hours. After removal, the wound is treated only with plain dressings until reepithelization occurs. If there is intense pain under the dressing, it should be removed immediately and the wound should be thoroughly inspected in search of signs of ischemia, hematoma or infection. When suturing is needed, it should start from the most difficult area of surgical access, such as the auditory canal and concha, finishing the surgery in the periphery. In some cases of extensive lacerations, wedge resection or minimal debridement is required, and the edges should be brought close in a way as not to alter the normal curvature of the ear.

In extensive abrasions or when small pieces of skin are lost, the lesion must be exhaustively cleaned and occlusive dressing with vaselinated rayon gauze must be applied. Epithelization will occur satisfactorily in 7 to 10 days, since the ear has a great ability of secondary healing.

In the cases with significant loss of skin<sup>5</sup> and exposure of the perichondrium, skin grafts are used for the repair. The preferred donor site is the contralateral postauricular region because it has similar color and texture.

When there is loss of perichondrium with exposure of the cartilage, the following can be used: wedge resection and primary closure, local flap, excision of the cartilage and skin graft, or maintenance of the open wound. Wedge resection with primary closure is used when the lesion is small or has a peripheral location.

When local flaps are used, the preferred area is the postauricular region. In some cases, the flap can be taken to the exposed area and, in a second stage, return it to its origin using a skin graft in the stump area. In other cases, the cartilage can be resected with a graft placed in the stump area. This procedure has the advantage of involving only one stage.<sup>6</sup>

Another alternative would be to maintain the wound open, frequently changing the dressing with gauze soaked in saline, waiting for the formation of granulation tissue and performing secondary repair subsequently.

### PARTIAL LOSS OF THE PINNA

When there is a substantial detachment of the ear but the blood flow is preserved by a small pedicle, the tissues should be sutured to their original locations, with as little trauma as possible. For the fixation of the cartilaginous framework, 6-0 monofilament nylon sutures should be used with the goal of keeping it in position. It is necessary to reevaluate tissue viability 48 hours after the initial procedure.

Strauch<sup>3</sup> observed that the ear survived when the pedicle was made of only one portion of the lobule or of a small segment close to the insertion of the pinna on the cephalic seg-

ment. The ideal treatment in partial avulsions with cartilage exposure should aim for its immediate closure. The cartilage can be preserved with a graft or a partially adhered segment, covered by adjacent flap or buried under the flap (pocket technique). Traumas can range from partial to total loss of the pinna. After anesthesia, cleaning and debridement, as already described, the extension of tissue loss and the state of the remaining structure determines if the wound can be sutured primarily or if it will need reconstruction.

Loss of skin with intact perichondrium can be repaired with a partial or total graft. Postauricular skin provides tissue that matches the skin of the pinna; supraclavicular areas can also be used. If there is loss of skin and perichondrium, a vascularized tissue is needed to cover the cartilage. We can then use a flap from the pre or postauricular area but preauricular flaps can seem thick for the lateral aspect of the pinna and have less than satisfactory cosmetic results. If the area of cartilage exposed is small, it can easily be excised and the edges of the wound sutured together. If none of these options is possible, we can wait for tissue granulation, maintaining with local dressings until a graft can be done.

Reconstruction of total tissue loss,<sup>5</sup> such as the helix, earlobe and segmental defects affecting the upper, middle or lower aspect of the pinna can be quite complex or require multiple steps. The method of choice for reconstruction will depend on the size of the defect. Defects with less than 2 cm can be transformed into small ellipses and closed primarily. Benchemam et al<sup>7</sup> described a technique (Antia-Buch) with the use of upper and lower chondrocutaneous flaps of the helix adjacent to the defect. After incision of the skin and cartilage of the lateral aspect of the pinna, the skin of the medial aspect is widely undermined allowing advancement of the flaps over the defect. These advancement techniques can correct large defects, however, sometimes the reduction in size of the ear is not acceptable. In these cases, a reconstruction in stages must be performed, bringing another tissue to the defect to reconstruct the helix. There is a variety of techniques for rotation of tubular flaps for this purpose. Another option involves advancement of the skin of the medial aspect of the pinna and of the postauricular area, that can be combined to cartilage grafts. This technique can be used in larger ear lesions. When multiple surgical steps are needed, the cartilage must not be left exposed. It can be covered embedding it in the postauricular skin where the affected area is washed, cleaned, dermabraded and anatomically sutured to the remaining ear stump. Therefore, a postauricular pocket or tunnel is created, which protects this stump. Two weeks later, the embedded portion is re-exposed in order to complete epithelization. This provides an adequate protection, and the overlying skin can be used for the first phase of the reconstruction. Cartilage from the contralateral concha can be used for a composite graft. This technique can also be used to reconstruct the ear with a larger segment loss.

