Complications in Orthognathic Surgery
A Report of 1000 Cases

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KEYWORDS

• Complications • Orthognathic • Surgery

KEY POINTS

- Multiple complications secondary to orthognathic surgery are evaluated based on a study of 1000 consecutive procedures.
- Complications may develop in the preoperative, intraoperative, and postoperative stages of patient care.
- A thorough understanding of intraoperative and postoperative complications allows the appropriate steps to be taken to maximize an esthetic and functional endpoint.

Multiple factors come into play when treating the individual with a dentofacial deformity to provide the most esthetic and functional result.[1] Because of the precise planning required and complexity of the surgery, a multitude of levels exist from which errors can occur. For even the most experienced surgeon, unforeseen complications may arise. Obstacles that may lead to complications can be divided as:

- Preoperative
- Intraoperative
- Postoperative

In this article, the authors review complications by studying those that occur in the previously listed phases of treatment. One thousand consecutive patients who underwent orthognathic surgery performed by the senior author over a 5-year time period were evaluated. These cases included 337 mandibular osteotomies, 274 maxillary osteotomies, and 389 combined osteotomies. **Table 1** provides a more precise breakdown of the procedures. Reviewing these cases provides a better understanding of the most common complications, management of these situations, and resolution of the complications.

COMPLICATIONS RESULTING FROM PREOPERATIVE PLANNING ERRORS

The introduction of computer-aided surgical simulation has greatly enhanced the efficiency and accuracy of orthognathic surgery. Computer-aided surgical simulation allows dentofacial deformities to be better visualized and evaluated with relation to roll, pitch, and yaw. This 3-dimensional virtual plan can then be transferred to the operating room via a prefabricated splint. In traditional treatment planning, the workup involves reproduction of the occlusal discrepancy on a semiadjustable articulator through facebow transfer. The occlusal relationship is referenced through measurement of fixed points. Manipulation can then be completed with the occlusal correction subsequently remounted. Errors and inaccuracies in this model surgery can contribute to compounding errors that are ultimately transferred to the operating room and patient. Often, incorrect centric relation

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Table 1
Procedures in the 1000 cases

Procedure	n
Mandibular osteotomies	
Total	726
Isolated Mandible	337
Double jaw	389
Bilateral sagittal split osteotomy	684
TOVRO	35
Subapical (total)	7
Maxillary osteotomies	
Total	663
Isolated Maxilla	247
Double jaw	389
Single piece	321
Segmental	342

records may not be identified during the preoperative phase of treatment, only to be discovered during the intraoperative or postoperative period. Use of virtual surgical planning eliminates many of the uncertainties that go into preparing a case. Computer-aided surgical simulation is addressed in the article "Virtual Surgical Planning in Orthognathic Surgery" by Drs Franco, Farrell, and Tucker elsewhere in this issue.

It is essential to understand the patient's functional and esthetic challenges to ensure that surgery will address their concerns. Proper patient education is necessary to comprehend not only the surgery itself, but also the postoperative course. Visual aids at the preoperative visits, using current computer programming software (eg, Dolphin Aquarium, Dolphin Software, Chatsworth, CA, USA) in addition to prediction imaging, can provide the patient with further insight into their treatment. Patient willingness and motivation directly impact the patient's satisfaction and compliance in the postoperative period.

In this series of 1000 patients, there were no significant complications identified as a result of errors in the presurgical planning phase.

INTRAOPERATIVE COMPLICATIONS

Hemorrhage

A review of the literature reveals a number of reports concerning bleeding. All indicate that serious bleeds are rare.[2–4] No intraoperative bleeding problems requiring secondary intervention were observed in the 1000 cases reviewed. One patient returned to the operating room to control and reduce bleeding immediately after a Lefort I osteotomy. The descending palatine vessels were recauterized and a surgical pack was placed. Three patients required a nasal packing in the post anesthesia care unit. No patient returned for bleeding problems after hospital discharge. In similar studies involving complications in orthognathic surgery, Panula and colleagues[5] reviewed 655 patients, reporting 1 case of a serious bleed. Kramer and colleagues[6] found extensive bleeding in 1.1% of a prospective study of 1000 patients. A survey by Lanigan[7] of approximately 800 oral and maxillofacial surgeons found 18 cases of serious intraoperative bleeding and 21 cases of postoperative bleeding.

Intraoperative complications may occur secondary to maxillary or mandibular osteotomies. Hemorrhagic complications associated with osteotomies through the posterior maxilla have been well documented.[8] Understanding the pertinent head and neck anatomy, common sources of hemorrhage can be elucidated. Vessels most often involved include the descending palatine arteries, pterygoid venous plexus, masseteric artery, retromandibular vein, and the facial artery. Maxillary venous bleeding most commonly involves the pterygoid venous plexus. If the bleed is arterial, the vessels most commonly associated are terminal branches of the maxillary artery, often the descending palatine and sphenopalatine arteries. Cauterizing the descending palatine vessels at the time of surgery can prevent a postoperative bleed. During pterygomaxillary dysjunction (maxillary downfracture), the maxillary artery and its branches are the most susceptible to injury.[6] Bleeding may also result from a superiorly positioned pterygoid plate fracture after pterygomaxillary dysjunction that results in internal carotid artery hemorrhage. The sharp edges of the detached pterygoid plates forced back during the downfracture are implicated in lacerating the internal carotid artery and jugular vein.[6] Should bleeding occur during surgery, the following steps allow one to properly achieve hemostasis.

1. Initial measures include hypotensive anesthesia, adequate visualization, and direct pressure.
2. Hemoclip or electrocautery may be utilized in addition to local measures, such as Surgicel (oxidized cellulose sponges; Ethicon, Somerville, NJ, USA) or Avitene (microfibrillar bovine collagen; Medline, Mundelein, IL, USA).
3. In cases where there is persistent low-pressure bleeding (pterygoid venous plexus area) packing often stops the oozing, but once removed bleeding continues. In such cases, the osteotomy can be completed and fixated with packing placed, leaving the tail of packing exposed through the posterior aspect of the incision. The packing is then easily removed on the following day, usually with resolution of the bleeding.