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(CASE REPORT)

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Skeletal relapse after orthognathic surgery

Jan Rustemeyer *

Department of Oral and Maxillofacial Surgery, Clinic Center Bremen-Mitte, Bremen, Germany.

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Abstract

Orthognathic surgery, performed to correct functional and aesthetic jaw and facial irregularities, significantly enhances the quality of life for patients. Despite advancements in surgical techniques and computer-assisted planning, postoperative complications such as unintentional occlusion disorders and jaw misalignments remain common. Studies reveal postoperative jaw misalignments and malocclusions in approximately 10% of cases. Relapses after bimaxillary orthognathic surgery predominantly affect maxillary movements, especially in patients with cleft lip and palate, with up to 20% relapse due to scar contraction. Deviations from the preoperative plan occur even with advanced technologies, within generally accepted tolerances of less than 2 mm for translational and 2 degrees for rotational movements. The primary causes of relapse are linked to postoperative stability rather than planning accuracy, with contributing factors including the feasibility of orthodontic pre- and post-treatment, long-standing dysgnathia leading to tooth loss, and advanced patient age. These factors should be carefully considered to minimize the risk of relapse and improve surgical outcomes.

Keywords: Bimaxillary surgery; Relapse; Maxillary movement; Planning; Postoperative stability

1. Introduction

Orthognathic surgery, performed worldwide approximately 70,000 to 100,000 times annually, addresses functional and aesthetic issues related to jaw and facial irregularities, generally enhancing patients' quality of life. The increasing number of procedures is due to advancements in surgical techniques and computer-assisted surgical planning, which improve outcomes and precision [1-3]. However, orthognathic surgery can lead to unintended occlusion disorders and jaw misalignments, resulting in significant deviations from the preoperative plan.

1.1. Postoperative Deviations and Complications

A comprehensive review based on data from the Danish Patient Compensation Association revealed that postoperative jaw misalignments occurred in 9% and malocclusions in 11% of 237 cases [4]. Further studies reported postoperative unplanned malocclusion rates of up to 13% [5], with an overall complication rate of 33.8%, necessitating a second surgery in 5.7% of cases [6]. These high rates of undesired outcomes are likely due to complex cases involving vertical skeletal corrections.

1.2. Relapse in Maxillary Movements

Relapses after bimaxillary (two-jaw) orthognathic surgery usually affect maxillary movements, particularly in previously operated patients with cleft lip and palate. Maxillary advancement at the Le Fort I level can result in up to a 20% relapse of the maxilla, primarily due to scar contraction and previous velopharyngoplasty curbing maxillary advancement [7]. For patients without a history of cleft lip and palate, literature reports skeletal deviations despite virtual planning. These deviations include sagittal plane forward movements of 0.1 mm to 0.6 mm, vertical plane

* Corresponding author: Jan Rustemeyer

movements of up to 0.7 mm, and transverse plane lateral movements of up to 0.5 mm, even with patient-specific osteosynthesis materials [8, 9]. Using "cold-ablation laser osteotomy," preoperative planning can only be realized with an average deviation of 0.8 mm [10]. Generally accepted definitions of acceptable postsurgical deviations from intended outcomes in orthognathic surgery are less than 2 mm for translational and 2 degrees for rotational movements [11-13]. Achieving 100% implementation of the planned skeletal shift, even using the latest technologies, seems rarely possible, especially in complex cases. Deviations from the plan over time after surgery often fall within statistically possible ranges and cannot be influenced even with the latest medical advancements.

2. Factors Contributing to Relapses

The reasons for partial relapses requiring subsequent reoperation are usually not due to planning accuracy or intraoperative implementation but are most likely related to postoperative stability, even if traditional rigid fixation of the maxillary complex is performed with four mini-plates fixed at the nasomaxillary and zygomaticomaxillary regions along the trajectories bilaterally [14]. The exact cause of this instability cannot be scientifically determined with certainty. In addition to statistical deviations due to the limits of current technology, the following unfavorable factors likely contribute to relapses and should be considered:

2.1. Orthodontic Pre- and Post-treatment

Using a multibracket appliance ("fixed braces") may not be feasible if there is a relative contraindication or if health insurance does not cover the costs. Consequently, the maxillary front cannot be developed before surgery to achieve a stable and significant overbite of at least 2 mm in the planning. This overbite, combined with elastics over the multibracket appliance in the anterior tooth area, is crucial for counteracting a relapse, especially an open bite. Even a slight, scientifically expected deviation of the maxillary position could likely be compensated by a multibracket appliance and application of elastics with the possibility of fine adjustment (Figure 1).

