

# Progressive Bite Jumping Using the SUS Device

## A novel concept for nonsurgical bite correction in adults

The concept of progressive bite jumping enables treatment of malocclusions in adult patients without surgery. An existing temporomandibular dysfunction needs to be corrected first. Thereafter, progressive advancement of the mandible is performed in several steps and finally followed by long-term retention. Dr. Aladin Sabbagh presents the concept and the retention devices required, so-called Mara stops and SUS devices. This article aims to provide information about innovations in interdisciplinary dentistry. Treatment of such adult cases should be reserved to an experienced orthodontist.

Since the insights of Kingsley in 1877 and Herbst in 1905, utilization and activation of mandibular growth has been attempted for correction in younger patients using functional orthopaedic appliances so as to eliminate a malocclusion without extractions or surgery<sup>1</sup>. More problems are faced in the treatment of adult patients with serious malocclusions. Despite the advances of maxillofacial surgical methods and techniques having occurred during recent years, many patients decline to undergo such an operation – not only due to fear of surgery and related risks and side-effects, but partly for ethical or economic reasons as well. In many cases, these patients could not be treated and frequently had to accept functional and esthetic disadvantages, temporomandibular disorders, or tooth loss.

### Remodeling of TMJ possible also in adult patients

Recent morphologic, histological and magnet resonance tomographic analyses demonstrate the uniqueness of the temporomandibular joint: It not only possesses a particularly active avascular fiber cartilage

with high proliferative capacity, but also has the ability of remodeling and adaptation even in adult patients<sup>12</sup>.

This specific adaptability and recent years' advances of fixed functional orthodontic techniques and TMJ diagnostics allow treatment of adults with mandibular retrognathism without surgery in certain cases with respective indication, even though the adaptive/remodeling capacity of the temporomandibular joint is reduced in adults compared to youth (condylus caping and fossa shifting, Fig. 1 and 2)

### Concept of progressive bite jumping

The concept of progressive bite jumping is based on three principles:

1. condylar anterior displacement/ drift (passive) due to joint decompression (Fig. 3),
2. stepwise progressive mandibular advancement (active) using fixed functional orthopaedic appliances (Fig. 4),
3. fixed long-term retention using a modified Mara appliance (Mara stops, Fig. 5).

#### 1. Passive condylar anterior displacement/ drift

Especially in CI II-2 patients, a forced posterior position of the condyles is adopted (Fig.6).



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1987 - 1989 Postgraduation at the University of Damascus Department of Maxillofacial Surgery and certification as oral surgeon.

1989 - 1993 Postgraduate education in orthodontics at the University of Kiel (Germany) and in a certified orthodontic practice in Nuremberg (Germany).

1993 Certification as a specialist in orthodontics (Munich), and start of own private orthodontic practice in Erlangen (Germany).

1997 Registered patent: the Sabbagh Universal Spring.(USA, Germany)

"Prof.Dr.Dantas" honour award, and various other awards for international outstanding merits in many countries.

Member of the Editorial Board of the journal "Arab Dental", VVA Health, Essen (Germany), member of numerous national and international orthodontic associations.

A steep retroinclination of the incisors often induces such a forced position of the mandible. The dorsal position of the condyles exerts an unphysiological pressure on the bilaminar zone and may lead to painful trauma of this tissue, anterior disc displacement and headache. According to the DGZMK and AFDT, examination of the TMJ is a medical and forensic must<sup>33</sup>, however, thanks to manual functional analysis this is feasible in daily practice with little



little time and material efforts (Fig. 7)<sup>23-25</sup>. If the presence of a TMJ dysfunction is ascertained (such as in the case of the forced posterior position), therapy of the temporomandibular joint is medically and forensically indispensable prior to orthodontic bite correction.

This pre-treatment is of great advantage to subsequent orthodontic therapy. Clinical experience shows that elimination of the forced dorsal position enables anterior movement of the

mandible, thus improving the starting conditions for bite correction. A 10-week pre-treatment is considered to resolve the problems that force the mandible into this unphysiological position (Fig. 8). An occlusally adjusted relaxation splint without incisor guidance is utilized for correction of occlusal disturbances and muscle relaxation. Concomitantly, ligaments and muscles are mobilized by physiotherapy (Fig. 9).

