ORIGINAL ARTICLE

Retrospective examination of complications observed in orthognathic surgical surgery in 85 patients

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ABSTRACT

BACKGROUND: The aim of our study is to examine the possible complications, risk factors, and solutions encountered in orthognathic surgery in the light of the cases; we performed in our clinic.

METHODS: This study includes a retrospective analysis of the records of 85 patients who underwent orthognathic surgery between 2015 and 2020 in Istanbul Pendik District Hospital Oral and Maxillofacial Surgery Service. The types of complications encountered during the operations were recorded in the study. Independent variables such as gender, age, number of operations, surgical site, and type of osteotomy were evaluated. Complications were evaluated according to the Clavien–Dindo classification. The data were presented for statistical analysis with a significance level of 0.05.

RESULTS: Of the 85 patients included in the study, 40 were male and 45 were female. Of these patients, 65 had double chin operation and 20 had single chin operation. A total of 150 jaw osteotomies were performed, 78 of them in the maxilla and 72 in the mandible. While the maxilla was operated in 13 of the cases, in which single jaw operation was performed, only the mandible was treated in 7 of them. Complications were observed in 24 (10.57%) of a total of 227 osteotomies. Among the complications encountered, bleeding (8), nerve damage (7), malocclusion (3), infection (2), TMJ problems (2), bad split (1), and deviation at the tip of the nose (1) stand out, while complications were observed equally in men and women, complications were observed more frequently in cases with longer operative time ($p<0.05$). Complications were observed more frequently in bilateral sagittal split osteotomies ($p<0.001$) compared to Le Fort 1 osteotomies. Clavien–Dindo grade I complications were most common (72.04%) depending on the treatment. According to the Clavien–Dindo classification, there was no relationship between gender, age, duration of surgery, length of hospital stay, or surgical site, and the degree of complications ($p\geq0.05$).

CONCLUSION: Post-operative malocclusion, bleeding, inferior alveolar nerve injury, infection, poor division, and infection are the most common complications in orthognathic surgery. It can be associated with factors such as the duration of the operation, the number of operations, the site of the operation, and the type of osteotomy which performed. It is thought that positive contributions can be made to the success of the surgery by considering these factors in the treatment planning, during the operation and in the post-operative follow-up part.

Keywords: Complication; orthognathic surgery; post-operation.

INTRODUCTION

Orthognathic surgery is generally a safe multidisciplinary approach with high patient satisfaction. For the success rate to be as high as possible, careful and detailed examination of the patient, evaluation of the patient's expectations and concerns, comprehensive treatment planning, careful and atraumatic surgical technique, and effective communication

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with all other disciplines are required.[1] While evaluating the patient, factors such as the patient's age, gender, ethnicity, as well as characteristic features such as face shape, body structure, and posture should be taken into account.

Orthognathic surgery greatly improves the quality of life of patients and gives them self-confidence, but as in any surgery, orthognathic surgery may have some complications. These can be divided into intraoperative and post-operative complications. Complications such as bleeding, bad split, nerve damage, breaking of surgical instruments or brackets, and forgetting of tampons materials in the surgical field may occur intraoperatively. Post-operative complications such as infection, fixation problems, temporomandibular joint problems, and relapse may also be encountered.[2] Surgery is a procedure with a risk of complications due to its nature. The aim, here, is not to reduce the complications to zero, but to increase the knowledge and skills, and to reduce the complication rate by evaluating the risk factors and to manage the complications well. For this reason, it is of great importance for researchers to transfer their experiences to other physicians through retrospective studies.[3]

In our study, we aimed to retrospectively analyzed the complications encountered during the operations of 85 patients who underwent orthognathic surgery between 2015 and 2020.

