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Review Article

Risks in Treatment by Surgical Techniques of Orthognathic Surgery

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Abstract

Orthognathic surgery is the surgical manipulation of the elements of the facial skeleton; It includes surgical techniques aimed at improving facial aspect in patients with dentomaxillofacial disharmonies; whose objective is the restitution of facial harmony, obtaining a correct dental occlusion and maintaining the stability of the results achieved. An exhaustive bibliographic review was carried out on the main complications and risks involved in orthognathic surgery.

Keywords: Orthognathic Surgery; Risks; Complications; Jaws

Introduction

Orthognathic surgery is the surgical manipulation of the elements of the facial skeleton; It includes surgical techniques aimed at improving facial aspect in patients with dentomaxillofacial disharmonies; whose objective is the restitution of facial harmony, obtaining a correct dental occlusion and maintaining the stability of the results achieved. Given the advent, dissemination and expansion of dissimilar cosmetic surgery techniques in order to correct facial disharmonies, orthognathic surgery is imposed especially due to the stability of the results over time. The techniques that support this surgical therapy had their origin in the early twentieth century, mainly in Germany, England and France. From then on, they have been modified and have experienced significant development in recent decades until they them into very versatile and predictable methods for orthopedic-surgical corrections of dentomaxillofacial disharmonies, but is not exempt from presenting complications [1,2].

Since Schuchardt and Obwegeser described the mandibular sagittal osteotomy and von Langenbeck the maxillary osteotomy, many surgical variants have developed in order to minimize intra and postoperative risks. The technical advances in preoperative planning and the protocol of orthognathic surgery allow to obtain predictable and stable results in time and associated with the improvement of surgical instruments, have made possible the decrease in complications rates, a low index of surgical complications that It is described between 1-25% and vary according to the series depending on what is defined as complication. Next, the risks and complications that may occur in patients with dentomaxillofacial disharmonies under treatment by surgical techniques of orthognathic surgery are exposed. The knowledge of these complications allows their prevention and early detection so that, in case they are presented, the behavior is adequate. Those associated with surgical techniques in the jaw, in the jaw, in the chin, among others are approached.

Surgical risks associated with maxillary osteotomies [1,3].

Objective: To describe the main complications and risks in orthognathic surgery. Literature search methods Scientific information was collected through a search using the following descriptors in English: The Medical Subject Headings (MeSH): "orthognathic surgery, risks, facial and dental deformity. Analysis strategy The search was based solely on orthognathic surgery and its risks and complications 2. Development.

Unwanted osteotomy

The most frequent unwanted fractures during maxillary osteotomy involve the pterygoid region and sphenoid and do not usually affect the maxilla properly. Li and Stephens describe a greater frequency of non -favorable fractures in the maxilla of edentulous patients compared to the folded patient being the most frequent

fracture in the palate junction with the posterior maxillary region. The most risky patients of this complication are those who have an atrophic jaw due to edentulism, although also patients with palatine fissure and those who have suffered previous surgery in the jaw. Before an atrophic jaw, it is recommended to perform the pterigomaxillary disjunction by an oscillating saw, before cutting the lateral and medial walls of the maxila. It is possible to separate the maxilla through an osteotomy in the tuberosity instead of the pterigoids. In all cases the movements must be controlled during osteotomy and the dysyntors must be used prudence, to avoid the possible risks of unwanted fractures. Robinson and Hendy described two types of fractures during the pterigomaxillary disjunction: high and low. The high affect the body of the sphenoid and the base of the skull, causing nervous and/or vascular damage.

