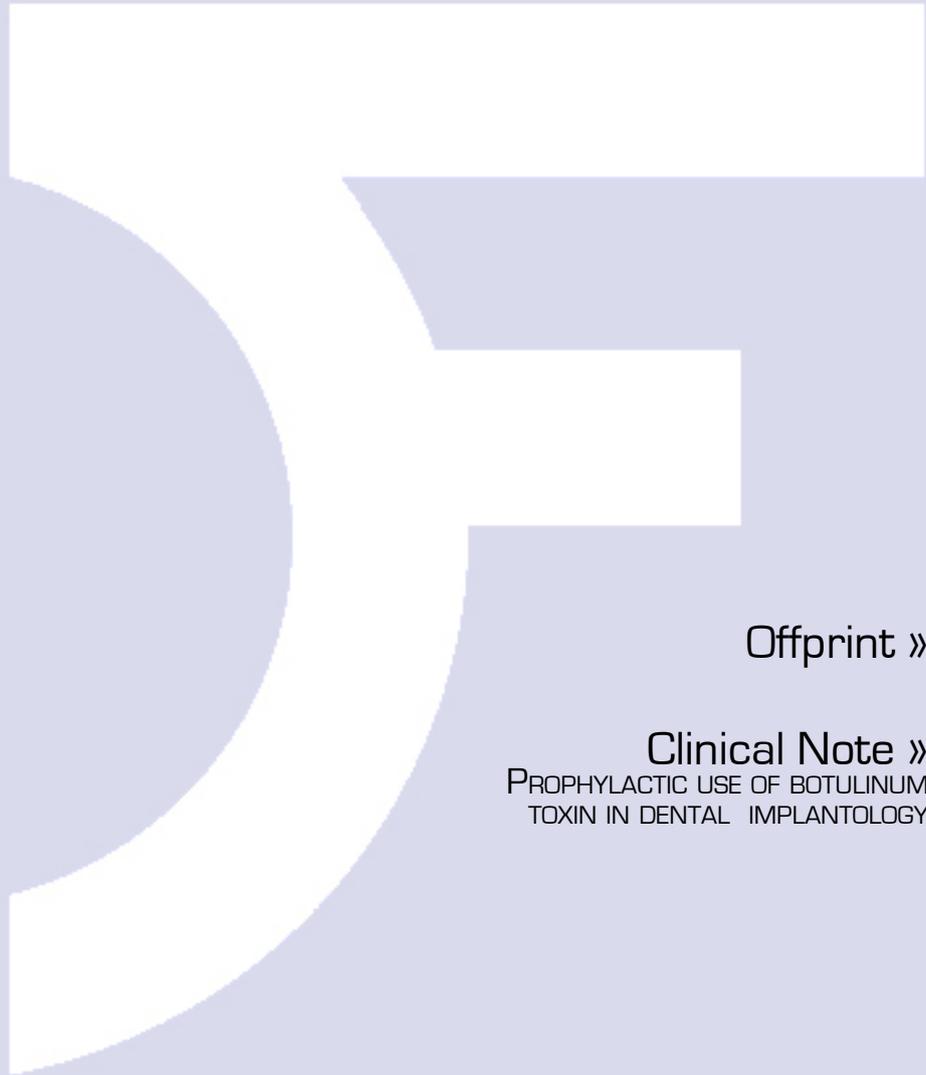




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Clinical Note »

PROPHYLACTIC USE OF BOTULINUM
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Clinical Note

Prophylactic use of botulinum toxin in dental implantology

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The clinical role of botulinum toxin as a therapeutic agent is expanding. Our group has found a new role for its use in dental implantology. Its safe and effective use with bruxism and oral mandibular dystonia prompted its use with dental implants in immediate load protocols where temporarily reducing masticatory forces can be of prophylactic benefit to protecting the osseointegration process.

Immediate loading has become a hot topic in implant dentistry. It shortens the treatment time and makes it possible to provide the patient with an aesthetic reconstruction during the whole treatment period. Controlling functional forces has been suggested as one of the ingredients for obtaining success with immediate implant loading ¹.

Furthermore, whether one prescribes to immediate or delayed loading, osseointegration rates for conventional dental implant systems are relatively high (>93%) under normal bone conditions.

Jaw volume, bone quality, and overload are the three major determinants for late implant

failures ². Since osseointegration represents a dynamic process both during its establishment and its maintenance, implants initially well integrated may occasionally show unexpected mobility when the bone/implant/restoration system is in actual function. This mobility can be the result of increasing muscular forces or a changing occlusal situation after an unexpected repositioning of the temporomandibular joints. If the mobility is not the result of infection, the implant may be treated and protected without an invasive removal procedure. *Prophylactic* administration of botulinum toxin close to the time of implantation for immediately loaded implants has been reported to control functional forces.

