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Case Report:

Restoring the correct sagittal and vertical inter-maxillary relationship in skelettal Class 2 cases: The technology of the Strategic Implant® offers the possibility of creating harmonic function even in cases with severe skelettal discrepancies

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Abstract

If patients with a sagittal Angle Class II jaw relationship are treated, their intra-oral relationship poses special challenges. As long as fixed restorations are placed on teeth, dentists usually have to restore in an habitual inter-maxillary relationship. In order to keep the cantilever forces on teeth acceptably low, the vertical dimension is often not restored properly. Traditionally restorations having circular occlusal contacts are incorporated, i.e. occlusal contacts in the front are created. The pre-existing (opposing) teeth «guide» the new prosthetic restoration. This concept is commonly also used for conventional dental implants, because the traditional concept for these devices allows only a 1:1 implant-crown-ratio. Hence, especially in cases of jaw bone atrophy the vertical dimension is reduced. The disadvantage of this concept is the violation of the «mechanical harmony» which had been established between maxillo-facial muscles, joints and bones during growth. In this article we explain principles of the surgical and prosthetic treatment of a case using Strategic Implant® technology, in order to restore a severe Angle Class II inter-maxillary relationship.

Key Words

Strategic Implant® restoration,
vertical dimension,
sagittal jaw relationship,
Angle Class II.

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Introduction

A 53-year old, healthy male patient, heavy smoker, with severe tooth destruction and profound periodontal involvement due to tremendous hygiene deficits, requested for the restoration of the upper jaw. The patient desired treatment in the upper jaw, because the bridge in the 2nd quadrant was mobile.

Clinically his upper and lower dentition was in «correct» («normal») circular contact in the lateral segments and the front.

Nevertheless the plane of bite in the right and left side showed severe differences in orientation. Hence also the curves of Spee were different on both sides and bilateral symmetrical mastication was of course impossible. [1, 2]

The panoramic overview picture (Fig.1) shows the radiological situation before our treatment.