MATERIALS AND METHODS

In this retrospective study, the data of patients who were treated with Le Fort I osteotomy and Bilateral Sagittal Split osteotomy between 2015 and 2020 by the same surgical team in Istanbul Pendik District Hospital Maxillofacial Surgery Clinic were used. The study was approved by the Local Ethics Committee on December 1, 2020 with the number 48670771–514.10 and the protocol number 443, in accordance with the Declaration of Helsinki. In our study, patients with inadequate registration, patients with pre-operative Temporomandibular Joint (TMJ) complaints, patients who underwent TMJ surgery in combination with double chin surgery, and previous craniofacial surgery and craniofacial syndrome were excluded from the study.

The independent variables used in the study are as follows; gender, age, duration of surgery and hospital stay, number of sites and surgical sites, and type of osteotomy performed. Surgical fields were divided into four groups:
1. Maxilla only
2. Mandible only
3. Double jaw surgery
4. Double jaw surgery and genioplasty.

The osteotomy types used in the study were Le Fort I osteotomy, bilateral sagittal split osteotomy, and jaw tip osteotomy. Existing complications were classified from 1 to 5 according to the Clavien–Dindo classification.[4] In this classification, Type I refers to any deviation from the normal post-operative course without the need for medical or surgical interventions. Complications in this group can be treated with drugs such as antiemetics, antipyretics, analgesics, diuretics, electrolytes, and physiotherapy.

Type II complications require pharmacological treatment with drugs other than those permitted in Type I complications, such as blood transfusions or total parenteral nutrition. In Type 3 complications, a second surgical intervention is required for treatment. Type 4 complications refer to life-threatening conditions. Finally, grade V complications result in patient death.

RESULTS

A total of 85 patients were operated during the study period. Of the patients, 40 (47%) were male and 45 (53%) were female. The mean age of the patients was 26.7±5.5 years, and 51.8% of the surgeries were performed on patients between the ages of 21 and 30. The total number of Le Fort I and BSSOs performed is 150, of which 78 (52%) are in the maxilla and 72 (48%) are in the mandible. While the maxilla was operated in 13 of the cases, in which single jaw operation was performed, only the mandible was treated in 7 of them. A total of 65 patients underwent double jaw operation (76%), and genioplasty was also performed in only 5 of these cases (5.88%). The total number of Le Fort I osteotomies performed was 78 (34%), and the total number of SSOs performed was 144 (63%). Genioplasty was performed in only five cases (3%). As a result, 227 different osteotomies were examined in the study.

DISCUSSION

Orthognathic surgery has become a very common surgical method to correct maxillomandibular deformities today. The rate of reported complications of this surgery, which has been performed for more than 50 years, has gradually increased over time. However, the total number of complications may be underestimated as surgeons may not be able to report complications easily due to their professional obligations and limited participation.[5]

Vascular Complication

Bleeding complications observed during orthognathic surgery have decreased considerably with the use of hypotensive anesthesia technique. Bleeding mostly occurs during down fraction of the maxilla after Le Fort I osteotomy or during separation of the pterygoid junction. The incidence of severe bleeding requiring blood transfusion with Le Fort I osteotomy has been reported to be approximately 1%.[6] Specific areas that may cause excessive bleeding in the maxilla are the pterygoid venous plexus, maxillary artery in the pterygopalatine fossa, palatine artery, nasal, and maxillary sinus mucosa.

Of the 8 bleeding complications encountered in our study, six were observed during Le Fort one osteotomy, two of which were caused by the descending palatine artery and four of

them were caused by the pterygoid plexus. Arterial bleeding of the descending palatine was controlled by cauterizing the relevant area, while pterygoid plexus bleeding was controlled by buffering appropriately. To prevent possible bleeding in the pterygoid plexus, the periosteal elevator must be used in a subperiosteal position and with very gentle movements, while dissecting backward from the maxilla tuber region. To prevent possible damage to the maxillary artery in the pterygopalatine fossa, the pterygoid osteotome should be used with its tip directed downward toward the hamulus.

The maxillary artery courses at least 1.5 cm above the basal part of the pterygoid fissure. Ferri et al.,[7] in 2019, reported that they applied embolization to patients with secondary bleeding that occurred with sudden epistaxis in four patients between post-operative day 7 and day 10 in a series of 5,025 cases. Epistaxis was observed in our patients during the first 7 days and it was not at a serious level.