## 2. Active progressive mandibular advancement

In contrast to the conventional doctrine after Herbst which claims one-step total mandibular advancement, we prefer so-called progressive advancement by steps of 3-4 millimeters every two months (Figs. 10-12).

This progressive advancement has proved its clinical and practical worth for more than 10 years:  
 - A laterally open bite and the jeopardy of tongue dysfunction are reduced in patients at risk.



Fig. 1: Condylus caping, MRI 3 months after mandibular advancement using the SUS device



Fig. 2: Condylus caping, MRI 6 months after mandibular advancement using the SUS device



Fig. 3: Passive condylar anterior displacement/drift



Fig. 4: The SUS device is inserted in analogy to the Herbst appliance



Fig. 5: Long-term retention using Mara stops



Fig. 6: 48-year old female patient with cover-bite and forced dorsal position

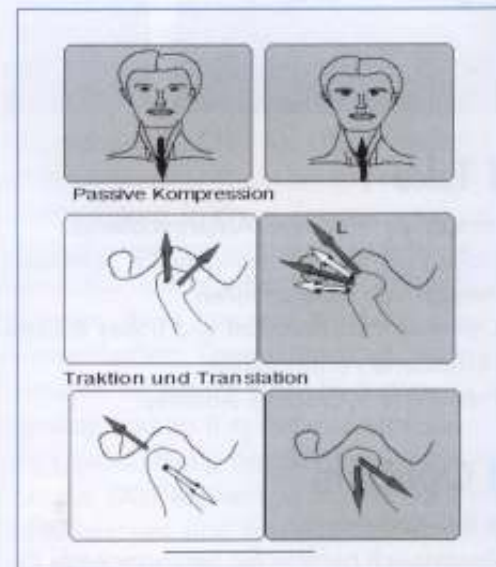


Fig. 7: Manual functional analysis





Fig. 8: Relaxation splint in the mandible



a



b



c

Fig. 9: Following successful TMJ decompression, orthodontic rehabilitation in the maxilla is initiated

- Pressure on the anchorage unit and on the teeth/joints is reduced, the risk of fracture and patient burden are diminished.
- Recent scientific studies proved that such a stepwise procedure yields better results. The studies show a substantially greater skeletal effect and improved adaptation<sup>32</sup>. Histological and morphological studies in the rat model revealed a significantly higher cell division rate and cartilage apposition in progressive advancement as compared to



a



b



c

Fig. 10: After the leveling phase, the mandible is advanced by about 3 millimeters

total advancement<sup>8,19</sup>, even in adult rats.

- Electromyographic studies show a reduction of the muscle tonus by the onset of advancement with subsequent normalization.

Muscular adaptation in progressive advancement was significantly better than in total advancement (Leung DK, Hagg U.9) which crucially minimizes the risk of relapse.

Advancement by 3-4 millimeters enables slight lateral bite opening depending on the condylar path inclination, and, thus, extrusion of the posterior teeth leads to bite elevation which is desired in most cases, and to lengthening of the lower face. A flat condylar path may prevent sufficient bite opening during the first step of advancement. This is made up for, however, during the subsequent step of advancement by the front tooth contact accomplished.

Thus, the assertion that bite elevation or vertical improvement





Fig. 11: The second advancement step is performed after 2 months using a spacer (distance) spring of 3 millimeters

Thus, the assertion that bite elevation or vertical improvement of the profile cannot be achieved but by total advancement, is untenable.

