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Review Article

Risks in Cartilage Diseases

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Abstract

Cartilage conditions can occur in Maxillofacial Surgery consultations or in any of the stomatological specialties. Given that there are various diagnoses, and likewise the triggering causes of these processes, it is often complex for the professional to reach an accurate and timely recognition, to establish the appropriate therapy. In this chapter, together with each pathological lesion, the different risks and complications will be presented according to the evolution of the conditions. A bibliographic review was carried out with the aim of delving into the main complications and risks of injuries present in cartilage tissue. Inflammatory, congenital and tumor-type lesions may occur, among other variants, also being divided into benign and malignant.

Keywords: Cartilage; Chondritis; Endochondral; Chondroma

Introduction

On many occasions, patients come to stomatology or maxillofacial surgery consultations with inflammatory, infectious or tumor processes coming from the cartilaginous tissues of the orofacial complex. In the first case, professionals must be prepared to guide themselves in the diagnosis and thus manage the patient appropriately, and surgeons must master the therapeutic behaviors and the risks or complications that may arise due to these conditions [1,2].

This chapter will address the main injuries linked to these tissues, without emphasizing the temporomandibular joint, since due to its characteristics a separate chapter was dedicated to injuries in this region. Cartilage tissue, or cartilage, is a type of specialized, elastic connective tissue, lacking blood vessels, formed mainly by extracellular matrix and scattered cells called chondrocytes. The outer part of the cartilage, called perichondrium, is responsible for providing life support to the chondrocytes. Although cartilage and bone have many different functions, some are similar and related.

Objective

To describe the main complications and risks of diseases and injuries of cartilage tissue.

Reference search methods

The scientific information was collected through a search using the following descriptors in English: The Medical Subject Headings (MeSH): "cartilage, tissue, chondropathies, chondroma, chondrosarcoma

Analysis strategy

The search was based solely on the cartilaginous conditions of the oromaxillofacial complex.

Developing

Through the fourth edition of Histology Text: Color Atlas, we show the types and characteristics of cartilage, one of the main tissues that participate in supporting the body, closely associated with the skeletal system. Cartilage has a firm, flexible matrix that resists mechanical forces. The bone matrix, however, is one of the hardest tissues in the body, and also withstands the forces applied to it. These two connective tissues have specialized cells that secrete the matrix in which the cells then become trapped [1,3].

Articular cartilage is a highly specialized tissue that provides a contact, sliding and cushioning surface at the ends of bones to form joints. Cartilage injuries represent a challenge for current health

systems by increasing their prevalence thanks to the improvement in the quantity and, above all, quality of life of our population, which leads to a demand for greater physical activity in a broader age range.

Classification of cartilage

Cartilage is classified into three types according to the types of fibers present in the matrix.

- Hyaline cartilage contains type II collagen fibers in the matrix, which is the most abundant cartilage in the body and has many functions.
- Elastic cartilage contains, in addition to type II collagen fibers, a large amount of elastic fibers dispersed in the matrix, which give it more flexibility.
- Fibrocartilage has dense and thick type I collagen fibers in the matrix, which allow it to withstand intense traction forces, which is what is observed in the temporomandibular joint (TMJ), [1,4,5].

Inflammatory processes of cartilage

Relapsing polychondritis

Relapsing polychondritis is a rare disease, probably of autoimmune origin, that affects cartilaginous tissues, such as the ears, nose, laryngotracheal and articular structures. The evolution is characterized by recurrent and progressive inflammation of the cartilaginous tissue that eventually produces the destruction of the affected structures. The combination of corticosteroids with immunosuppressive or immunomodulatory agents (cyclosporine, azathioprine, methotrexate and anti-TNF) is recommended. auricular perichondritis Auricular perichondritis is a diffuse inflammatory process, but not necessarily infectious, that manifests with erythema and pain of the pinna, or an abscess between the cartilage and the perichondrium [4-7].

The perichondrium is a layer of connective tissue that surrounds cartilage, providing all the nutrients it needs. It is located in all areas of the body where cartilage exists. When it becomes inflamed for various reasons (See box), perichondritis occurs. If not treated in time, the infection can progress and affect the cartilage, called chondritis, which can cause greater damage [1,4,8].

Treatment is mainly based on urgent therapy with oral antibiotics, typically a fluoroquinolone, sometimes with an aminoglycoside and a semisynthetic penicillin. Patients with diffuse inflammation of the entire pinna are treated with empiric antibiotics and often a systemic corticosteroid for its anti-inflammatory effects. Any foreign material must be removed. If the etiology is not clearly infectious, an inflammatory disorder should be evaluated. auricular chondritis Inflammation and itching of the auricular region that occurs in entities such as seborrheic dermatitis, contact dermatitis, atopic dermatitis and neurotic excoriations, among others, favor invasion of microorganisms to the external auditory canal, which increases the risk of chondritis [9-11].