Hiranuma and collaborators report that the unwanted fracture line is due to the direction in which the osteotomo is positioned and can therefore be predictable. I.2. Sphenoid fracture. The unwanted fractures that affect the pterigoid process, the body of the sphenoid and the base of the skull are of the most serious complications in orthognathic surgery. The appearance of these unwanted fracture strokes that extend in cranial direction occurs at the time of "down fracture" or caudal disjunction of the maxilla during the lefort type osteotomy. The affected areas: -Cephalorrachid fluid phystula: in the literature the appearance of cerebrospinal fluid leaks after osteotomies Lefort I. Gruber publishes a patient whose behavior was the placement of a lumbar drain, without any sequel. – blindness

Girotto and collaborators publish in an article three cases of visual loss during maxillary osteotomy. The three cases agree that a post -surgical rhinolicuorrhea accompanied by a transient or permanent vision loss appeared. -The optical nerve injury: it takes place through a traumatic indirect mechanism at the time of pterigomaxillary disjunction. To avoid nerve lesion, they recommend the lower angulation of pterigomaxillary osteotomy to make the fracture line more predictable. - ABDUCENSE Paresia: Described by Watts in 1984 and Reiner and Willoughby in 1988, as a rare and reversible complication after an osteotomy type Lefort I [1-4].

Sensitive alteration. During the maxillary osteotomy, the Nasopalatine duct is systematically sectioned and, therefore, the Nasopalatine vasculonervious package. The upper alveolar nerves and mucous nerve endings are also sectioned by incision. In addition, major palatine nerves can be sectioned in some cases to facilitate the manipulation of the segmented maxilla, although the priority in segmented osteotomy is to keep them. The infraorbital nerve can also be indirectly injured (traction, pressure or entrap by the osteosynthesis material) or directly in high osteotomies. In any case, these alterations in the sensitivity of the mucosa of the jaw, palate and territory of the infraorbital branch are usually transitory and recover in a short time. The maxillary branch of the trigeminal nerve is in charge of the maxillary and facial sensitive contribution (except the anterior part of the septum and the nasal side wall, innervated by the first trigeminal division). In any case, the persistent alterations of the sensitivity of the middle facial third after orthognathic surgery are uncommon.

Hemorrhage. Hemorrhage is a feared complication in Lefort I osteotomy I. Under normal conditions, it is because it is a region with profuse vascularization, bleeding is normal at the time of the caudal disjunction of the jaw. Generally bleeding is of little amount and gives spontaneously in a few minutes. If the lesion of any arterial vessel of significant diameter occurs, bleeding is persistent and the bleeding vessel must be identified to make a ligation. The vessels that are most frequently involved in bleeding after maxillary osteotomy are the descending palatine artery, branches of the internal maxillary artery, the internal maxillary artery itself or the pterigoid venous plexus.

Many cases of massive bleeding have been reported, although most of them are due to incorrect instrument (bad position of the osteotomo, milling of bone sparks around descending palatal artery, a little careful jaw descent, also non -diagnosed vascular malformations. The most problematic cases of bleeding are those that occur several days after surgery. Normally the patient manifests with epistaxis (unless it is posterior, which will be presented as bleeding by mouth or pharynx). These bleeding can be triggered by episodes of arterial hypertension, failures of surgical ligatures or rupture of arteriovenous fistulas [4,5].

Avascular necrosis. The avascular or aseptic necrosis of the maxilla is a clinical picture consequence of a failure of the blood supply to this region after surgery. The incidence reflected in the literature is less than 1%. Clinically it manifests itself as bone necrosis, gingival retraction, loss of dental vitality, periodontal pathology, mobility and dental loss or some dentoalveolar bone segment. The causes that can cause a decrease in blood flow to the region surgically were collected by Lanigan: section of the posterior palatine arteries, vascular thrombosis, drilling of the palatine mucosa during maxillary segmentation or vascular lesion when handling the soft palate during the segmentation. In the important advances, it has been recommended to release the vessels of their bone channel to reduce tension and their acoding that can lead to a decrease in

flow. The most sensitive region is the anterior area of the maxilla because its blood contribution depends exclusively on an intact palatine pedicle.