### TOTAL AVULSION OF THE PINNA

In the literature, the success of reimplantation of completely avulsed was possible with aggressive treatment with in-

travenous antibiotics, anticoagulants and vasodilators. Venous congestion should be relieved through multiple punctures or incisions to allow drainage.

Microsurgery is performed whenever possible nowadays, with new vascular anastomosis conducted with microsurgical techniques. Anticoagulation, antibiotic therapy, frequent dressings and venous drainage techniques are also needed.

The part amputated should be transported in sterile conditions, cooled and resutured as quickly as possible. When it is not possible to rescue it, we can opt for fixed prosthesis, osseointegrated implants or total reconstruction of the pinna.<sup>6</sup>

Ear amputations have an extremely complex surgical solution. Until recently, the only possible option was saving the cartilaginous framework.

Careful attempts of saving the extremely damaged cartilaginous framework can make reconstruction difficult. This occurs because the traumatized or damaged cartilage generates inadequate details or protrusions.

Current reconstruction techniques using autogenous cartilage grafts covered by flaps of the fascia of the temporal muscle offer better results than those achieved with attempts of conservation of cartilage in distant sites.

In amputation cases that are treated with placement of the denuded cartilage underneath the postauricular flap and release of the flap in 2 to 4 weeks, late retraction of the inserted segment is seen, as well as loss of the outline and contour of the ear.

Reconstructions with autogenous cartilage using a segment of the contralateral concha or rib cartilage associated to proper cutaneous coverage frequently yield more acceptable ears from the cosmetic point of view.

Reimplantation of large segments or of the whole ear is sometimes destined to failure, except if the recipient area is first prepared to increase vascularization.<sup>3</sup>

### ANIMAL BITES

Basic concepts of repair of ear lesions are described previously with some specific considerations. First, identify the animal (including human) and extension of the lesion. As with other wounds, photographic documentation is necessary, as well as tetanus prophylaxis and investigation regarding rabies prophylaxis.

All patients should be treated with antibiotic. Such lesions are contaminated by aerobic and anaerobic microorganisms,<sup>4</sup> the most frequent being detected in human bites: *S. aureus*, *Pasteurella multocida*, *Streptococci*, *Bacteroides* and *Fusobacterium* sp. Penicillin or ampicillin covers most pathogens, including *P. multocida*. Amoxicillin/clavulanate and ticarcillin have a broader spectrum of action, including *S. aureus* and beta-lactamase positive. Treatment begins with thorough cleaning and irrigation of the wound. If it is very large and requires surgical reconstruction, the timing must be considered (early/late). It is controversial, but late reconstruction in cases of severe human bites or in those that occurred many hours before is possible if it is earlier than 5 hours, with the wound clean and able to be primarily closed. In



case the repair cannot be performed immediately, local dressings should be applied until there is granulation tissue in the area, and it is clean and free of infections.

### LESIONS BY THERMAL CHANGES

#### Cold or freezing

Localized trauma resulting from exposure to the cold,<sup>8</sup> being tissue loss due to direct cellular and vascular damage. Animal studies show that after freezing, chondrocytes show immediate evidences of injury followed by minimal changes in the epidermal cells. However, the microvasculature shows dramatic changes, with detachment of endothelial cells from the internal elastic lamina (ice crystal formation), stasis and extravasation of red blood cells, interstitial edema, low flow and tissue necrosis. Release of arachidonic acid metabolites, thromboxane A2 and prostaglandins worsen the necrosis and act in the regulation of blood vessels in an unclear way, leading to tissue ischemia and loss.

Frostbite can be superficial or deep. Deep tissues remain intact if freezing is superficial, what does not happen when it reaches deeper layers.