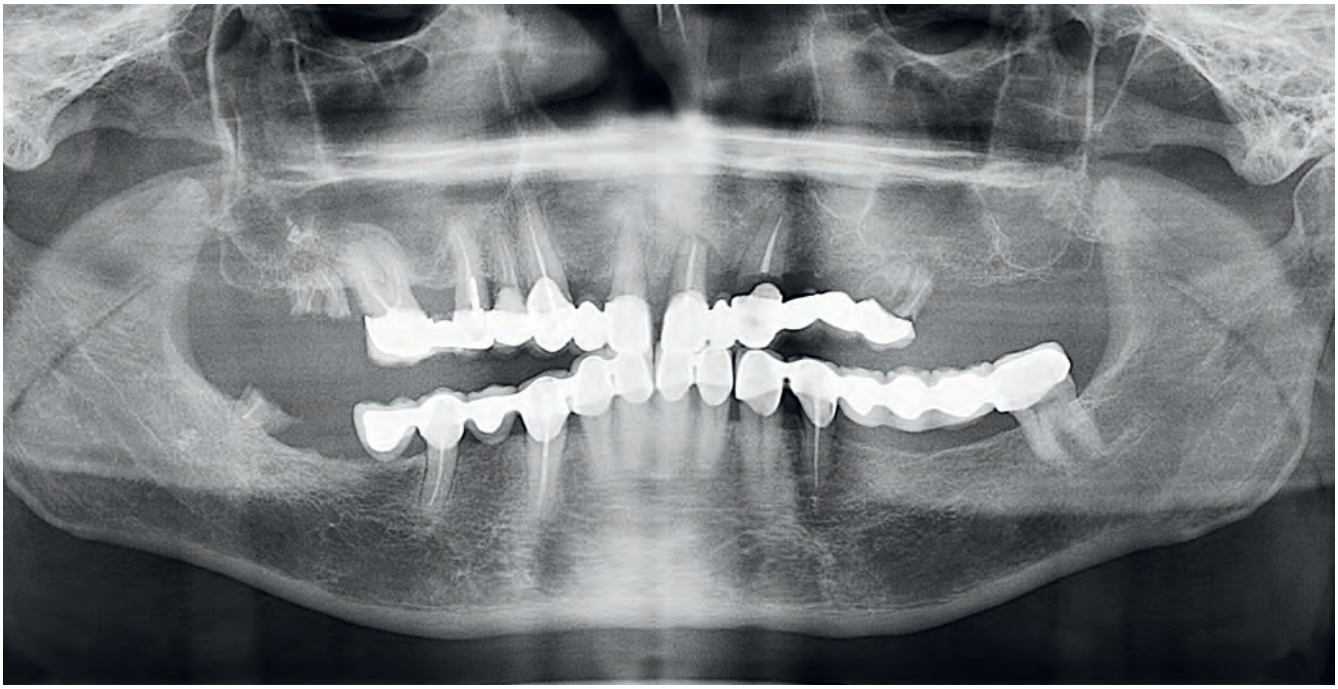

Fig. 1 *The pre-operative panoramic overview picture shows severely destructed teeth in the upper jaw, with periodontal and endodontic involvement. The curve of Spee and plane of bite were not identical on both sides of the mandible. Temporo-mandibular joints show typical anterior flattening typical for Angle Class II cases. Elongation of the upper and lower front teeth and anteriorly flattened surfaces of the temporo-mandibular joints indicate a pre-existing skeletal Angle Class II [3,4,5].*

Of course we advised the patient to restore both jaws at the same time and explained that the adjustment of bilateral mastication pattern would be much easier and sagittal problems could be adjusted. The patient refused any treatment with implants in the lower jaw for transient financial reasons and insisted on treatment only in the upper jaw.[6]

2. Materials and Methods

2.1 Surgery

Under local anaesthesia all upper teeth were removed and 10 Strategic Implant® devices were incorporated and osseofixed in the 2nd and 3rd cortical, (Fig. 2). The intra-oral soft tissues required suturing with 3.0 Silk sutures in single locations. The treatment was performed under a strict Betadine-protection-regime, using 5% Betadine solution for a thorough pre-operative and constant intra-operative cleaning. Also post-operatively, during metal-try-in (on day 1), and before and after the final cementation (on day 2), plenty of Betadine 5% was applied directly on the intra-oral soft tissues to exclude any infections and to sterilize the intra-oral cavity. No antibiotics were applied. The patient smoked pre-operatively