Nelson and collaborators, described the decrease in blood flow that leads to maintaining the intact maxillary vessels in front of section, obtaining very conclusive data: on palatine bone the suppression of the contribution of the posterior palatine arteries goes from 100 to 11%; on palatal mucosa, from 98 to 16%; in alveolar bone from 43 to 11%; and in adhered gum of 63 to 5%. The most important risk factors for the development of avascular necrosis are: segmental osteotomies, tobacco consumption, advanced age, rehabilitation of an atrophic jaw, patients with cracked lip and palate pathology, extreme movements (great advances or impacts), lesions of the palatine mucosa or the hypotension maintained, in circumvestibular incisions that in those that leave lipstick or vertical incisions that leads to: gingival recession, periodontal bone loss and dental lesion, bone exposure, dental and alveolar loss. Different maneuvers have also been proposed to prevent the appearance of this complication: preserve whenever possible the descending palatine arteries, divide the jaw into the lowest possible number of fragments, avoid compression of the palatine or gingival mucosa (splints, wires).

Perform an assisted surgical expansion (SARPE) prior to transverse problems, adequate orthodontic divergence of the roots of the teeth adjacent to segmental osteotomy, judicious use of forceps and dysyuntators to avoid injury of the palatal mucosa and the vessels, avoid consumption of postoperative tobacco, avoid extreme perioperative hypotension and moderate the use of electrobisturi during the incision of the vestibular mucosa, among others.

Osteomeatal complex and nasolacrimal duct lesion. During the maxillary osteotomy, the nasal mucosa is separated and protects properly so as not to injure the prayers during the surgical procedure. Sometimes the resection of the lower cornete is necessary for the impact of the upper jaw. Turbinectomy has historically been associated with atrophic rhinitis, as well as in injury to the tear duct. If it is lacerated, it is normally recanalized spontaneously, although it can also be stigated or obstructed with the consequent epiphora. A case of alteration of tear secretion has also been described. This complication is related to a possible Parasympathetic fiber lesion during osteotomy [3-6].

Sinus Pathology. Maxillary breast infection after maxillary osteotomy is uncommon. Patients with pre -existing sinus pathology may have exacerbation episodes during the postoperative period. Sinus or nasal fistulas can occur in segmental osteotomies when there are orasal or orosinusal communications, 6-9 months should be expected and a local flap in two layers, meanwhile to place palatine plate.

Inadequate replacement of the nasal septum. In Lefort I type osteotomies and in Lefort and segmented osteotomies there may be a bad position of the osteotomized segments at the time of osteosynthesis or the alteration of the average cornete, which produces an alteration in the drainage of the maxillary sinus.

Modifications in the Arencia bases. The inadequate treatment of the septum, paranasal musculature and lip mucosa can cause: widening of nasal wings, increase the wing grooves, elevation of the nasal tip (obtuse nasolabial angle), flattening and thinning of the upper lip, decrease in the oral corners. All this are postoperative negative aesthetic consequences.

Adjacent teeth injuries. This dental risk can occur during osteotomy due to Lefort I techniques and with greater incidence in segmented, which requires appropriate dental treatment [3-6].

Rare complications. Some infrequent complications collected in the literature, which are worth highlighting, include: - Airway alterations: The endotracheal tube is located in the area of osteotomies. The mobilization and displacement of the tube, the loss of pressure from the Pneumotaponation are circumstances that anesthesiologist takes into account in the surgical procedures of the facial massif.

The rupture of the endotracheal tube has been described as it passes through the nostrils during the osteotomy of the lateral wall of them. - Pneumothorax/Pneumomediastino: It occurs when dissecting, the air passes between the periosteum and the bone and crosses the different fascias until reaching the mediastinum. Another possible explanation is an increase in airway pressure, generating an alveolar break. This pressure increase may be due to an inability to cough or excessive ventilatory pressure during anesthesia. The postoperative intermaxillary fixation, if it is also accompanied by the obstruction of the upper airways, can lead to respiratory failure; If this is accompanied in addition to secretions and blood remains on the airway, bronchial and atelectasis obstruction can occur [6-9].

Clinically manifests itself as respiratory distress, circulation and chest pain. Oxygen saturation sometimes does not alter. Radiologically it can go unnoticed in the chest x -ray, the computed tomog-

raphy being the diagnostic test of choice. - Deviation of the nasal septum: Through the osteotomy type Lefort I there is broad access to the bone and cartilaginous septum, so these alterations can be corrected. It is important to dry an adequate portion of the septum base in the jaw; If the nasal septum is not carried out correctly, it can be accommodated inadequately and give rise to a deviation. In these cases the patient may have respiratory failure due to the obstruction of the nasal fossa and ventilation problems of the maxillary breasts.

