Success rate of anterior open-bite orthodontic-orthognathic surgical treatment

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**Introduction:** The aim was to evaluate the short-term success rate of combined orthodontic-orthognathic surgical correction of anterior open bite. **Methods:** Fifteen patients (ages, 15-28 years) with open bite treated with a combined orthodontic-surgical approach were examined. Lateral cephalograms from before treatment, after treatment, and after an average of 18 months (range, 10-26 months) of retention were evaluated. Overbite was classified as normal (2-3.5 mm), borderline (0-1.5 mm), or relapse (<0 mm), and overjet as normal (2-3.5 mm) or relapse (≥4 and ≤1.5 mm). **Results:** The average overbite was –3.2 mm before treatment, 1.8 mm after treatment, and 1.3 mm after retention. During active treatment, overbite and overjet were normalized in 53.3% and 66.7% of the subjects, respectively. After the retention period, 1 patient (6.7%) showed a negative overbite, whereas a borderline overbite was found in 53.3% of the subjects. Overjet relapsed in 40% of the subjects. Only 40% of the patients had a completely successful treatment with incisal contact and normal overjet and overbite. **Conclusions:** Orthodontic-surgical treatment of anterior open bite improves the overbite, but an excellent treatment outcome with normal overjet and overbite and proper incisal contact was achieved in only 40% of the subjects. (Am J Orthod Dentofacial Orthop 2010;138:716-9)

Successful treatment of skeletal open bite is considered a challenge. Attempts to control maxillary development and prevent eruption of the posterior teeth during growth are often counteracted by late adolescent growth changes, thus resulting in a relatively high percentage of adult open-bite treatments. It is often necessary to treat severe open bite problems with combined orthodontic-orthognathic treatment with LeFort I impaction or bimaxillary surgery aims at correcting the jaw inclination and reducing the excessive anterior facial height to achieve good facial esthetics as well as a functional occlusion. However, relapse even after combined orthodontic-orthognathic treatment does occur.

A functional occlusion that includes among other characteristics a correct interincisal relationship with incisal overlap and interincisal contact is a general orthodontic treatment goal. Lack of interincisal contact despite a positive overbite (OB)—a so-called open bite with OB—was first described by Moyers. It was found to be an indicator for habits and a prognostic factor for open-bite stability.

However, most open-bite studies evaluated only OB as a parameter for success and stability. Only Denison et al differentiated real open bites and open bites with OB at pretreatment, but whether interincisal contact could be established and maintained was unfortunately not described.

Therefore, the aim of this study was to evaluate the short-term success rate of combined orthodontic-orthognathic surgical correction of anterior open bite, giving special emphasis to interincisal relationship and contact.

**MATERIAL AND METHODS**

Between 1995 and 2008, a total of 41 open-bite patients were planned for a combined orthodontic-orthognathic surgical approach at the Department of Orthodontics of the University of Giessen in Germany. Twenty-six patients were excluded from the study because of no surgical treatment desired (n = 22), syndromes (n = 2), and incomplete documentation (n = 2). The remaining 15 Angle Class I (n = 1), Class II (n = 9), and Class III (n = 5) open-bite patients (9 male, 6 female) with a mean pretreatment age of 19.9 ± 4.03 years (range, 15-28 years) were examined retrospectively. All patients had undergone presurgical and postsurgical orthodontic treatment with fixed appliances. The system used for all patients was a Tip-Edge...
bracket system (TP Orthodontics, LaPorte, Ind) with a 0.22-in slot. No patient received any myofunctional therapy either during or after treatment. Lateral cephalograms from before treatment (T1), after orthodontic-surgical treatment (T2), and after retention—ie, after appliance removal—(T3) were evaluated. The average length of the retention period was 18 months (range, 10-26 months). All radiographs were traced and evaluated by the same investigator (U.J.). No correction for linear enlargement (approximately 8%) was performed.

Standard cephalometric parameters, overjet (OJ) and OB, were measured (Fig 1). OB was classified as normal (2-3.5 mm), borderline (0-1.5 mm), or relapse (≤0 mm), and OJ as normal (2-3.5 mm) or relapse (≥4 and ≤1.5 mm). Furthermore, interincisal contact was evaluated visually.