Causes of perichondritis
Traumas (See Figure 1)
Insect bites
Ear piercings through cartilage
Systemic inflammatory conditions (eg, vasculitis such as granulomatosis with polyangiitis, relapsing polychondritis)
Incision of superficial infections of the pinna

Table a

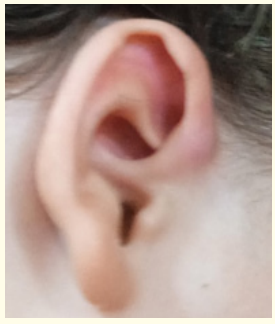

Figure 1: Pediatric patient with onset of perichondritis in the root of the helix due to trauma. Courtesy of Dr. Otto Alemán Miranda.

Deformity or destruction of the auricular cartilage can occur due to infectious or non-infectious causes. The first are the most frequent and the The main microorganisms are *S. aureus, P. aeruginosa* and *Proteus species*. Non-infectious causes include inflammatory, neoplastic, and traumatic causes.

Recurrent episodes of chondritis cause the destruction of normal cartilage structures with replacement by fibrous tissue, the ear becomes deformed and It acquires a nodular or "cauliflower" appearance. Calcification is seen in up to 40% of cases. Occasionally, auricular disease can involve the ear. internal or vestibular pathway, presenting hearing loss, tinnitus and vertigo. In patients who present characteristic clinical manifestations, biopsy is not necessary to establish the diagnosis. Due to the variable course of

relapsing polychondritis, the best therapeutic strategy consists of individualized treatment, since there is no standard treatment. The following have been indicated: anti-inflammatories steroids, corticosteroids, dapsone, methotrexate and biological therapy.

Nasal perichondritis

As explained in the auricular region, it is a diffuse inflammatory process, and it has the same etiology. The nasal cartilage can be seriously damaged, causing a saddle nose deformity and is characterized by being very painful at times. The treatment is the same as when it occurs in the ear. Infectious processes in the auricular region The causes can vary from an infected wound, a boil, infected insect bites, as well as foreign bodies where one of the most frequent is the use of a piercing [11,12].

Among its clinical characteristics, the pavilion is red, thickened, painful and hot on palpation. The pain is throbbing and becomes intense, fever and abscesses appear. It can progress to cartilage necrosis and deformity. When the cartilage is seriously affected, it is necessary to debride the injured area and the surrounding areas. The diagnosis is clinical and the cause is confirmed by culture of the exudate [13-15].

Therefore, when a person consults about the possibility of having a piercing, they should be informed of the possible complications depending on the implantation site and the care necessary in relation to the piercing. Doctors should know proper care to avoid infection at piercing sites. Patients must be fully informed when undergoing the procedure in case of complications. In most cases, these aforementioned injuries must be treated together or after evaluation with the otorhinolaryngology (ENT) specialist. There are other processes such as otitis externa that will not be addressed since they are specific to said specialty (ENT) [16].

Infectious processes in the nasal region Nasal vestibule infections are common conditions in otorhinolaryngology clinical practice. But, on many occasions they go to the maxillofacial surgery consultation, so the professional must be prepared to know how to diagnose them and properly guide the patient. Its etiology is mainly linked to trauma due to manipulation of the vestibule, its instrumentalization during a procedure and systemic states that predispose to its appearance. Squamous papilloma/vulruca verruca Squamous papillomas (PE) and vulgar warts (VV) correspond to benign squamous neoplastic proliferations (See Figure). Both are caused by human papillomavirus infection. Both can appear at any age and have the particularity of arising in sites covered by squamous epithelial tissue, especially in regions of epithelial transition, including the skin that covers the nose and the interior of the nasal vestibule. The treatment is surgical with a good prognosis, which may be recurrent [16-18].

Figure 2: Verruca vulgaris in the nasal vestibule. Courtesy of Dr. Otto Alemán Miranda.

Rhinoscleroma It is defined as a chronic progressive granulomatous pathology that affects the nose and upper airway, its causal agent corresponds to Klebsiella rhinoscleromatis, affecting the nose in 90 % to 100 % of cases, in addition to the nasopharynx, larynx, oral cavity, trachea, Eustachian tube and middle ear [16-19].