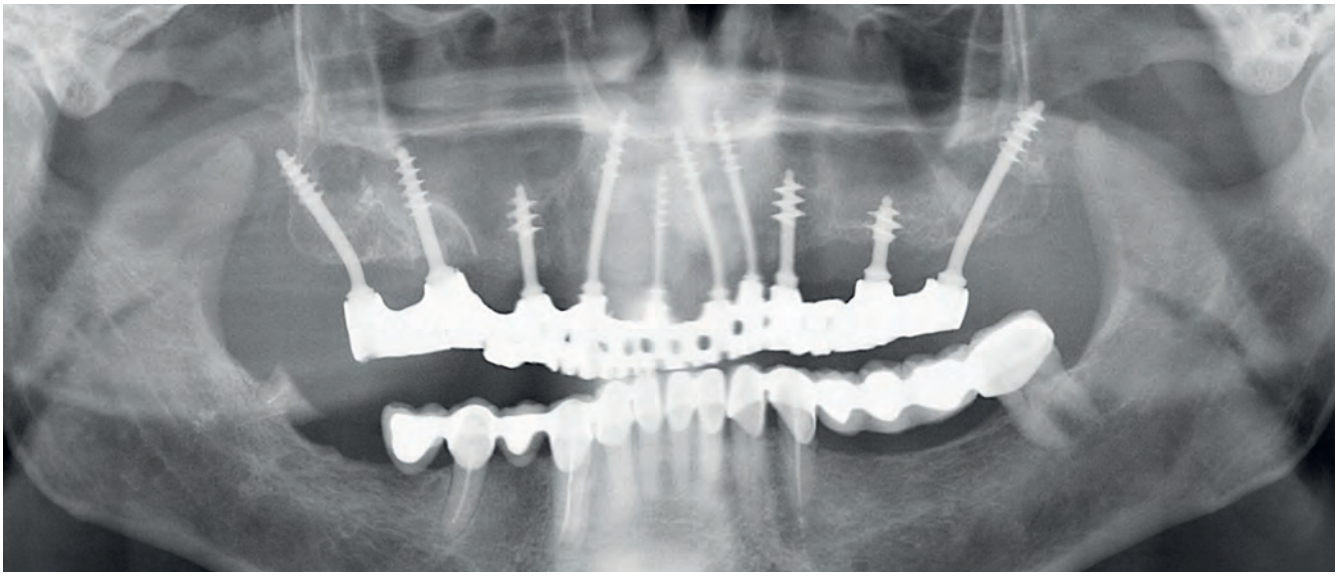

Fig. 2 *The post-operative panoramic overview picture taken during the metal-try in 5 hours after the operation, shows sound anchorage of Strategic Implants in the 2nd cortical (floor of the maxillary sinus, anterior nasal spine, floor of the nose) as well as in the 3rd cortical (pterygoid plate of the sphenoid bone). The implant in region 15/16 is anchored in the vertical, palatal bone of the maxilla, it does not penetrate into the maxillary sinus. The implant in region 28 reaches the pterygoid plate through the maxillary sinus.*

and immediately post-operatively, but he managed to stay without nicotine during the 75-minute intervention (admitted consumption 2 packs/day).

Immediately after the insertion of the implants impressions were taken, using only A-Silicone putty in the upper jaw. Because we expected wound healing problems and because the left sinus had been opened during the intervention, the patient received post-operative antibiotic coverage with Avelox for 5 days. Besides this medication against pain was administered by the patient according to his personal demand and the patient was advised to rinse his mouth twice daily with Betadine 5%. The healing was quite delayed and pain was reported more then 4 days, which owed to the massive abuse of nicotine. The bite was taken with a fast setting silicone (Relation D) both after the intervention (i.e. on implants) and again on the metal frames at the end of the try-in.

After two weeks a communication between the mouth and the maxiallry sinus was observed by the patient along the implant in area 15. We addressed this problem with a thorough cleaning and rinsing with Betadine. The communication disappeared without any surgical intervention a few days later.

2.2 Prosthetics

It had been decided with the patient that the lower jaw would receive a non-permanent fixed, occlusal adjustment to allow the fabrication of an immediately loaded implant-borne fixed prosthesis in the upper jaw. Also we planned to restore the case with the joints positioned in centric position and to create at the same time a bilateral pattern of mastication with the option of an anterior sliding of the mandible. This concept allows testing of the best sagittal position of the mandible.

The metal frame of a lab-fabricated metal-to-acrylic bridge was tried in on the first post-operative day and after completion and adjustments cemented with Fuji Plus one day later. [7,8, 9,10,11,12]

The pronounced Angle Class 2 jaw relationship required a specific lab approach. [13,14,15,16]

Two principal requirements were made for the bridge:

1. The upper front should support the upper lip and deliver the illusion of teeth in their original position.
2. For mastication a flat «ramp», orientated according to the plane of Kamper and providing at least some Spee was required, which should allow finding an adequate jaw position.

The procedure of fabrication and adjustment of the prosthetic work-piece is described in the following figures:

Fig. 3a *Wax-up on the model of the lower jaw for adjustment of the plane of bite and the curve of Spee. The lower front crowns were shortened on the mouth right to the level of the metal.*

Fig. 3b *The wax-up requires some more material in the molar area. This slide reveals the severe class II sagittal relationship of the jaws.*

Fig. 4 *Silicone-transfer for later use in the mouth.*

Fig. 5a *Ground lower bridge segment. A «stop» has been left in the distal part of the molar to allow precise repositioning of the silicone-transfer.*

