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Research Article

**COMPLICATIONS OF ORTHOGNATHIC SURGERY**

Tareq Saleh Sagheer Alzahrani<sup>1</sup>, ALI MOHAMMAD A ALZAH RANI<sup>1</sup>, Saleh Abdullah Alqarni<sup>1</sup>, Samar Abdulmajid Aldergham<sup>1</sup>, Alawi Ali Hakami<sup>1</sup>, Mansour Hebah Thabet Almakrami<sup>2</sup>, Faisal Hassan saleh Al milaq<sup>2</sup>, Amal kamal jumaymi<sup>3</sup>, Hind Jumah Alrefai<sup>4</sup>, Noha Ahmed Alkurdi<sup>4</sup>

<sup>1</sup>Ministry of health, <sup>2</sup>Najran University, <sup>3</sup>Armed forces jazan hospital, <sup>4</sup>University Dental Hospital at King AbdulAziz University.

**Abstract:**

**Introduction:** Orthognathic surgery is one of the common treatment approaches of maxillofacial deformities, the aim of which is to improve the facial appearance to benefit the patient psychologically and socially. While most patients undergo orthognathic surgery for aesthetic improvement which is most often followed by postoperative functional complications. The decision to the aesthetic side or functional side is ultimately the patient's choice. A wide variety of complication is associated with orthognathic surgery such as vascular disease, temporomandibular joints (TMJ) problems, infection, bone necrosis, nerve damage, hair loss, hearing problems, vision impairment, and neuropsychiatric problems, but rarely any complication is fatal.

**The aim of Work:** The study aims to understand various complication related to orthognathic surgery

**Methodology:** We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE, January 1985, through February 2017. The following search terms were used: orthognathic surgery, complications of orthognathic surgery, bleeding, relapse, fracture, neurologic complications, gingival sensitivity

**Conclusion:**

While most patients undergo orthognathic for an aesthetic purpose which may pose a risk of various complication, therefore patient must decide carefully whether their purpose of undergoing orthognathic surgery lies on the aesthetic side or functional side. Though there are a wide variety of complication related to orthognathic surgery, complications can be resolved without any severe damage if detected early and with appropriate treatment. Besides an oral and maxillofacial surgeon must have a full understanding of types, causes, and treatment of complication and should deliver the information to the patient who develops these complications.

**Keywords:** complication, orthognathic surgery, intra-operative complication, post-operative complications.

**Corresponding author:**

Tareq Saleh Sagheer Alzahrani,  
Ministry of health.

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## INTRODUCTION:

Orthognathic surgery is one of the common treatment approaches of maxillofacial deformities, the aim of which is to improve the facial appearance to benefit the patient psychologically and socially. While most patients undergo orthognathic surgery for aesthetic improvement which is most often followed by postoperative functional complications. The decision to the aesthetic side or functional side is ultimately the patient's choice. A wide variety of complication is associated with orthognathic surgery such as vascular disease, temporomandibular joints (TMJ) problems, infection, bone necrosis, nerve damage, hair loss, hearing problems, vision impairment, and neuropsychiatric problems, but rarely any complication is fatal. [1]

## METHODOLOGY:

### • Data Sources and Search terms

We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE, January 1985, through February 2017. The following search terms were used: orthognathic surgery, complications of orthognathic surgery, bleeding, relapse, fracture, neurologic complications, gingival sensitivity

### • Data Extraction

Two reviewers have independently reviewed the studies, abstracted data, and disagreements were resolved by consensus. Studies were evaluated for

quality and a review protocol was followed throughout.

The study was approved by the ethical board of King Abdulaziz University Hospital

### Complications

The complications can be broadly classified as **Intra-operative** and **post-operative** complications.

