

ORTHOGNATHIC SURGERY AND ITS POST-OPERATIVE COMPLICATIONS - A COMPREHENSIVE REVIEW

Running Title: Complications of orthognathic surgery

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ABSTRACT:

AIM: To review the postoperative complications of orthognathic surgery.

BACKGROUND: Orthognathic surgeries are unique facial surgeries that improve facial aesthetics by establishing a proper alignment of the jaws through surgical corrections. These surgical procedures are mainly done in order to reposition the maxilla, mandible and the chin in patients whose dental deformities cannot be corrected by orthodontic correction or camouflage.

OBJECTIVE: Orthognathic surgery is the standard procedure done across to correct congenital, developmental, or acquired dentofacial deformities. Performing an orthognathic surgery is said to improve facial esthetics, masticatory function of the jaws and articulation. This article reviews the postoperative stature of the most common orthognathic surgeries and their potential complications.

CONCLUSION: While most patients undergo orthognathic surgery for aesthetic purposes, aesthetic improvements are most often followed by postoperative functional complications. Therefore, it is important for the patients to carefully decide whether their purpose of undergoing orthognathic surgery is on the aesthetic side or the functional side. Studies have suggested that the rate of complications following orthognathic surgery is more than 40%. Therefore, it is important for the patients to receive a detailed explanation on the complications related to these jaw surgery before they decide to undergo the procedure

KEYWORDS: Orthognathic surgery, Osteotomy, Complications, Aesthetics, Skeletofacial, Jaw surgery, Post operative

INTRODUCTION:

Corrective jaw surgery also known as orthognathic surgery is involved in correction procedures of the jaw, temporomandibular joint disorders, malocclusion problems commencing from skeletal anomalies and complications of the dental bite that could not be treated with ease by dental braces. This surgery is also used in the treatment of a broad spectrum of facial imbalances culminating in facial aesthetics, thereby giving a colossal amount of self esteem. Congenital conditions like the cleft palate can also be treated by this procedure[1]. An oro-maxillofacial surgeon usually performs a jaw osteotomy, a procedure wherein there's surgical alignment of an arch of teeth, or the segment of a dental arch with its associated jawbone. These procedures are usually performed in accordance with an orthodontist. Gross jaw discrepancies involving the anteroposterior, vertical or transverse, skeletofacial discrepancies involving sleep apnea, and airway defects are all treated by orthognathic surgery[2]. Disproportion of a grown upper

or lower jaw usually causes chewing problems and there is a lot of muscle and bone straining. Micrognathism otherwise commonly termed as undersized jaw leads to an overbite, wherein, the lower jaw doesn't protrude far enough to occlude with the upper jaw. Micrognathia on the contrary, is an oversized jaw causes an underbite, wherein the lower jaw is proclined a bit too far from the upper jaw failing to occlude. Long face syndrome elicits an open bite, a long face, hyper divergent face and maxillary hypoplasia. All these growth anomalies cannot be treated with basic orthodontic procedures but only through surgical interventions. Surgeons take xrays of the jaws of patients in determination of the deformity and make plans in accordance with orthodontists prior to surgery[3,4].

Along with all the aesthetic improvements and advantages, orthognathic jaw surgeries also have its own post operative complications. These complications generally includes relapse of the corrected jaw segment, neurological complications such as nerve injury and neuropathic pain, Temporomandibular disorder, change in nasal morphology, infection of the bone causing necrosis of the bony segment, respiratory insufficiency, pseudoaneurysm, tooth injury, venous thromboembolism, ear infections, hearing problem leading to deafness, obstructive sleep apnea and rarely the complications proceeding orthognathic surgery also includes death of the patient[5,6]. Previously our team has done many researches, systematic reviews and surveys which has led to the idea of the current topic on impaction removal[7-21]. The aim of this article is to review the postoperative complications of orthognathic surgery.

TYPES OF ORTHOGNATHIC SURGERIES:

Orthognathic surgeries of the jaws can be divided into two broad categories which includes maxillary and mandibular surgeries. Under maxillary surgeries, total maxillary osteotomy and segmental alveolar maxillary osteotomies for anterior and posterior segments are performed. Other maxillary surgical procedures include maxillary advancements and maxillary setbacks[22]. Orthognathic surgical procedures of the mandible include Bilateral sagittal split osteotomy, Vertical subsigmoid osteotomy, Subapical osteotomy, Genioplasty[23].

POST OPERATIVE COMPLICATIONS:

RELAPSE AND NEUROLOGICAL COMPLICATIONS:

The most commonest post operative complication of orthographic surgery is relapse similar to that of orthodontic treatment. Under relapse the commonest incidences that can occur includes condylar malposition which leads to severe open bite following the completion of the orthognathic surgery, gap between the distal and the proximal segment which can be due to forced fixation in cases of maxillary and mandibular realignment, pterygomasseteric tension which affects the functioning of the masticatory muscles and proximal rotation of the teeth in undesired position leading to severe relapse. Relapse is quite common in maxillary and mandibular set back and bilateral sagittal split osteotomy. It is also reported that physiological equilibrium is highly disturbed in cases of mandibular set back leading to relapse[24,25]. The second most common postoperative complication of orthographic surgery includes nervous complications such as neurological injury and neuropathic pain. Inferior alveolar nerve, mental nerve, infraorbital nerve and the incisive nerves are the commonly affected nerves during orthographic surgeries. The damage to the facial nerve is quite rare in occurrence. The damage to the sensory nerves is either reversible or irreversible or partially reversible which is checked during the followup of the patient. Early diagnosis of neuropathic pain is essential as it may persist for even about a year. In cases of Bilateral sagittal split osteotomy, neuropathic pain is commonly observed due to the damage to the inferior alveolar nerve[26,27]. Teerijoki-Oksa et al have indicated that persistence of neuropathic pain for more than one month after surgery is an indication of axonal damage and might take longer than a year to be healed[28].