Therapeutic administration of botulinum toxin in patients exhibiting instability after implant placement for the purpose of preserving an implant/restoration system unrelated to infection has also been reported

The use of Botulinum Toxin has become routine practice both *prophylactically* and *therapeutically* when basal (lateral) implants are used. Basal implants consist of a thin cylindrical part and a larger, cortically anchored base plate. They are inserted from the lateral aspect of the jaw bone through a T-shaped slot. The slot may be closed by means of bone augmentation or through self healing (Figure 1). When cases with extreme bone atrophy are treated with this implant therapy, long prosthetical cantilevers are often required to establish correct restoration of the vertical dimension (Figure 1). These cantilevers may in addition increase the risk of overload.

Comprehensive insertion of implants and immediately loaded restorations can change all parameters of masticatory function; the newly created occlusal surfaces will be included in the masticatory process and the vertical dimension is often changed.

This results in considerable changes in the patterns of muscular function, which in turn influences the morphology of the jawbone and thus the relative position of the dental arches. Most patients are able to position and move their dental arches congruently during the day. During phases in which voluntary control is absent (i.e., during the night), the jaws may approximate in positions that greatly deviate from their daytime positions. If this happens, balance is lost. Muscular dynamics during the patient's sleep are unique and differ from those during voluntary clenching exerting a greater mechanical load on the temporomandibular joint on the balancing side ⁵.

The *prophylactic* administration of botulinum toxin may reduce the risk of damage being exerted to the bony interface by gradual or sudden changes in mandibular position on the interface of immediately loaded implants before they are detected at the scheduled follow-up appointments. Especially in early phases of the implant therapy, such forces may mobilize the implants.

If implants are placed in bone areas where tensile forces dominate ⁶, these forces may enhance bone resorption by creating unfavorable conditions for implant integration, especially if the implant is not yet firmly integrated (e.g., im-

mediate load conditions). To avoid detachment of the bony interface from the implant and overload in areas that have been subject to minor loads preoperatively, the *prophylactic* reduction of masticatory forces through the use of botulinum toxin therapy appears to be a sensible therapeutic adjunct.

Whether one prescribes to early or delayed loading, the phase of functional use of dental implant systems is often characterized by extensive changes in the relative positions of the dental arches, segments or individual teeth.

The extent and sequence of these changes cannot be predicted, which is why the inserted restorations must be monitored and adjusted at regular intervals. Even more unpredictable are the morphological changes which can have a variety of effects in the implanted jawbone. Changes in the integrated implants and thus the functional surfaces of the restorations will passively follow ⁷. In addition to masticatory force and masticatory function, age, hormonal status and genetic dispositions as well as habits and other factors will play a role in determining the nature and extent of these changes ⁸⁻¹¹. Collectively, these changes often exceed the extent of what dentists know and expect from their daily experience with tooth-supported restorations.

One might be concerned that though the therapeutic approach using botulinum toxin will inhibit masticatory function temporarily, the masticatory forces will eventually return to previous levels once the effect of the drug has subsided, once again exercising their potential deleterious

functions. However, a permanent reduction of masticatory forces is not the therapeutic objective. Rather, the objective is to create a more favorable load situation during a phase of higher elasticity in the region of the bony interface for a limited time to allow the bone to remineralize and the implant to reintegrate in the bony interface region. Hence, it is necessary to address premature contacts and unilateral loading at the outset of botulinum toxin therapy to ensure the stabilization of the bone/implant system will be a lasting success.

The authors commonly prescribe to the *prophylactic* administration of botulinum toxin in full arch implant cases with advanced atrophy of the maxilla in immediate load protocols using basal (discussed earlier) implants. If sufficient bone is available in the upper jaw to allow the placement of eight or more implants (with a diameter of 10 mm or more), the need for botulinum toxin therapy is less imminent; however, we often apply it in all cases because we find the benefits outweigh the risks of failed osseointegration in immediate loading protocols. In our clinical experience, witnessing the benefits of this treatment, we no longer can deprive patients in immediate load protocols from this treatment, especially in cases with reduced bone supply. Since the bone in the mandible is usually of better quality, botulinum toxin is not indicated. The authors believe that bilateral medication of the masseter muscles (without treating the temporalis muscles) will generally suffice to achieve satisfactory results both *prophylactically* and *therapeutically*; however, no studies have been conducted to support this clinical anecdote.