Fig. 5b *The wax-up requires some more material in the molar area. This slide reveals the severe class II sagittal relationship of the jaws.*

Fig. 6a *After polymerizing the front teeth in pink acrylic, a distal «ramp» is created on a retentive metal frame. As we did not create cusps and fossae, the mandible was allowed to find its best sagittal position. Note that before the treatment the lower front was in direct contact with the upper front. The teeth in the upper jaw were exactly in the same position as the teeth which were positioned in the bridge.*

Fig. 6b *The lower canine will serve as a premolar. The total length of the chewing table (in the retral position of the lower jaw) on both sides is only three premolars.*

Fig. 7 *Impressions of the lower teeth and the wax-up-area on the acrylic «ramp». These impressions give orientation for the final shape of the «ramp». This picture shows how difficult it is to get the vestibular cusp of the first lower premolar into contact with the upper dentition. Such a stop-contact is vital for the feedback of a well functioning masticatory system. [13]*

3. Results

Within less than 72 hours the patient was equipped with fixed teeth and he was able to return to a normal masticatory function and eat everything right way.

His previous anterior pattern of chewing resumed immediately. A bilateral pattern of chewing had replaced the former malfunction. The occlusion and mastication was controlled every three months and adjusted. During the first recall appointment most of the adjustments were made, after this only minor adjustments were required.

Fig. 8 *The plane of bite is parallel to the plane of Kamper after the lower bridge has been increased.*

Fig. 9 *Sagittal relationship of both jaws right after the incorporation of the upper bridge.*

Fig. 10 *18 months later the upper bridge was replaced by a metal-composite bridge and the only in the 4th quadrant was replaced by a MFC onlay.*

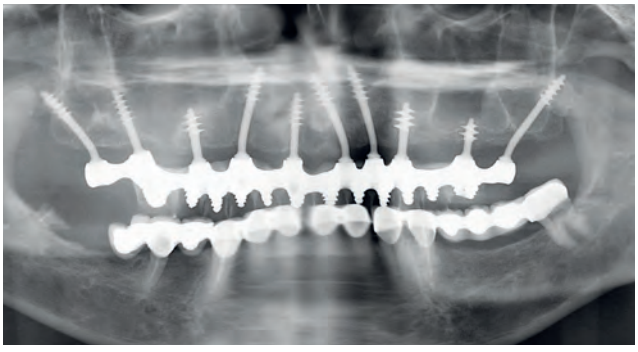

Fig. 12 *Final panoramic overview picture, showing the implants and circuar bridge in the upper jaw as well as the corrected APPI in the lower jaw.*

Fig. 11 *Because the front teeth were elongated and could not be shortened further, we had to install a considerable sagittal step and to lift the bite.*

4. Discussion

This case provided three difficulties:

- a severe Angle Class 2 jaw relationship with a highly unstable sagittal joint position.
- an unsuitable table for mastication at the onset of the treatment.
- an unsuitable occlusal and masticatory situation in the non-treated jaw.

4.1. Specifics of the treatment of skeletal Class II jaw relationship

Many patients seeking treatment by an implantologist are showing «normal» anterior contacts at the onset of the treatment, while the distal dentition has broken down. Chewing is often reduced to an anterior direction. During the restoration when the bite is taken, such patients may suddenly show a relapse of their joints towards distal and this way the malposition of the lower jaw becomes apparent for the first time.

In order to allow deprogramming of the muscles and to ensure that the process happens, typically we will not provide a temporary bridge to the patients before the 2nd bite is taken i.e. during metal-try-in. This will in most of the cases allow the masticatory muscles to relax and the joints will move easier towards their regular distal position. We have observed in many cases that it is not possible to take a «correct» bite immediately after the operation and impression taking. The results of this treatment step differed significantly from the second bite taking on the metal frame one day later.[2,18,19,20,21]

As soon as the jaw relapses it is easy to create a situation where both arches are not in contact during occlusion and function. The key to such a permanent relapse is however a sufficient vertical dimension and a situation where the frontal group of teeth has no possibility for occlusal contacts and no functional slopes are possible during regular mastication. Nevertheless the patient must be given the possibility to bite off e.g. a piece of an apple or bread.[19,21]

4.2. Temporary restoration on pre-existing restorations

We have used a fixed acrylic overlay on the pre-existing restoration in the right lower jaw in order to create a normal curve of Spee and align the plane of bite with the Kamper plane.