From Mol van Otterloo advocates to check after the maxillary replacement that the nasal septum moves freely and reposition the septa after extubation.

- Perforation of the nasal septum: described by Mainous and Crowell in 1973, due to a laceration of the Pericondrium. - Asistolia: described by Ragno and collaborators in 1989, during the Maxillary descent maneuver. When the jaw replacing the heart rate, it was normalized spontaneously. Severe bradycardia, previously described during the reduction of facial bone fractures. Several studies have shown that at the time of jaw disjunction, there can be an increase in intraorbital pressure and by this mechanism and mediated by fibers of the parasympathetic autonomous system trigger a glass-vagal syncope. In the proposed mechanism it would intervene the trigeminal-vagal reflex. The authors recommend glycopirrolate instead of atropine to reverse asistolia (greater protection against vagal phenomena). - Auditory injury: It is a rare complication. It has been described in several publications, as a temporary loss due to the alteration in the position of the Eustaquio tube [6-9].

The alteration of the middle ear by interference in the transmission of the sound wave of the Sierra during the osteotomy (which arrives by air driving through bone driving) and for the effect of the shock waves of the shock waves has also been described the percussion with chicks on the otolites of the middle ear. The appearance of a postoperative peripheral vertigo can also occur in other procedures that imply percussion on the craniofacial skeleton, such as obtaining warra grafts, sinus elevations with osteotomes, among others. II. Surgical risks associated with mandibular osteotomies. It is difficult to specify the percentage of complications generated in a mandibular osteotomy. They should be differentiated depending on the technique used, although sometimes it is difficult to find homogeneous series.

The most used techniques today are Obwegeser's sagittal osteotomy modified by Dalpont, the oblique sagittal of Bruce Epker and to a lesser acceptance the subcondiets [6-9].

Incomplete mandibular osteotomy and undesirable fractures. We consider that a mandibular sagittal osteotomy is incomplete when at the time of the movement of progress or retronation and in osteosynthesis there is still a solution of continuity of the proximal fragment with the distal in the osteotomy. It usually occurs at the mandibular angle level and can often go unnoticed. If it goes unnoticed, it can lead to a recurrence of dentomaxillofacial disharmony or an earlier position of the condyle in the glenoid pit. Epker and Hensuck described modifications in osteotomy to avoid this type of complication. The described incidence varies from 1-10.9%.

Macintosh in 1981 described a rate of 6.8%. Van de Perre in 1995, published from 1 233 interventions 7.9% of unwanted osteotomy, TELTZ row and collaborators describe in 2005 an incidence of only 1% (n = 1 264). And Falter and collaborators report a series of 1 008 patients operated until 2010 with an incidence of 1.4%. Above all, it occurs in jaws with a hard bone by fusion of corticals. It is rarely bilaterally appreciated.

There are two typical "Bad Split" patterns: in the proximal fragment, in the vestibular wing of osteotomy and in the distal fragment, by the lingual region. The most difficult complication to solve, although less frequent, is the fracture in the distal segment (0.8%). It usually occurs at the third molar level, where the bone is thinner [10-13].

Epker and Wolford state that fracture at the level of the lingual cortex may be related to the extraction of the impacted third molar concomitantly with surgery, so they do not advise this practice, although this issue is controversial. The systematic use of computerized axial tomography can help to locate the path of the inferior alveolar nerve canal, but it is not performed systematically or is protocolized in any reference center. It is important to leave a sufficient thickness of the vestibular wing both to avoid unwanted fracture and to give sufficient stability to the osteotomy.

The frequency of inadequate fractures of the proximal fragment varies in described series (1-3%), presenting subcondylar fracture and intracapsular sagittal fracture. II.2. Mandibular fracture. It can occur at the subcondylar, condylar or coronoid process level. MacIntosh and Turvey describe in their series an incidence of around 3.3% and 3.1%-3.9% respectively. It is usually due to an incomplete or excessively high horizontal osteotomy. During surgery it is detected because the midline deviates at the time of releasing the intermaxillary fixation. Sagittal fractures of the condyle do not present this deviation, they present with prolonged trismus and noises when opening the mouth. It is necessary to identify patients with

this risk: robust jaws with fusion of corticals, hypoplastic jaws, history of surgery in the area or simultaneous extraction of third molars, the appropriate use of the material is essential, both chisels and disjunctors [12,13].