In cases of severe preoperative atrophy, the surgeon may want to medicate both muscles. We administer a full dose of 200 -250 U for each masseter muscle in order to provide an adequate reduction of chewing forces for up to eight weeks, (Figures 3-5). Our rationale is based on the 50-60 day time period for primary mineralization of woven bone (callus). These recommendations are based on the principles of bone physiology and healing, clinical experience and its application in other maxillofacial conditions.

There are alternative treatment strategies to decrease the loads on the bony interface, such as the use of interceptors, splint therapies, and TENS devices. Interceptors and splints tend to change the location and the time pattern of increased masticatory forces, whereas TENS devices provide relaxation for a very limited time period. We find that that these strategies do not provide enough protection against deleterious involuntary nocturnal mandibular excursions or nocturnal changes in the mandibular position. No clinical studies exist comparing these methods to botulinum toxin therapy.

Botulinum toxin therapy is not indicated in cases where the heavily remodelled intrabony overload areas have become infected. To our knowledge and clinical experience, reintegration of implant surfaces cannot occur in the presence of granulomatous changes at the bony interface, especially if the interface of the implant is roughened which promotes retention of the infection.

Our experience with botulinum toxin has been applied with lateral implants ¹²⁻¹⁵.

However, it is conceivable, in principle, that this medication can be used as an adjunct in treatment concepts including either root-form implants or a combination of root-form and lateral implants. To establish the scientific safety and efficacy of botulinum toxin use in dental implantology, more studies need to be published on this topic. Based on its safety and efficacy in other craniomaxillofacial conditions, and in our 10-year clinical experience with lateral implants, we consider it safe to use, however, encourage research in its application.

This research could compare patients with poor bone who do or do not receive botulinum toxin therapy or compare botulinum toxin therapy to other methods of controlling masticatory forces. A focus on discovering the appropriate doses for therapeutic and prophylactic indications while considering the bone physiology for increasing the chances of successful integration in immediate load protocols for root-form dental implants would also be useful.

In particular, patients with reduced bone supply as well as patients suspected of delivering high masticatory forces present special challenges to the implantologist. Prophylactic administration of botulinum toxin may facilitate a reduction of the strength of the masseter and temporalis muscles after implantation, especially with immediate load.

Bone/implant/restoration systems can become mobile due to overload on the peri-implant bone during the treatment phase. Botulinum toxin can reduce the indirect influence of the

masticatory load on the bone/implant interface which may in turn protect the osseointegration process.

Figures

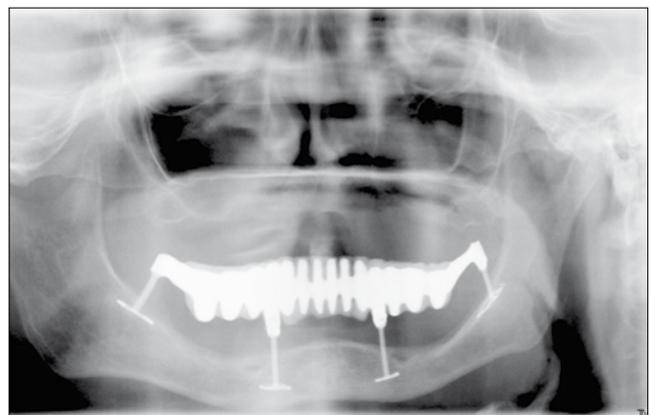


Figure 1. Fixed restoration of the extremely atrophied mandible with a metal-to-ceramic bridge and basal implants (6 years postoperative panoramic view).

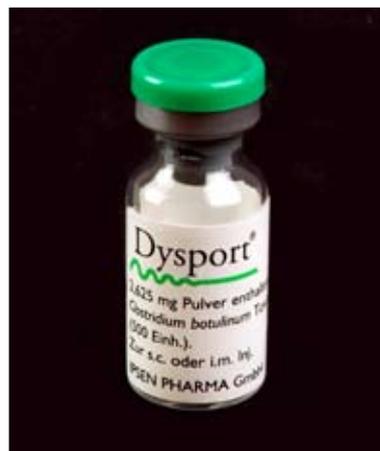


Figure 2. One vial of Dysport contains 500 U of dry substance which should be diluted with sodium chloride. The molecule is very sensitive; therefore, should not be shaken.



Figure 3. The prominent areas of the masseter muscle are easy to palpate. Before injecting the drug, markings may be made on the skin to allow orientation for the injection.



Figure 4. Injection of one half of the dose for one masseter muscle from outside the mouth into the center of the marked area. The 200-250 Units of Botulinum toxin are divided between two areas of the masseter muscle.



Figure 5. The superior and anterior part of the masseter muscle may be easily identified and accessed from inside the mouth.

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