TEMPOROMANDIBULAR DISORDERS:

Numerous studies investigated the relation between orthognathic surgeries and temporomandibular disorders and have suggested that all types of jaw surgeries affect the temporomandibular joint either directly or indirectly. The common complications include temporomandibular pain and degeneration. So it is always advisable for the patients with temporomandibular joint symptoms to stabilize the joint prior to the surgery in order to avoid complications[29]. During the surgery it is always advisable to remove all the bony interferences that exist between the distal and the proximal segments. It is important that the condylar heads should settle passively into the glenoid fossa. Non rigid fixation by the use of monocortical plates and screws for fixation of the bony segments is recommended. Use of lag screws and compression plates are generally avoided during the surgery. Mandibular hypomobility can be minimized by avoiding long term intermaxillary fixation[30]. Studies have suggested that maxillomandibular rotation in a counterclockwise direction will have a drastic impact on the temporomandibular joint due to load and stress leading to condylar resorption. The rate of temporomandibular disorders tends to be greater among patients with mandibular retrusion and steep occlusal planes. Maxillary setback generally improves masticatory functions by improving bite force unlike mandibular setbacks[31].

CHANGES IN NASAL MORPHOLOGY:

The other aesthetic complications includes the changes occurring in the nasal region such as change in nasal morphology, widening of the nose and nasal deviation. The morphology of the nose is likely to change following orthographic surgery especially during maxillae repositioning. Most of the patients are even subjected to rhinoplasty following the maxillary realignment. Nasal widening and nasal deviation are the commonly reported changes occurring in the nasal cavity following orthographic surgery

causing a high aesthetic compromise[32]. Superior impaction or maxillary advancement procedures causes nasal widening which affects the nasal septum and the alar cartilage. Nasotracheal intubation done during the surgery creates high pressure causing nasal deviation and incomplete deflation of the cuff during extubation causes dislocation of the nasal cartilage. Septal reduction of about 3 mm is necessary to avoid nasal deviation[33].

BONY INFECTIONS, NECROSIS AND RESPIRATORY INSUFFICIENCY:

In cases who underwent transoral vertical ramus osteotomy, rare cases of bone necrosis were reported. The main cause for necrosis of the bone is the local ischemia that developed due to excessive ablation of the soft tissues confined to the specific reason and hematoma formation. Poor healing of the hard and soft tissues leads to delayed union or nonunion of the site of osteotomy. This is common in conditions where the anterior displacement of a segment is more than 6 mm and patients with healing disorders. Studies have also reported certain infections such as cellulitis, osteomyelitis, sinusitis and abscess formation to be the postoperative complications of orthognathic surgeries. Early diagnosis and treatment helps in the complete cure of the infections[34,35]. Due to implantation of screws on the bones during the surgery, tooth injuries are common in patients undergoing orthognathic treatment. The screw placement on the root surface leads to pulpal necrosis, tooth discolouration or fracture of the segment of tooth at the root apex. This is commonly seen in mandibular subapical osteotomy and genioplasty. As the patients are given general anaesthesia, nausea and vomiting are most frequently seen. Severe edematous swelling and hemorrhage are common following the surgical procedures whereas nausea and vomiting can rarely have lethal effects on the patients[36]. In some case studies it has been reported that patients who underwent orthognathic surgery developed obstructive sleep apnea. This is due to the positional changes in the hyoid bone leading to narrowing of the airways causing unusual snoring. The other airway related complications leading to respiratory insufficiency includes pneumonia, pneumothorax, atelectasis and airway obstruction. Damage to the mucous membrane of the nasal region, intermaxillary fixation, dyspnea may be caused due to bleeding and accumulated secretions which can also lead to airway obstruction causing respiratory insufficiency, rarely aspirated pneumonia[37,38].

OTHER SYSTEMIC COMPLICATIONS:

Ophthalmic examination of the patients after orthognathic surgery showed damage of the lacrimal gland causing lack of tearing ability. Studies have reported that lack of tearing may occur as soon as three days after the surgery and may extend upto months until which the patients are asked to use artificial tears. Otitis media causing unilateral fullness of the ears and auditory dysfunction caused due to maxillary osteotomy were diagnosed in a few cases. These are also reported to be temporary and do not need any specific treatment. The other systemic complications include asystole, cardiac dysrhythmias, bradycardia which can be lethal. Pseudoaneurysm or arteriovenous fistula rarely develops after the orthognathic surgery which can cause facial swelling, benign paroxysmal positional vertigo causing brief dizziness lasting less than a minute which repeats on positional changes is been reported in patients following the jaw surgery[39]. Studies have reported that venous thromboembolism is common among patients who underwent orthognathic surgery due to long term hospitalization and local hypoxia after the procedure. It has also been reported that severe intraoperative hemorrhage, airway obstruction and other cardiac complications can also lead to death in some patients[40].

CONCLUSION:

Orthognathic surgery is included with a wide variety of complications and there are also certain unusual complications that are hard to predict. The surgeon who performs the surgery is expected to have a full understanding of the types, causes, and treatment of complications and should also deliver this information to patients who develop these postoperative complications following the surgical procedure. Frequent follow ups must be encouraged to diagnose these complications at a very early stage such that desired treatment can be given early to cure the existing and prevent the future complications thus enhancing the betterment of the patient.

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