Mommaerts advocates introducing a chisel or periosteum partially over the horizontal osteotomy line to prevent fracture at this level, based on a description by Obwegeser. II.3. Nerve injury. Injury to the inferior alveolar nerve has been extensively studied. Injury to this nerve is the most frequent complication during sagittal mandibular osteotomy. Injury to the lingual nerve has also been described. The incidence of inadvertent injury to the inferior alveolar nerve varies between 1.3% and 7% of patients.

The causes that can cause nerve injury are multiple: inadequate placement of the osteotomy, direct injury by osteosynthesis material (bicortical screws), inadequate visualization of the inferior alveolar nerve (secondary to intraoperative bleeding), anatomical alteration of the nerve (lateral position) and the length of the mandibular angle. Important, although infrequent and anecdotal, is injury to the facial nerve during sagittal mandibular osteotomy. An estimated incidence of 0.1% is reported and neuropraxia/axonotmesis is attributed to nerve compression and/or traction. II.4. Vascular injury. At the mandibular level, bleeding is the most frequent vascular complication. The definition of hemorrhage varies according to the authors.

For MacIntosh, it is bleeding that interferes with vision or that takes a while to control, while for Turvey, it is bleeding from a vessel of significant caliber that is not controlled with basic hemostasis measures. The mandible receives vascular supply from different sources: internal maxillary artery, facial artery, inferior alveolar artery, lingual artery and periosteal perforators. Of all these sources, the most important comes from the inferior alveolar vessels and secondly from the muscular perforators. This vascular supply from multiple sources makes complications due to lack of blood supply rare [13-15].

The most frequently injured arteries during mandibular orthognathic surgery are the internal maxilla in the sigmoid sinus, the facial artery as it passes through the posterior region of the mandibular body, and the inferior alveolar artery. The incidence of bleeding in the context of a mandibular osteotomy varies depending on the series: 2.3-38%. Bruce Epker describes the possible sequelae resulting from vascular injury (from least to most serious): periodontal disease, pulp necrosis, infection, delayed union, pseudoarthrosis, bone or tooth loss. Aseptic mandibular necrosis has also been described, although it is rare. To avoid vascular injury, it is recommended to have a thorough knowledge of mandibular anatomy, minimal periosteal removal during surgery, and to avoid avulsion/stretching of the mandibular vascular-nervous bundle. Injury to the internal maxillary artery may occur in vertical subcondylar osteotomies due to the proximity of this vessel to the sigmoid notch, condyle and coronoid process. It is difficult to stop bleeding from this source due to its large calibre, difficulty of access and the elasticity of the vessel which contracts it when cut and moves it away from the operative field. Ligation of the external carotid artery or embolisation can resolve the problem if direct ligation is not possible. Injury to the facial vessels usually occurs at the level of the mandibular base when performing the vertical portion of the sagittal osteotomy. If the section is incomplete, the vessel can be reached with a mosquito forceps; if the section is complete, the elastic action causes retraction of the vessel which makes it difficult to locate the bleeding mouth [13-15].

Condylar resorption. It is defined as the progressive decrease in the volume and height of the condyle. It is associated with a progressive alteration of the occlusion, with the development of an open bite, deviation of the midline and the appearance of a true osteoarthritis of the temporomandibular joint. The incidence described varies between 2.3 and 6.7% of patients undergoing surgical treatment using orthognathic surgery techniques. It occurs mainly in women, with a predominance of 9:1 in men. It is also more frequent in adolescents and, although it can develop at any age, it does not usually appear after 40 years of age. The etiology of the process is uncertain. Different local factors (displacement of the articular disc, bruxism, trauma) and systemic factors (estrogen, vitamin D or calcium deficiency, or the coexistence of systemic arthritis) have been implicated. A local compressive factor in the joint (coexisting or not with a systemic factor) can generate an inflammatory cascade in the temporomandibular joint, with an increase in cytokines, free radicals and pro-inflammatory factors that degenerate into a total remodelling of the condyle and its resorption.