Nerve Damage

All of the patients with nerve damage in our study were aged 25 years and under. This may be the reason for the complete resolution of drowsiness within 1 year in most of the patients. Although numbness decreases in only 1 of the patients, it still continues. Genioplasty and double jaw surgery were performed in only 2 of 7 cases with nerve damage, while double chin surgery was performed in the other 5 cases. Espeland et al.,[8] in 2008, 508 patients who underwent orthognathic surgery were followed for 3 years, and the rate of patients with ongoing nerve damage is 36%. About 70% of patients over the age of 40 continue to experience numbness, while only 30% of patients under the age of 20 continue to have numbness. In another retrospective study by Posnick et al.[9] in 2014, mental and inferior alveolar nerve damage was examined in 115 patients undergoing orthognathic surgery. While numbness persists after 1 year in 29% of patients who underwent bilateral sagittal split osteotomy, this rate is 10% in patients who only underwent genioplasty. In patients with BSSO and genioplasty applied together, drowsiness still continues in 67% of the patients at the control after 1 year.

Nerve damage after Le Fort I osteotomy most commonly occurs in the infraorbital and descending palatine nerves. Damage to the infraorbital nerve due to traction of the retractor is usually temporary. The incidence of damage to the infraorbital nerve in the 12-month post-operative period was reported as 6%.[10] The risk of permanent nerve damage increases with increasing age. In our study, no nerve damage complication was observed after Le Fort I osteotomy.

Condylar Malposition

If the mandible comes back within a few days after the surgery or before the patient is awakened; then, there is a surgical error, not a relapse. The condyle is not positioned correctly in the glenoid fossa and a "condylar sag" has formed or tension-free fixation of the proximal and distal parts has not been achieved, which is common in cases of asymmetry. In an article, he published in 2002, Reyneke defined the concept of condylar sag and suggested a solution. In the aforementioned publication, 184 patients who underwent bilateral sagittal split osteotomy were retrospectively analyzed, and occlusion disorder was observed in 18 patients after the completion of the surgery.[11] All of the malocclusion complications observed in our study were patients with asymmetry. After osteotomy is performed in these patients, it is necessary to ensure passive seating of the distal and proximal parts, especially on the side with asymmetry. If this is not taken care of, the lingual part of the proximal part will push the distal part outward, while the mandible is rotated, the ideal position of the condyle in the fossa will be disturbed and asymmetry will occur again. In this case, the patient should be re-operated and passive seating of both segments should be ensured. In the three cases of malocclusion observed in our study, the patients were re-intubated, the fragments were removed and re-fixed in this way to passively fit the fragments.

Infection

Infection rates observed after orthognathic surgery have decreased to the level of 1% today. Among the reasons for this are the development of surgical technique and the administration of prophylactic antibiotics. According to a retrospective study conducted by Iannetti et al.[12] on 3,236 patients, IV antibiotic use twice at 8-h intervals during and after the operation, and oral antibiotic use for 5 days after the operation reduces the incidence of post-operative infection. However, Ferri et al.[7] and a review state that the most common complication in orthognathic surgery patients is infection.[5]

Kuhlefelt et al.[13] published a study in 2012 revealing that cigarette consumption significantly increases the risk of infection in the post-orthognathic surgery period. In this study, 286 patients who had undergone single jaw (BSSO or Le Fort I) surgery in a retrospective 7-year period were examined. While the rate of infection observed in all patients was 9.1%, this rate increased to 14.4% in smokers. In non-smokers, the infection rate remained at 7%. Although the incidence of sinusitis after Le Fort I osteotomy is quite low, this situation can sometimes be encountered. Changes in the mucociliary mechanism in the sinus, clot retention in the sinus cavity, presence of foreign body in the operation area (graft, fixation screw, and bracket), anatomical blockade of the ostium, and pre-operative sinusitis can be considered as causes. To rule out such possibilities, it should be studied very carefully during the operation, foreign objects such as brackets that may escape in the operation area should be counted before and after the procedure, carefully examined whether the burr tips are broken, if they are broken, they should be removed, the area should be thoroughly washed with serum before the fixation, and the presence of pathology in the sinus should be checked before the procedure. To be sure, a detailed tomographic examination should be performed.[10]