### 3. Fixed long-term retention

One of the main reasons for relapse after Class II therapy is muscle contraction, especially in the digastric muscle area. Electromyographic studies show that it takes the masticatory muscles up to one year to adapt to the new position of the mandible<sup>14</sup>. Therefore, sufficient bimaxillary retention is imperative particularly in adults. The problems of removable retention appliances, especially with poor patient compliance, are well-known. In order to ensure fixed and sufficient stabilization of the bite position achieved, we created a construction (Mara stops) resembling the Mara<sup>TM</sup> device (Ormco). A passive protrusion plane arrests the posterior

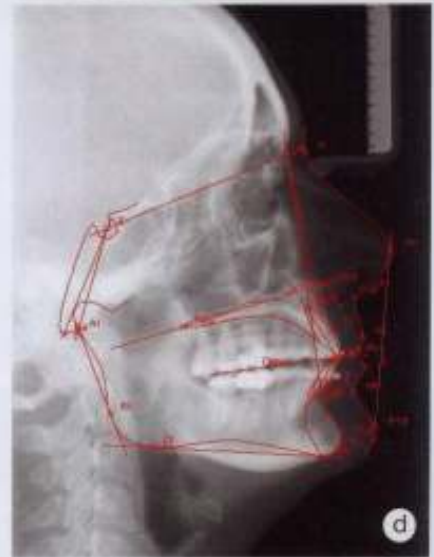
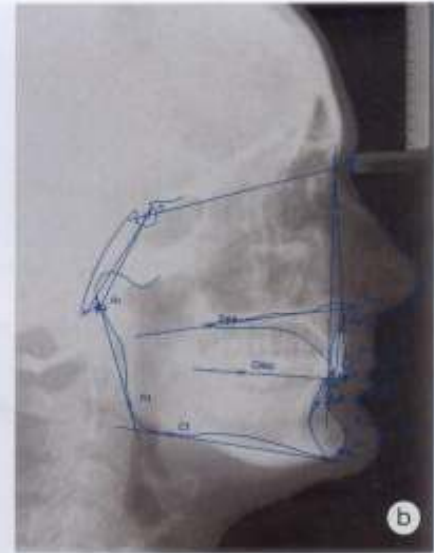


Fig. 12: Profile photographs and lateral cephalograms before and after therapy

tendency of the mandible without inducing an anterior shift.

For the individual production of the above mentioned Mara stops, the first molar bands are excluded from debanding. Firstly, an inclined plane is attached to the maxillary bracket using light-cured resin.

Subsequently, the counterpart is bonded to the mandibular bracket. Interfering contacts in centric occlusion and lateral movements should be avoided (Fig. 13).

The SUS<sup>®</sup> (Sabbagh Universal Spring) appliance used here is a telescope element which can be fixedly inserted between the maxilla and the mandible. Thus, easy and rapid bite jumping can be achieved due to its 24 hour-action and its inconspicuous appearance.

This telescope element comprises a continuously activated spring permitting dental movements such as maxillary distalization, mandibular mesialization or anchorage purposes. If necessary, however, the spring effect may be largely eliminated so as to use the telescope element as a rigid hinge in analogy to the Herbst hinge rather than as a spring. The new, improved construction of the SUS<sup>®</sup> enables stable and easy application using an arch adapter (Fig. 14). Thus, skeletal discrepancies such as the distal bite are amenable to treatment as well.





Fig. 13: The fixed retention phase using Mara stops lasts about 1 year

- One universal size, identical for left and right side (no stock-holding)
- Easy and quick continuous activation using the supplementary springs provided
- Excellent biocompatibility and stability owing to laser welding
- Wide scope of indications.

### Clinical use of the SUS®

1. Correction of distal bites (Herbst® effect)
2. Dentoalveolar compensation of occlusion (substitute of elastics)
3. Unilateral correction of Class II/laterognathia
4. Distalization of upper posterior teeth (substitute of headgear)
5. Mandibular space closure (e.g., in second premolar aplasia)
6. Therapy of TMJ dysfunctions

### Conclusion

Progressive bite jumping using the SUS® device is a realistic alternative of surgical correction for borderline cases.

In many cases, it is even more TMJ friendly and less costly and risky. However, observing the respective indications and procedure is crucial to success.



Fig. 14: The SUS® device

The SUS® possesses the following proven features:

- It is the only device of its kind which can be used not only as a spring, but also as a rigid hinge (in analogy to the Herbst hinge) in order to achieve skeletal effects and TMJ remodeling.

A list of references can be ordered from the editorial staff:

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