Diagnosis is fundamentally clinical. Symptoms usually begin about 2 months after surgery, presenting as pain in the temporomandibular joint and functional alteration (recurrence of the deformity): progressive development of an anterior open bite and class II malocclusion in bilateral cases; deviation of the mandibular midline towards the affected side, class II malocclusion together with ipsilateral crossbite and premature posterior contacts in unilateral cases.

Surgical risks associated with chin osteotomies. Various complications have been described during the performance of this procedure: inadequate fracture, nerve injury, surgical wound dehiscence, chin ptosis, incomplete osteotomy, bone resorption. III.1. Inadequate fracture. The mandibular symphysis and basalis are areas of hard and dense cortical bone. It is important to adequately complete the osteotomy in the areas closest to the basalis to avoid inadequate fracture lines. It is also important to preserve sufficient alveolar bone so that a mandibular fracture does not occur in the area of the symphysis. Inadequate fractures have been described that occur through the inferior dental nerve canal reaching the sigmoid notch, due to performing an incomplete osteotomy, that is, not reaching the mandibular basalis, and once the chisels are used to complete the separation of the osteotomized fragments, the fracture line is directed through the inferior dental nerve canal [16-19].

Nerve injury. The mental nerves (and their incisive branch) are the most important structures to be spared during mentoplasty. Incidences of nerve paresthesia are reported at 10-28.5% overall. In addition, alterations in dental vitality tests secondary to osteotomy are reported (possible damage to the lower alveolar branches during osteotomy or with the placement of osteosynthesis material). Ideally, tests are proposed to analyze and study the evolution of nerve recovery after chin surgery. In addition, these tests allow to differentiate whether the sensory alteration is due to injury from mentoplasty or from sagittal mandibular osteotomy. 3% of patients suffer from it permanently, suffering strange sensory sensations in the chin, mouth and lips, which causes them: the inability to not detect food remains left on the lips or chin, difficulty kissing or eating, discomfort in the gums, slight drooling, biting inside the cheeks and errors when pronouncing certain words.

Hemorrhage. A case of hemorrhage has been described after a mentoplasty secondary to a pseudoaneurysm of the inferior labial artery, which required surgical ligation of the artery. Bleeding and sublingual hematoma may also occur due to perforation of the lingual cortex during the osteotomy or drilling in the placement of the screws. III.4. Chin ptosis. Chin ptosis appears when the chin muscles are excessively deperiostealized at the base of the mandible. The drooping of the soft tissues gives rise to a deformity known as "witch's chin", which is very unsightly because it ages the face [20-22].

To avoid this problem, it is recommended to moderate the periosteum removal at this level and to restore the periosteum and the musculature at the surgical closure. Likewise, the correct vascularization of the bone fragments is ensured, reducing the risk of their resorption. III.5. Palpation of the mandibular step. Above all, it is important when performing vertical reduction mentoplasty. At the radiological level it is always very evident, but at the aesthetic level it does not usually have repercussions. When performing the osteotomy, it is recommended to do it as horizontally as possible and to palpate the mandibular contour after the osteosynthesis. It is advisable that the resection fragment be wedge-shaped (maximum width at the level of the anterior surface of the symphysis and narrower at the lower edge of the mandible, below the mental nerves. III.6. Injuries to the tooth roots. This risk may occur during the osteotomy, so it is suggested to take into account the reference points and lines at the time of performing the osteotomy on the chin. If this occurs, appropriate dental treatment should be performed. III. Postoperative risks [23-26].

Occlusal changes. Malocclusion is a complication of orthognathic surgery that is relatively common and can sometimes be resolved with the placement of elastics through the intermaxillary fixation. When an immediate anterior open bite occurs, it is very likely that there has been an inadequate removal of the posterior dental interferences, with displacement of the condyle outside the glenoid cavity; it may also be due to the fact that, at the time of rigid fixation with plates and screws, the correct position was not taken into account. certainty that the condyle was in the correct position. Failure of the osteosynthesis can cause posterior or anterior open bites or lateral displacements. Causes of late open bite include collapse of the transverse expansion, condylar resorption with shortening of the vertical ramus, additional bone growth (growth of the individual).