A higher incidence has been reported in conditions of lower socioeconomic level, poor hygiene, malnutrition and in the female population, being 13 times more frequent than in the male population. The natural course of this disease has been separated into three stages, often overlapping, the first stage called catarrhal or atrophic is characterized by persistent bad-smelling rhinorrhea associated with the formation of scabs and unilateral or bilateral nasal obstruction, later in the granulomatous or hypertrophic, intranasal nodules associated with granulatory tissue or masses appear in the anterior region of the septum that can be confused with malignant neoplasms, often accompanied by frontal headache, anosmia and cacosmia [19-21].

Finally, in the fibrotic or sclerotic stage, scar tissue appears with progressive changes that lead to stenosis of the nasal cavity, nasopharynx and larynx in an average time of 10-15 years, even becoming necessary in some cases to perform a tracheostomy. Treatment generally requires tetracyclines and quinolones for a period of six months or until the biopsy results are negative. But in certain advanced cases it can be combined with surgery. (View Figure 3)

Folliculitis/furunculosis Folliculitis is defined as inflammation of the hair follicle, which can be due to infectious etiologies, wheth-

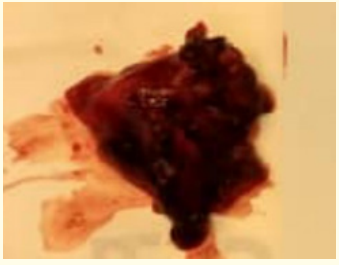

Figure 3: Lesion removed due to rhinoscleroma. Courtesy of Dr. Otto Alemán Miranda.

er bacterial, viral, fungal or parasitic, and non-infectious secondary to follicular trauma or occlusion of the hair follicle (See image 3). Infectious folliculitis is characterized by being more susceptible to treatment and is mainly caused by S. aureus. Clinically, superficial folliculitis can present single or multiple papular or pustular lesions with an erythematous base with a central hair, which heal without scarring when treated. On the other hand, deep folliculitis is characterized by plaques or nodules associated or not with pustules that overlap the erythema and induration [22,23].

The latter are more symptomatic and when treated usually leave a scar. The most commonly used systemic antibiotic treatment in the literature is amoxicillin associated with clavulanic acid; however, the use of clindamycin or macrolides has also been recommended [20,23,24].

Figure 4: Patient with nasal folliculitis. View from below. Courtesy of Dr. Charles Anthony López Verdecia.

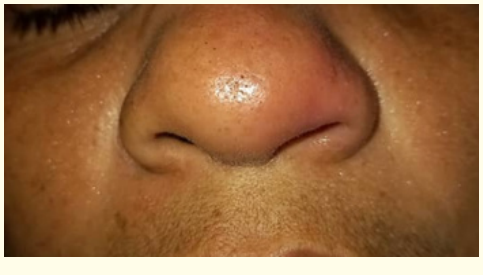

Figure 5: Patient with nasal folliculitis. Front view from above. Courtesy of Dr. Charles Anthony López Verdecia.

Nasal vestibulitis Nasal vestibulitis corresponds to an acute localized infection of the hairy region of the nasal vestibule. It differs from folliculitis by presenting a diffuse involvement not limited to the hair follicle associated with the presence of scabs. It is caused by methicillin-susceptible S. aureus (MSSA) in up to 43-81 % of cases. Additionally, cases with positive cultures for MRSA, Prevotella spp and N. dassonvillei have been reported at a lower frequency [22-24].

The mechanism by which this pathology occurs implies the existence of two factors, the existence of a disruption of the epithelial barrier that allows the passage of microorganisms to the underlying structures, associated with colonization by these agents, especially by S. aureus. Both factors present trigger the production of an inflammatory response that explains the symptoms. Clinically, nasal vestibulitis presents with pain located in the vestibule and nasal tip, associated with erythema, edema and sometimes epistaxis [25].

On physical examination, redness of the skin of the vestibule, tenderness to manipulation, and the presence of yellowish scabs can typically be observed. In relation to management, there are no clinical guidelines; in practice, staggered management is usually carried out according to the severity of the clinical picture. In this way, in mild cases, treatment is carried out on an outpatient basis based on topical moisturizers and antibiotics, while, in the case of in severe cases, or poor response to treatment, signs of cellulitis or abscess formation, hospitalized management is recommended, associated with the use of systemic antibiotics in conjunction with the previously described topical treatment, which would allow better control of the infectious condition [25,26].

Cartilage tumors Chondroma Chondroma is a benign neoplasm, of mesenchymal origin, made up of mature cartilage cells without bone, which is uncommon in the orofacial area. A hamartomatous origin has been postulated. It occurs mainly inside the maxilla or mandible, which is why some authors call it enchondroma, although chondromas of soft tissues have also been described, such as in the tongue gland, cheeks, soft palate and even in the parotid gland. and there are the peripheral or juxtacortical ones. It is uncommon in the jaws, the greatest number of cases have been shown in the anterosuperior region of the jaw in adults. This condition has no sex predilection [20,25-27].