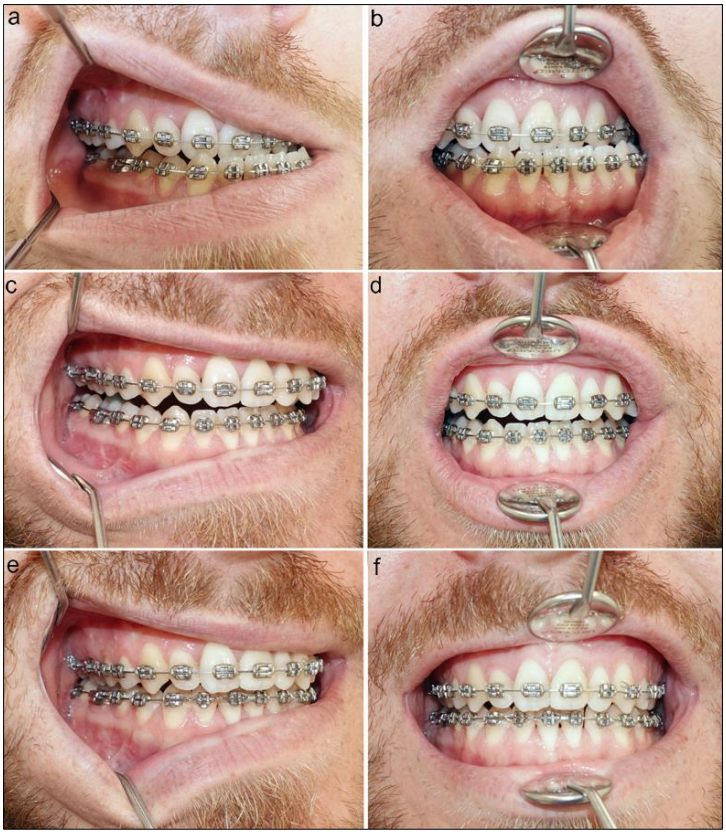

Figure 1 Change of occlusion upon treatment. Occlusion preoperative displays mandibular prognathia (a) with anterior crossbite (b). Open-bite lateral (c) and frontal (d) as symptoms of deviation from preoperative planning four weeks after bimaxillary surgery. Occlusion as planned throughout using elastics for closing the open bite and fine adjustment 12 weeks postoperatively (e and f)

2.2. Long-standing Dysgnathia

This condition significantly impacts subsequent tooth loss due to the "wrong" force distribution on the tooth surfaces resulting from skeletal malposition. Over time, this leads to attrition and tooth loss, particularly in the posterior region, resulting in a loss of support zones between the dental arches. Postoperatively, this can lead to a lack of occlusal stability, causing the maxilla to sag posteriorly and inferiorly (counterclockwise rotation) due to the pull of the attached soft tissue. Forces may occur that can overcome the rigidity of the osteosynthesis. Prophylactically, a corresponding prosthesis can rebuild the support zone, for example, with a clasp-anchored provisional. This provisional can then be included in the planning and worn intra- and postoperatively to mitigate the problem of the missing support zone and loss of bite height (Figure 2).

Figure 2 Mandibular prognathia and maxillary hypoplasia with free-end situation and therefore missing dental support zone on the left side (a, b). Six months after bimaxillary surgery without evidence of relapse. Wearing a clasp-anchored provisional since surgery to ensure stability of occlusion

2.3. Patient Age

In patients significantly older than the average age of 23.3 ± 4.8 years for those undergoing bimaxillary osteotomies [15], the maxilla may already exhibit advanced bone atrophy, possibly negatively impacting postoperative stability

3. Conclusion

Partial relapses after orthognathic surgery are often due to postoperative instability rather than inaccuracies in planning or intraoperative implementation. Factors such as orthodontic treatment feasibility, long-standing dysgnathia, and patient age play significant roles in these outcomes. Addressing these factors is crucial for minimizing relapse risks and improving surgical results.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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