### Intra-operative complication

#### Hemorrhage

Severe bleeding is one of the most complications in orthognathic surgery and can occur if inferior alveolar, superior alveolar, retromandibular, maxillary, facial and sublingual vessels become damaged. Massive hemorrhage has been reported as a common complication in LeFort osteotomies with the incidence of life-threatening hemorrhage in maxillary osteotomies.[1]The Descending palatine artery is the most common cause of mild to moderate bleeding during LeFort I osteotomy and it can be damaged during medial wall osteotomy. In superior positioning of the maxilla, bone removal around descending palatine artery is a common vascular injury and if encounter, it should be cauterized. Internal maxillary artery is the commonest source of massive bleeding. [2] Thus the curved osteotome should be placed very meticulously in pterygomaxillary junction to avoid injuring the artery. Several techniques have been suggested to control the bleeding from internal maxillary arteries such as ligation of the external carotid artery and angiographic embolization. [3]

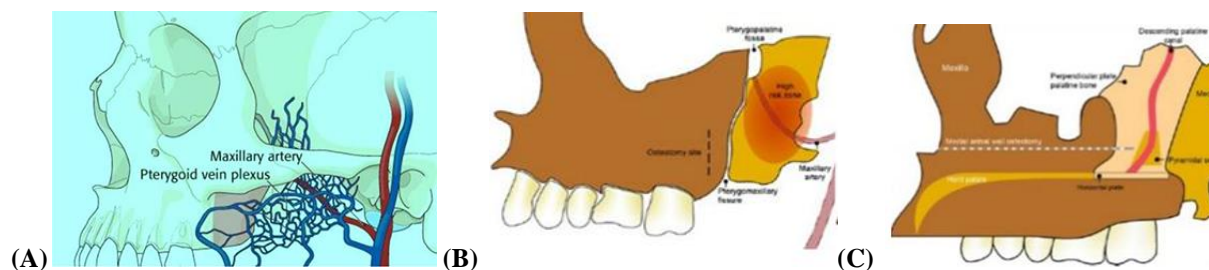


Figure 1: showing (A) Post bleeding source during LeFort I osteotomy (B) and (C) Relationship of osteotomy sites and major hemorrhage sources during LeFort I osteotomy. [6]

Packing is the first attempt to tamponade hemorrhage. In case delayed bleeding post LeFort I osteotomy, the surgical site should be reopened, and the maxilla should be moved downward to find the bleeding source. Thus a direct visualization of bleeding source and cauterization of injured vessels can stop the hemorrhage.[4] Bleeding thus can be stopped by applying pressure, using bone wax or resorbable hemostatic material, by using thrombin or epinephrine

impregnated gauze packing or electrocautery. According to a recent study the use of tranexamic acid is recommended in obviating perioperative blood loss during orthognathic surgery. Thus, the intraoperative bleeding and the possibility of developing complication vary and therefore it is important to measure relative blood loss by using patient-specific measures. [5]

### Bad Split/Segment Fracture

Sagittal split ramus osteotomy (SSRO) is the most common orthognathic surgery associated with the rate of bad splits and has been reported to be approximately 2.3%. Proximal segment buccal plate fracture and distal segment lingual fracture frequently occur during SSRO. In osteotomy of the inferior mandibular border, the risk of buccal cortical plate fracture is high when the forced separation of the bone segment is performed after. The inadequate vertical osteotomy at the inferior border, horizontal osteotomy performed too high above lingual, exertion of excessive force while separating proximal and distal segments, impacted third molars are some causes and risk factors of segment fracture. Removal of impacted teeth 6-9 months before SSRO or at the same time of surgery has always been a controversial topic. [6,7]

According to a study by Posnick et al. reported that no 'bad splits' following extraction of impacted third molars performed during SSRO, thus claimed that extraction of impacted third molar does not increase the rate of 'bad' splits and delay bone healing. [15] But according to another study by Reyneke et al. suggested that since impacted teeth interfere with SSRO and increase the rate of fracture in proximal or distal segment, thinning of the cortical bone due presence of empty sockets, thus recommended that impacted teeth be extracted 6-9 months prior orthognathic surgery. [6,8,9]