This is a cheap and fast possibility to create a suitable dentition in the non-treated jaw. We estimate that these temporary masticatory device can work for 2-3 years and during this period of time the patient has time to raise cash for further and final treatment of both jaws. Hence also

from a financial point of view a two-step treatment approach is justified.

The advantage of such overlays is that the quality and life expectation of the teeth underneath such a restauration is of minor importance, because the financial investment into these teeth is almost zero. It is also possible to deliberately overload teeth if this is necessary, e.g. through a distal cantilever pontic.

5. Conclusion

When restoring on a Strategic Implant® under immediate load conditions great care must be taken to install a bilateral pattern of chewing to avoid over-loading of single implants. Anterior patterns of chewing must be avoided, because such function creates extrusion forces on the bone around distal implants and may cause failure.

Often, if the patient requests treatment only in one jaw, the opposite jaw presents an unsuitable table of mastication which requires correction.

The primary aim of oral implant treatments in immediate load protocols is the establishing of bilateral masticatory function on two premolars and one molar on each side in an adequate vertical dimension and a centric joint position. In order to provide bilateral equal mastication the joints must be allowed to settle in a stable distal rest position, the curves of Spee must be identical on both sides and the plane of bite must be alinged to the Kamper plane. [22,23,24,25,26] Delivering a final bridge durable aesthetics and a sustainable gum line within the allowed period of time for immediate loading protocols (72 hours) is usually impossible. Final treatments will take place between 9 and 48 months after the first treatment steps.

Many patients who present at the onset of the treatment a skelettal class I jaw relationship (considering frontal contacts the inter-maxillary cusp relationship) show a sagittal relapse of the joints during the initial treatment phase. They then present a real class II jaw relationship and have to be treated accordingly.

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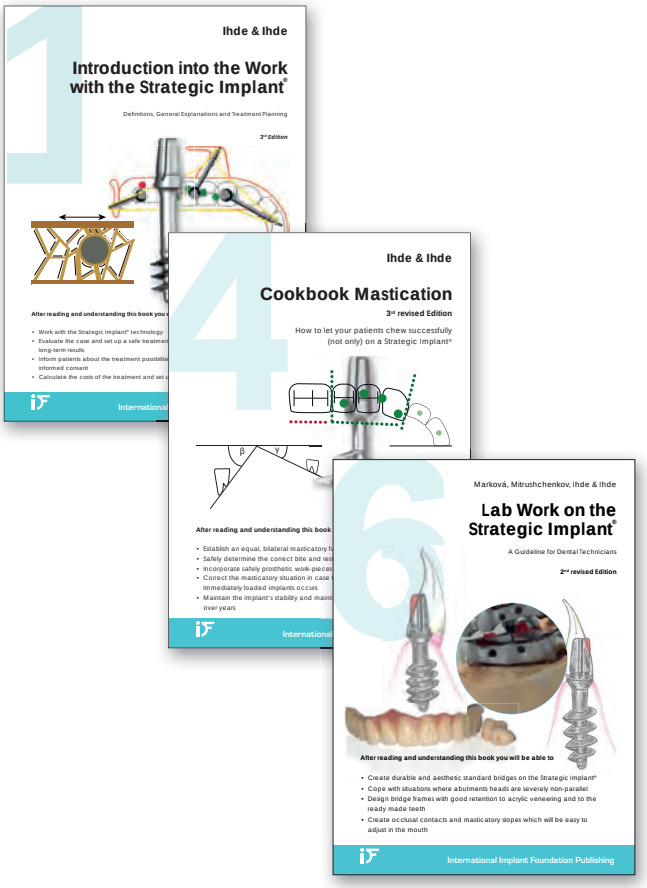

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