RESULTS

Average OB values were –3.2 mm at T1, 1.8 mm at T2, and 1.3 mm at T3. During active treatment (T1-T2), OB and OJ were normalized in 53.3% and 66.7% of the subjects, respectively. At T3, 1 patient (6.7%) showed a negative OB, whereas a borderline OB was found in 53.3% of the subjects (Fig 2). OJ relapsed in 40% of the subjects.

An interincisal contact was found in 53.3% (at T2) and 46.6% (at T3) of the patients, respectively. However, only 40% of the patients had a completely successful treatment with interincisal contact and normal OJ and OB.

Considering the skeletal parameters, before active orthodontic treatment, 80% of the subjects had a hyperdivergent (>38°) vertical jaw base relationship with an average mandibular plane angle (ML/NSL) of 43.6°. During the retention period (T2-T3), the ML/NSL increased in 40% of the subjects. Half of these patients exhibited a stable OB, 33.3% were borderline, and 1 had a negative OB (16.7%). The interjawbase angle (ML/NL) first decreased during active treatment (T1-T2) from 35.5° to 31.8°, but increased slightly to 32.9° thereafter. The maxillary plane angle (NL/NSL) was relatively stable, increasing from 8.3° to 11.1° (T1-T2) and decreasing to 10.2° (T3).

Patients with a borderline or relapsed OB after retention exhibited more proclined incisors than did those with a stable OB (Fig 3). Correspondingly, the interincisal angle (IsL/iIil) at T3 was greatest in patients with a stable OB (140.8°) and smallest in those with OB relapse (84°).

The inclination of the mandibular incisors (iIil/ML) remained on average unchanged at about 87° during the entire observation period. The maxillary incisor inclination (IsL/NL) was more or less unchanged during active treatment (T1-T2) (104.3° and 104°), but a slight proclination was seen during the retention period (106.2°).
DISCUSSION

It might be argued that our follow-up was too short. However, since most skeletal and dentoalveolar changes have been described to occur within the first 6 months after surgery, the 18-month follow-up period can be considered acceptable for the evaluation of short-term stability and success.12

The sample in our study was relatively small. However, compared with most studies in the literature, it seems acceptable because they also included only small to average numbers of subjects (10-58 patients).4,9-16,19 In addition, our subjects were a nearly consecutive sample of nonsyndromic open-bite patients; only 2 patients were excluded because of partially missing records.

The patients’ ages at T1 varied between 15 and 28 years. Although it can be assumed that their growth had terminated (complete fusion of the radial epiphysis), facial growth continues at a slow rate throughout life, and changes observed over a follow-up period might represent a continuation of growth rather than posttreatment relapse.20,21

There are several possible reasons for OB relapse after surgical-orthodontic treatment. Functional factors such as imbalanced intrinsic forces (abnormal tongue or lip position) and extrinsic forces (persistent or newly adopted habits) play an important role in both the etiology and the recurrence of open bite after treatment.1,22 Furthermore, surgical factors resulting from muscle adaptation or bone healing problems, improper positioning of the bony segments, soft-tissue tension against the mobilized segment, temporomandibular changes, or other factors can cause open-bite relapse.4 On the other hand, Denison et al10 proposed that posttreatment relapse was due to dentoalveolar changes only.

An excellent treatment outcome (normal OJ, incisal overlap, and interincisal contact) was found in only 40% of the patients. About half of our subjects (53.3%) exhibited a borderline OB at T3; this cannot be called a good treatment result. Nevertheless, a true relapse with negative OB at T3 was found in only 1 subject (6.7%). In terms of true relapse, these findings contrast with the results of Swinnen et al19 and Iannetti et al,23 who reported fully stable OBs 1 to 2 years after treatment. However, the results are in line with most studies in the literature, describing anterior open bite relapse in 2% to 37% of patients.4,9-16
CONCLUSIONS

Orthodontic-surgical treatment of anterior open-bite patients improves the OB, but an excellent treatment outcome with normal OJ, incisal overlap, and interincisal contact was found in only 40% of the patients. Therefore, the treatment goals for future surgical anterior open-bite patients should be adjusted accordingly.

REFERENCES