This type of lesion is more frequent in cold climates and the auricular region is frequently affected because of its exposed location and the low amount of subcutaneous tissue to protect the blood vessels. Wind, humidity and temperature determine the severity of the lesion. Initially, there is vasoconstriction turning the ear pale and cold to touch, particularly in the most exposed areas. Hyperemia and edema follow, that impair capillary permeability even further. Crystallization of the intracellular fluid can be primarily responsible for this. The ear becomes edematous, erythematous, soft and can present bullae with fluid discharge through the skin. In the final stages of a cold burn, regional capillaries become filled with red blood cells due to the low flow through them and loss of serum due to abnormal permeability. Recovery is slow due to obstruction, thrombosis and ischemia, that lead to necrosis of the affected tissue.

Treatment is based on the severity of the lesion. The ear should be treated gently to minimize injury in a tissue already damaged and devitalized. Massage and other manipulations should be avoided. Allow ear temperature to gradually return to body temperature. When vasodilation occurs, pruritus and intense pain will occur, which should be controlled with analgesics. In children, restraining the hands is necessary. In severe cases or in those with prolonged exposure, the use of anticoagulants to minimize thrombosis and intravascular coagulation is recommended, and this treatment should be continued until the exact damaged area is identified. In all cases, combined estrogens and bioflavonoids can be used intravenously to improve abnormal capillary permeability. Antibiotics might be necessary to prevent infection of the devitalized tissue. If necrosis of some areas of the pinna becomes obvious, we must wait until it is completely defined before surgical excision is performed. Spontaneous detachment of the devitalized tissue allows for minimal surgery and a better cosmetic result. If there is suggestion of infection and gangrene, surgical excision must be performed immediately.

Cold can also be an important factor in juvenile spring eruption, chondrodermatitis nodularis helices, chilblains, lupus erythematosus and cryoglobulinemia. Lesions similar to those caused by the cold can be triggered by the excessive use of ethyl chloride spray for ear piercings.<sup>2,5</sup>

### BURNS

The pinna is particularly susceptible to thermal trauma<sup>9</sup> because of its exposed location and to the minimal amount of subcutaneous tissue between the skin and perichondrium. Tissue can be lost by direct thermal trauma and progressive dermal ischemia seems to be the result of a complex interaction of factors, including increased vascular permeability with significant edema formation and release of chemical mediators with potent effects on vascular function. The damaged tissue functions as a substrate for infections and, finally, cartilage loss and subsequent auricular deformity.

First degree burns affect only the epidermis. The ear becomes erythematous, warm and painful to touch, and a watchful waiting approach must be used. Second degree burns involve the epidermis and part of the dermis and can be subdivided into deep and superficial. Third degree burns or full-thickness are those where there is complete destruction of the epidermis and dermis. Many times, the differentiation between a partial deep burn and a full-thickness burn can be challenging. Mild edema can occur with a deep burn and a full-thickness burn might not present with pain or tissue dissection, leading to partial or total amputation of the ear. The lack of pain sensation does not help to determine the depth of the burn, because it varies in second and third degree burns. The main caution in cases of second and third degree burns is the prevention of chondritis, a serious infection that also leads to loss of cartilage. A meticulous care of the wound should be undertaken, and local pressure avoided. Purdue<sup>9</sup> described regimens that involve gentle washing of the ear and use of antibacterial soaps once or twice a day, followed by the application of topical antibacterial creams, reducing the incidence of chondritis to 0% to 3%. Exposed cartilage due to severe burns should be covered with vascularized tissue in the attempt of preserving it.

### ARTIFACTUAL OR IATROGENIC LESIONS

The majority of other forms of trauma tend to be artifactual or iatrogenic. Piercing can lead to infection, and the complications from this procedure can reach up to 34%, with keloid formation, nickel contact dermatitis and earlobe pseudolymphoma. Rupture of the tympanic membrane and acquired atresia of external auditory canal usually result from surgical trauma or inadequate attempts to remove foreign bodies or impacted cerumen. Contracture of the external auditory canal can follow burns.