The age range is variable; it may occur between the third or fourth decade of life, or from the first to the eighth decade. Most chondromas of the maxillofacial complex come from vestigial carti-

laginous remains of the nasal septum and ethmoid sinuses. Therefore, they are mainly located in the regions adjacent to the spine and the nasal septum. Those with a mandibular location have been observed in the symphysis, the body, the coronoid process and the mandibular condyle. They are clinically characterized as firm nodules with a smooth surface, their color is bluish white and microscopically they are made up of hyaline cartilaginous tissue that contains calcified or ossified islets, the growth is at the expense of the periosteum [1,4,5].

The soft tissues are little affected, they are rarely involved due to the gradual expansion of the lesion. When they are in relation to teeth they can produce tooth mobility or resorption. The main differential diagnosis should be made with chondrosarcoma. Radiographically we see a well-defined, oval or rounded radiolucent area, other times it has a multilocular appearance and when the hyaline matrix calcifies, radiopaque mottling appears. The ideal treatment to date is surgical excision with a certain margin of safety without being radical, covering a little bone and normal soft tissue. Long-term follow-up should be performed, although the prognosis is generally favorable [27-29].

Chondroblastoma Relatively rare benign tumor, characterized by a highly cellular and relatively undifferentiated tissue made up of rounded or polygonal cells similar to chondroblasts and with clear edges by multinucleated giant cells of the osteoclastic type, isolated or in groups. In general, little intercellular material is found, but the presence of small amounts of intercellular cartilaginous matrix with areas of focal calcification is typical. Its location in the head and neck is infrequent, very few publications appear in this regard where they describe it in the temporomandibular joint, but as such, there are no well-defined data so far. The treatment is excision with a low probability of recurrence and a good prognosis [29,30].

Myxochondroid fibroma Chondromyxoid fibroma is a benign tumor, characterized by the presence of lobulated areas of spindle or stellate cells, with abundant myxoid or chondroid intercellular material. Sometimes large pleomorphic cells are observed, which can be confused with chondrosarcoma. It is rare in the jaws but when it occurs it has been observed in the mandible, towards the posterior sector. It is characterized by a circumscribed lump that may or may not be painful. The treatment is surgical with no great safety margin. The prognosis is favorable with no tendency to become malignant [1,4,5].

Osteochondroma It is a benign neoplasm that some authors call osteocartilaginous exostosis. It is made up of mature bone and cartilage cells. It occurs mainly in long bones, but has been detected in the jaws, mainly in the mandible, towards the ascending ramus, coronoid process and condyle. The treatment is surgical without relevant complications or recurrences unless it is removed inappropriately.

Chondrosarcoma

Chondrosarcoma is a malignant tumor characterized by the formation of cartilage and a high tendency to recurrence. It is the second most common bone neoplasm of primary malignant bone tumors. It represents a quarter of all types of primary sarcomas. Chondrosarcoma is a sarcoma that accounts for approximately 0.1 % of all head and neck cancers. The term chondrosarcoma is used to describe a heterogeneous group of lesions with diverse clinical characteristics and morphologies. The histological subtypes are: myxoid, undifferentiated, clear cell and mesenchymal [27,29-31].

Its etiology is not clear, and it may arise from mature cartilage tissue, cartilage tissue reserve cells, or primitive mesenchymal cells with chondromatous differentiation. Its most frequent location at the skeletal level is the upper jaw (anterior alveolar region), followed by the mandible, while at the extraskeletal level it is the meninges and orbits. It generally appears between the second and third decades of life, and its distribution by sex is controversial. Clinically, it usually appears as a painless mass or local inflammation, followed by nasal obstruction, epistaxis, or tooth mobility and loss. In the immunohistochemical diagnosis, the following have been used: SOX-9, S100, expression of Bcl-2, parathyroid-like hormone (PTHIH), survivin, caveolin, vimentin, synaptophysin and chromogranin. In X-ray studies, osteolytic defects with a “ground glass” appearance are observed. The most frequent metastases are to the lung and regional lymph nodes. Myxoid chondrosarcoma has a high potential for lung metastasis. The treatment of choice is wide local excision. Chemotherapy and radiotherapy are effective in cases where the tumor has been partially resected or the lesion is in a region inaccessible to surgical intervention. Recurrences in the head and neck of 85 % have been reported. The prognosis is reserved [28,29,31].

Conclusion

The main complications and risks of cartilaginous conditions of the oromaxillofacial complex, as well as their sequelae, were described. Based on an exhaustive review of the literature, as well as

the author's previous experience. These injuries have a high international morbidity rate and cause multiple physical, mental and social conditions.

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