Treatment of a class-II deformity with skeletal open bite and latero-occlusion

By Nezar Watted, Josip Bill & Jürgen Reuther, Germany

History and initial examination

The 21-year-old female patient reported first to the prosthodontic department for the replacement of lost lower anteriors because of an accident 6-months prior to the first consultation. Lower left canine and incisors were missing and there was an extensive loss of alveolar bone in this region. In addition to the total luxation, there were crown fractures in the fourth quadrant. The patient also complained about temporomandibular joint pain when chewing, which initiated before the accident, and she felt she had an esthetic impairment because of rotated and crowded upper incisors.

The functional analysis showed that because of the impeded lip closure, the mandible is habitually protruded to make mouth closure possible. Thus, the condyles were displaced out of their physiologic position ventral and caudal towards the articular eminence. There was a corresponding functional anterior shift of the mandible from centric relation to maximum intercuspida-

tion (habitual occlusion).

Diagnosis

The diagnostic records were taken in habitual occlusion (Figs. 1a–c) as well as in centric relation (Figs. 2a, b, Figs. 3 a–f, Figs. 5). For diagnosis and treatment planning the records with centric relation were taken. Not only for diagnostic (centric relation) but also for therapeutic (TMD-symptoms) reasons, a flat plane splint was inserted for 5-weeks, which led to an improvement of the symptoms. In addition, the whole extent of the anterolateral functional shift (forced bite) was evident, the mandible was much more dorsal and deviated to the right so that there was a nonocclusion on the left side (Figs. 3a–d). The facial photographs show insufficient mouth and lip closure in the centric relation and the described deviation of the mandible to the right. The lateral facial picture shows a posterior divergent face with protruded lip prominence, and compared to the mid-face, a lower face—57 : 45 percent instead of 50 : 50 percent (Fig. 2). The patient had a Class-II deformity with a mandibular midline shift to the right, a circular open bite and nonocclusion on the left side (Figs. 3a–d). In the upper jaw an arch length discrepancy of 5 mm (Fig. 3e) existed. The lower jaw showed the reduced number of teeth, and the fractures of the lower right second premolar and second molar as consequence of the accident (Fig. 5).

The orthopantomogram (Fig. 4) shows the bone loss in the lower front due to the avulsion of the teeth, and the wire for the temporarily prosthodontic replacement of the lost teeth. Lower right second premolar showed a deep complicated fracture. Clinically, a grade III mobility was apparent because of the loss of the lingual bone and thus had to be extracted. In addition to the crownfraction of the lower right, the first molar had an apical lesion. All third molars were erupted and in the lower arch partially covered with gingiva. The most painful right condyle showed an uneven dent ventral, the left condyle a deformation. The greater abnormality of the right condyle might be caused by the mediodental forced bite.

Cephalometric analysis in centric relation elucidates a vertical and sagittal skeletal as well as soft tissue deformity. The values indicated a skeletal open bite with mild extraoral manifestations of a long face syndrome: distobasal jaw relation, increased interbasion angle (ML-NL = 55°) because of the posterior rotation of the mandible (ML-

Figs. 1a–c: Extraoral (a, b) and introral (c) pictures in maximum intercuspidation before insertion of the flat plane splint.

Figs. 2 a, b: Facial and lateral views in centric relation after insertion of the flat plane splint and prior to orthodontic treatment. A pronounced deviation of the mandible to the right, interognathic, and an aggravated lip closure can be seen (b).

Figs. 3a–f: Intraoral views in centric relation: distal occlusion on the right and left side (a–c). Non-occlusion on the left side (d), crowding in the upper jaw (e) and a reduced number of teeth in the lower jaw with fractures of the lower right second premolar and second molar (f).

Figs. 4: Orthopantomogram (OPG) at the beginning of treatment.

Figs. 5: Cephalograms in habitual intercuspidation (left) and centric relation after insertion of a splint (right).

Figs. 6a, b: Tracings of the cephalogram prior to treatment; there is a soft tissue and skeletal disharmony in the vertical dimension.

Figs. 7: Simulation of the surgical impact of the maxilla and the reaction of the mandible as described with cranial and simultaneous central autorotation.

Figs. 8: Inserted plane splint 4 weeks prior to surgery to establish a centric relation.

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NSL = 30°) and anterior rotation of the upper jaw (NL-NSL = 6°), slightly reduced ratio of upper to lower facial height (PFI/PFH = 60 percent) while growth had been balanced. Because of the loss of lower teeth, the dental analysis was reduced to the upper jaw. The vertical distribution of the soft tissue profile showed a disharmony of upper to lower face (G’-SN : Sn-Me’ = 43 : 57 percent). This could also be seen in the hony structures (N-Sna : Sna-Me = 40 : 60 percent). There was also a disharmony in the lower face (Sn-Stms-Me’ = 50 : 70 percent). These changes in the ratio were not because of an alteration of the upper lip, but more because of a lengthened lower face (Fig. 6a, b, Table 1).

Treatment plan and goals
- Stable and functional Class-I occlusion with physiologic position of the condyles
- Optimization of facial esthetics
- Physiologic mouth and lip closure
- Optimization of dental esthetics with consideration of periodontal health
- Fulfill the expectation and gain satisfaction of the patient
- Stabilize the result

In addition to the above treatment goals there was a special aim to improve facial esthetics not only in the sagittal but also in the vertical dimension. This was to be obtained by relatively shortening the lower face. Shortening of the lower face as causal therapy with corresponding effects on facial esthetics and lip function could be established only with a combined orthodontic-surgical approach. The pursued aims concerning esthetics and function could not have been reached by solely orthodontic measures. The deformity was too severe for a dentoalveolar compensation. Thus, a bimaxillary osteotomy was planned for surgery. To improve the vertical dimension, an impaction of the maxilla was necessary, which should be greater dorsal than ventral. As a consequence of the impaction, the mandible with the condyles as "centers of rotation" was supposed to autorotate sagittal and vertical; thus a displacement ventral, and at the same time cranial, of the pogonion was to be expected (Fig. 7). For total correction of the sagittal deformity a surgical advancement of the mandible was planned because the autorotation of the mandible was regarded as non-sufficient for the correction of the distal occlusion.

Presurgery measures and orthodontic setup
“Splint therapy” A flat plane splint was inserted for 5 weeks to establish a physiologic centric relation of the condyles for final treatment planning and to reduce the temporomandibular joint pain. Thus the forced bite could be diagnosed to its whole extent. Diagnostic records with the wrong position of the condyles (because of the forced bite) would have led to a wrong diagnosis, treatment planning and to a treatment with corresponding consequences for the result.

Orthodontic preparation
The aim of orthodontic preparation was to develop the dental arches, to harmonize them in the three dimensions of space, and to eliminate the dental compensation of the skeletal deformity. Decisive for the preparation was the protrusion and torqueing of the upper anterior

Table 1: Cephalometric Analysis
Table 2: Skeletal Analysis

Table 3: Dental Analysis