### Post- Operative Complications

#### Relapse

Muscle-related physiological effects influenced by the direction of bone rotation and the amount of bone movement, the asymmetry between right and left mandibles, changes in condylar position, changes in teeth position after surgery, change in mandibular plane, in ramus inclination, type of fixation and final split are some the factors associated with relapse. [10] Following are the common causes of relapse:

- **Condylar Malposition**
- **The gap between proximal and distal segment:** Creation of gaps between bony segments after SSRO is inevitable, forced fixation, in this case, can lead to change in condylar position and relapse. [11]
- **Pterygomasseteric tension:** Mandibular setback osteotomy changes the physiological equilibrium of pterygomasseteric sling

subsequently affecting the function of muscles which tend to rotate the proximal segment causing a relapse.

- **Clockwise rotation of the proximal segment:** Tendency of relapse increases when the proximal segment that previously rotated clockwise starts to rotate counterclockwise. [12]

### Neurologic Injury

Most common nerves affected by neurological injuries associated with orthognathic surgeries are inferior alveolar nerve, mental nerve, incisive nerve, and infraorbital nerve and to some extent occasionally facial nerves. The infraorbital nerve may be compressed or transected during subperiosteal dissection and injured as a result of incorrect separation during disimpaction. [6] Nerve sensitivity may return within 6-12 months in bilateral sagittal ramus osteotomy. Neurosensory alteration is normally perceived as a result of traction of infraorbital never and direct trauma to anterior, medial and posterior superior nerves as well as nasopalatine and descending palatal nerve. [13]

### Neuropathic pain

About 21.4% of the patients reported pain after orthognathic surgery. According to a study by Teerijoki-Oksa et al. pain that persists after surgery indicates axonal damage. It is observed that neuropathic pain persists even after one-year post surgery therefore early diagnosis and management is a must. [14]

### Tooth Sensitivity

An osteotomy performed closer than 5mm of the apices of teeth poses a risk of tooth-root injuries. Superior repositioning of maxilla by more than 6mm, saving a 5 mm of margin is not always possible due to infraorbital foramen position. Loss of vascularity of dentition is rare after orthognathic surgery, but initial loss of response to pulpal stimulation is common. [15]

### Maxillary Sinusitis

LeFort I osteotomy is commonly associated with postoperative sinusitis possibly due to pre-existing sinus disease or presence of non-viable bone fragments left in the maxillary sinus. A recent study suggests that LeFort I. [16]

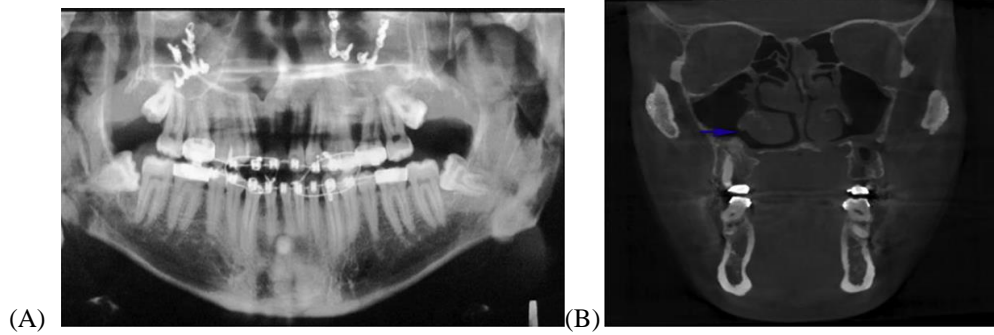


Figure 2: showing (A) Maxillary sinusitis after LeFort I osteotomy (B) Inflammation and Rhinosinusitis symptoms after LeFort I osteotomy. [6]