### ACANTHOMA FISSURATUM

Fissured lesion, sometimes presenting as an erythematous, scaly papule resembling an actinic keratosis. It occurs behind the ear or on the upper portion of the ear, at the junction with the

scalp and is caused by ill-adjusted eyeglass temples. The differential diagnosis includes basal cell carcinoma, actinic keratosis and early stage squamous cell carcinoma.<sup>6,10</sup>

### FOREIGN BODY

Foreign bodies in the ear canal are a common scenario at the emergency departments, more commonly in those younger than 5 years of age. They can be asymptomatic or painful, cause inflammation or infection of the external auditory canal,<sup>3</sup> otorrhea and tinnitus.<sup>11,12</sup>

In childhood, most correspond to small objects and grains, and in adults, the cotton in cotton buds. Treatment is washing the ear or surgery. The list of objects that can be found in the ear canals is varied, being impacted cerumen a common cause of irritation. On the other hand, little cerumen, particularly in women, can lead to pruritus. One must be careful and attentive with the excessive use of cotton, excessive cleaning or scratching of the ear. The use of metallic objects can lead to contact dermatitis. Abrupt attempts to remove the object lead to lesions of the isthmus or other areas. If the foreign body is smaller than the opening of the canal, it can be removed with Hartmann forceps. Larger objects should be “fished” with a handle or, in some cases, with injection of water through the wall similarly

to cerumen removal, or even aspirated with appropriate devices. In the case of insects, they should first be killed with a cotton plug embedded in ether, chloroform or alcohol for 5 minutes and then washed out. If the child is agitated, general anesthesia is needed. Many cases of trauma of the tympanic membrane and ossicles take place with children’s movements during this type of procedure. When objects are found beyond the isthmus, its removal must be done with anesthesia. Flies can deposit their eggs in the ear and the resulting myiasis can lead to pain, inflammation and, occasionally, more severe complications.

Loose hairs in the ear canal can also be the cause for noises in the ear.

### CONCLUSIONS


This review evidences a great variety of conditions that can affect the ear. Even though we sometimes have the impression that diseases affect the ear because it is part of the skin, what is true in many cases, others refer exclusively to this region and its own features and function. We addressed dermatitis, trauma, infections, congenital malformations and benign and malignant tumors, making this subject extremely interesting for the dermatologist and also surgeons; a broader knowledge allows opening up a range of possible differential diagnoses and treatment options. ●

### REFERENCES

1. Anshwal N, Thompson H. The development of the mammalian outer and middle ear. *J Anat.* 2015;228(2):217-32.
2. Garvey C, Garvey K, Hendi A. A review of common dermatologic disorders of the external ear. *J Am Acad Audiol.* 2008;19(3):226-32.
3. Eagles K, Fralich L, Stevenson JH. Ear Trauma. *Clin J Sports Med.* 2013;32(2):303-16.
4. Sosin M, Weissler JM, Pulcrano M, Rodriguez ED. Transcartilaginous ear piercing and infectious complications: a systematic review and critical analysis of outcomes. *Laryngoscope.* 2015;125(8):1827-34.
5. Strauch B, Vascones LO, Hall-Findlay EJ, Lee BT. *Grabb's Encyclopedia of Flaps.* 3rd ed. Philadelphia, PA: Wolters Kluwer; 2009.
6. Bai H, Tollefson TT. Treatment strategies for auricular avulsions: best practice. *JAMA Facial Plast Surg.* 2014;16(1):7-8.
7. Benchemam Y, Nicolas J, Alix T, Soubeyrand E, Tringali S, Labbé D, et al. The Antia-Buch flap technique in reconstruction of marginal ear defects. *Rev Stomatol Chir Maxillofac.* 2008;109(5):307-11
8. Emsen IM. A dangerous sequelae of frostbite: third-degree ear burn. *J Burn Care Res.* 2007;28(3):539.
9. Purdue GF, Hunt JL. Chondritis of the burned ear: a preventable complication. *Am J Surg.* 1986;152(3):257-9.
10. Deshpande NS, Sen A, Vasudevan B, Neema S. Acanthoma fissuratum: lest we forget. *Indian Dermatol Online J.* 2017;8(2):141-3
11. Oztürkcan S, Oztürkcan S. Dermatologic diseases of the external ear. *Clin Dermatol.* 2014;32(1):141-52.
12. Shea CR. Dermatologic diseases of the external auditory canal. *Otolaryngol Clin North Am.* 1996;29(5):783-94.

### DECLARATION OF PARTICIPATION:

**Bhertha M. Tamura** |  ORCID 0000-0001-7259-2998  
Design, writing and review

**Ana Carolina Junqueira Ferolla** |  ORCID  
Design, writing and review

**Cândida Naira Lima e Lima Santana** |  ORCID 0000-0002-2693-0025  
Design, writing and review