Aesthetic alterations. Maxillary or mandibular hypocorrections or hypercorrections, due to deficiencies in cephalometric planning, laboratory planning or surgical treatment in the operating room. Perform single-jaw surgical treatment when dentomaxillofacial disharmony affects both jaws. IV.3. Relapses. After surgical treatment in patients with dentomaxillofacial disharmonies, relapses may occur, having a multifactorial cause. It may be associated with presurgical planning, failure to meet surgical objectives in the intraoperative period, as well as intraoperative and/or postoperative complications in class II, where the mandibular muscles tend to regress the bone segments, so it is advisable to finish the surgery with an edge-to-edge occlusion and wait for the recurrence to lead us to the desired occlusion, also extreme movements and/or rotations where the muscular action can have an unfavorable influence, the fixation means used and the surgical technique used, postoperative follow-up, the use of orthodontic containment means in the immediate postoperative period, among others. IV.4. Exposure of the fixation means. In sagittal surgical techniques, semi-rigid fixa-

tion is frequently used using circummandibular wires, which in the immediate postoperative period may be exposed by not being properly braided or in an incorrect position with respect to the retromolar region [25-28].

Miniplate exposure is also described in LeFort I type osteotomies, and less frequently, mandibular plates in sagittal and vertical osteotomies, which is due to the position of the masseter muscle, which is attributed to a greater thickness of soft tissue. IV.5. Muscle atrophy. Sequelae such as atrophy and denervation, decreased muscle mass, length, strength and extensibility appear. It is produced by the periods of intermaxillary fixation, as well as the presence of post-surgical scars, which generate atrophy in the muscles. IV.6. Facial edema. It is a normal reaction in any surgical procedure and the intensity varies from one patient to another (mild, moderate, severe), as well as the procedure performed. Postoperative edema increases approximately until 48 hours after surgery, can last approximately one week, and disappears between the third and fourth week.

Nausea and vomiting. They may occur in association with the orthognathic surgery surgical technique used. They are most frequently experienced by patients with bimaxillary surgery and less frequently by patients who only undergo mentoplasty [29,30].

In addition, they are associated with general anesthesia and the passage of blood from the oral cavity to the stomach, despite the placement of a pharyngeal packing. At the end of the surgical procedure, gastric lavage with cold solution and aspiration through a nasogastric tube must be performed. In the immediate postoperative period, medical treatment is indicated to avoid or minimize these complications. IV.8. Pain. After treatment with orthognathic surgery surgical techniques, pain can vary from mild to moderate to severe. It is usually moderate and infrequent, and can be controlled with medication. IV.9. Postoperative bleeding. It may appear after surgery, and is generally associated with treatment with surgical techniques such as LeFort I, especially in the immediate postoperative period through the nasal passages, and is a controllable bleeding.

Postoperative infection. It is a risk that may occur after any surgical procedure, with signs and symptoms of sepsis appearing after 72 hours of surgical treatment. Infection rates of up to 7% are reported after treatment with surgical techniques of orthognathic surgery; antibiotic prophylaxis reduces the risk of surgical site infections, being administered during surgery and 24 hours after the surgical procedure [31,32].

Difficulty swallowing. This risk is associated with the surgical technique used, postoperative edema, surgical time, and nasotracheal intubation, and generally disappears between 48 and 72 hours after the procedure.

Temporomandibular joint dysfunction. Orthognathic surgery can potentially benefit the temporomandibular joint to establish a stable and balanced occlusion; however, it is difficult to predict to what degree this improvement will be. Both orthodontic and surgical treatment can present various joint conditions, which must be monitored and evaluated in the postoperative period [31,32].

Conclusion

The main consequences and risks of surgical procedures in orthognathic surgery were described and explained, thus showing the relevance of this branch of maxillofacial surgery.

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