All infections observed in our study originated from the mandible and were treated with drainage and antibiotic therapy. All infected patients are smokers. In our study, no sinusitis or any other infection was found after Le Fort I osteotomy. All patients examined in our study were given IV antibiotics every 8 h during the operation and in the next 2 days, and IM antibiotic use was continued for 5 days afterward. This may have reduced the infection complication rate.

Bad Split

Bad split is a complication that can occur during the separation after completing sagittal split osteomy in the mandible and sometimes can seriously affect the course of the surgery. Its incidence has been reported ranging from 1% to 23%.[5,7,14]

In the only case of bad split encountered in our study, type the buccal part was fixed to the proximal segment with miniplates and screws, and the operation was continued. Posnick et al.[15] have a retrospective study, in which they examined the incidence of bad split on a total of 524 sagittal split osteotomies performed in 262 patients. It was reported that there was no bad split in 524 SROs made in this study. The author stated that the most important reason for the success is keeping the medial osteotomy made at the level of the lingual mandible at the inner mandibular edge, low, and short. In the literature, the effect of the presence of wisdom teeth on the incidence of bad split has been discussed frequently, and there are many opinions for and against this issue. According to the above-mentioned study of Posnick et al., the presence of wisdom teeth does not affect the bad split during the procedure.

The medical incisions, we made in our study, were deepened a few mm above the lingula mandible and to cover approximately 1/3 of the inner surface of the ramus. As Posnick stated in his study, although the incision was not made short and low, the complication of bad split was low. This may be due to careful and slow work during the split process. In addition, it would be appropriate to examine the tomography of the mandible before the procedure to avoid the complication of bad split. Considering the risk of bad split, more care should be taken in the presence of thin and long ramus in young patients.[16]

Change of Nasal Morphology

After orthognathic surgery, some changes occur in the tip of the nose, dorsum, and nose wings due to maxillary advancement, burying or drooping. While these changes contribute to the aesthetic appearance to some extent, undesirable changes can also be encountered in some cases.[17,18] These changes are observed in the form of nasal deviation and nose widening.

In general, separation of the nasal soft tissues from the bone, burying or advancing the maxilla during surgery in any way may cause some enlargement of the nasal wings. In individuals with a long thin face type, this enlargement can be welcomed esthetically. However, the possible enlargement that may occur in individuals with a round face or whose nose wings are already wide will give a negative result in terms of aesthetics.

In cases, where maxillary embedding is performed, insufficient resection of the lower part of the nasal septum may cause nasal asymmetry as a result of septum sprain and deviation at the tip of the nose.[19] In our study, the reason for the deviation complication encountered in a case of maxillary embedding may be that the nasal septum was not resected sufficiently. In addition, the use of Chinch suture and some shaving of the aperture priformis reduces alar enlargement.

In our study, submental intubation was performed in 13 patients who were operated only in the maxilla, and the response of soft tissues to skeletal movement could be observed more easily in these cases. Chich suture was applied in all cases, where Le Fort I osteotomy was performed, and no enlargement was observed at the base of the nose in cases, where the maxilla was advanced and buried.[19]

Limitations of the Study

We did not discuss complications such as condylar resorption, late relapse, TMJ dysfunction, soft-tissue complications, fixation failure, and rare conditions. In addition, we had few cases compared to the case numbers in the retrospective publications in the literature.

Conclusion

The most common complications observed in orthognathic surgery, such as bleeding, infection, malocclusion, inferior alveolar nerve injury, poor cleavage, TMJ problems, and undesirable changes in the nose, observed during or after surgery have been studied. It is thought that some of these complications may be related to factors such as the surgical site and the type of osteotomy performed. It is thought that positive contributions can be made to the success of the surgery by considering these factors in the treatment planning, during the operation and in the post-operative follow-up part. In this way, it is possible to explain to the patient the different degrees of severity of the complications related to the surgery and the possible risk factors associated with them.