### Nasal Deformity and Nasolacrimal Duct Obstruction

Repositioning of maxilla during surgery is likely to change nasal morphology. Nose widening and nose deviation are commonly observed phenomena post surgery.[1] Nose widening is seen after orthognathic surgery in which nasal septum and alar cartilage are affected by superior impaction or advancement of the

maxilla and can be prevented by performing alar cinch suture.[17] Displacement of maxillary segments, the pressure created by nasotracheal intubation and dislocation of the quadrangular cartilage by an incompletely deflated cuff during extubating causes nasal deviation thus during superior positioning of the maxilla, septum reduction of at least 3mm must be done nasal deviation.[18]

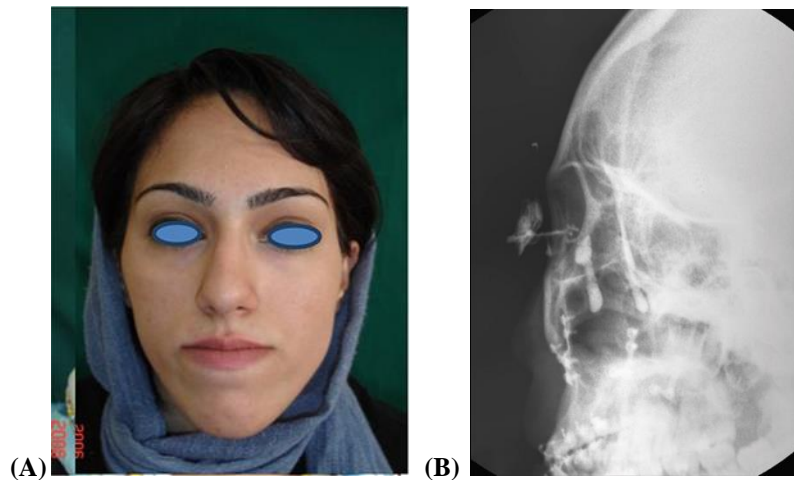


Figure 3: showing (A) Deviated nasal septum (B) Obstruction of NLD in patient undergone orthognathic surgery. [6,19]

Nasolacrimal duct obstruction (NLDO) after maxillary orthognathic surgery is rare. The normal distance between the NLD nasal opening and the nasal floor is 11-17mm. LeFort O osteotomy should be performed 5 mm above the nasal floor because the distal to the proximal part of NLD is vulnerable to be obstructed after maxillary osteotomy. [19]

### Temporomandibular dysfunction (TMD)

The effect of orthognathic surgeries on TMD is controversial. The pre-existing TMJ dysfunction is likely to worsen it post orthognathic surgery, particularly in mandibular advancement, although some cases showed improvement in signs and symptoms. Lag screw usage, improper control of

proximal segments and advancement more than 10mm increases the risk of post-orthognathic TMD. Thus, TMJ dysfunction should be closely evaluated, treated and monitored in orthognathic surgery patients. [1,20]

#### MISCELLANEOUS:

- Condylar luxation and bony interference: It is one of the major complications seen in Intraoral vertical ramus osteotomy (IVRO). The sequelae to which is skeletal instability and anteroinferior condylar displacement also known as condylar sag leading to the unpredictability of postoperative mandibular position. [6, 21]
- Aseptic Necrosis: Associated with LeFort I osteotomy.
- Unfavorable fracture
- Non-union of segment
- Improper positioning of the maxilla
- Condylar resorption
- Trigemino-cardiac reflex
- Ophthalmic complications
- Infection
- Post-operative airway problem
- Pseudoaneurysm
- Vomer-sphenoidal disarticulation.

#### CONCLUSION:

There is a wide variety of complication associated with orthognathic surgery, including some unusual complication which is hard to predict. Therefore, an oral and maxillofacial surgeon should have thorough knowledge and understanding of types, causes of complication with their respective treatment both intraoperative and post-operative. Malpractice must be avoided and best prevent with careful and meticulous measures. With experience and competence, the complication related to orthognathic surgery can be well managed.

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