Ethics Committee Approval: This study was approved by the İstanbul Prof. Dr. Cemil Taşçıoğlu City Hospital Clinical Research Ethics Committee (Date: 01.12.2020, Decision No: 443).

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ORİJİNAL ÇALIŞMA - *ÖZ*

85 hastada yapılan ortognatik cerrahi ameliyatlarında gözlenen komplikasyonların geriye dönük incelenmesi

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AMAÇ: Çalışmamızın amacı kliniğimizde yaptığımız olgular ışığında ortognatik cerrahide karşılaşılan muhtemel komplikasyonları, risk faktörlerini ve çözümlerini incelemektir.

GEREÇ VE YÖNTEM: Bu çalışmada İstanbul Pendik Bölge Hastanesi Ağız, Diş ve Çene Cerrahisi Servisinde 2015 ve 2020 yılları arasında ortognatik cerrahi uygulanan 85 hastanın kayıtlarının geriye dönük olarak incelenmesini kapsamaktadır. Çalışmada operasyonlarda karşılaşılan komplikasyon tipleri kaydedildi. Cinsiyet, yaş, ameliyat sayısı, ameliyat yeri ve yapılan osteotomi tipi gibi bağımsız değişkenler değerlendirildi. Komplikasyonlar Clavien-Dindo Sınıflamasına göre incelendi. Veriler anlamlılık düzeyi 0.05 ile istatistiksel analize sunuldu.

BULGULAR: Çalışmaya dahil olan 85 hastanın 40'ı erkek, 45'i kadındır. Bu hastaların 65'ine çift çene operasyonu, 20'sine tek çene operasyonu yapılmıştır. Toplamda 150 adet çene osteotomisi uygulanmış olup, bunların 78 tanesi maksillada, 72 tanesi mandibuladadır. Tek çene operasyonu yapılan vakaların 13'ünde maksillada işlem yapılmış iken, yedisinde sadece mandibula işlem görmüştür. Toplam 227 osteotomiden 24'ünde (%10.57) komplikasyon gözlenmiştir. Karşılaşılan komplikasyonlar arasında kanama (8), sinir hasarı (7), maloklüzyon (3), enfeksiyon (2), TME problemleri (2), bad split (1) ve burun ucunda deviasyon (1) göze çarpmaktadır. Komplikasyonlar kadın ve erkeklerde eşit olarak gözlenirken, ameliyat süresi uzayan olgularda daha sık komplikasyon gözlenmiştir ($p<0.05$). İki taraflı sagital split osteotomilerde ($p<0.001$) komplikasyonlar Le Fort I osteotomilerine göre daha sık gözlendi. Tedaviye bağlı olarak en sık (%72.04) Clavien-Dindo derece I komplikasyonları görüldü. Clavien-Dindo sınıflamasına göre cinsiyet, yaş, ameliyat süresi, hastanede kalış süresi veya cerrahi bölge arasında komplikasyon dereceleri arasında bir ilişki yoktu ($p\geq0.05$).

TARTIŞMA: Ortognatik cerrahide ameliyat sonrası maloklüzyon, kanama, inferior alveolar sinir yaralanması, enfeksiyon, kötü bölünme ve enfeksiyon en sık görülen komplikasyonlardır. Komplikasyonlar; ameliyat süresi, ameliyat sayısı, ameliyat yeri ve yapılan osteotomi tipi gibi faktörlerle ilişkilendirebilmektedir. Tedavi planlamasında, ameliyat esnasında ve ameliyat sonrası takip kısmında bu faktörlerde göz önünde bulundurularak ameliyatın başarısına olumlu katkılar sağlanabileceği düşünülmektedir

Anahtar sözcükler: Ameliyat sonrası; komplikasyon; ortognatik cerrahi.

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