

## Full arch implant borne FDPs in clinical situations with limited bone height using inclined/tilted implants.

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For the edentulous mandible, the literature supports immediate loading of 4 to 6 implants with a moderately rough surface along with a fixed dental prostheses. There is sufficient evidence that posterior implants can be placed in a tilted inclination where the bone ridge height does not allow for a straight implant to be placed.

For the edentulous maxilla, there is preliminary evidence that supports, in association with strictly defined conditions, immediate loading of 4 to 6 moderately rough surface implants with a fixed prostheses. While alveolar ridge resorption is frequently advanced in the anterior region, in the posterior region the lack of bone volume is often the result of increased pneumatization of the maxillary sinus. This situation requires either short implant lengths or a sinus lift elevation using a crestal or lateral approach. This can be carried out either simultaneously, if 4-6 mm residual bone height is present, or in a staged approach where less than 4 mm alveolar ridge height is available. However, one must take into account that the evidence supporting immediate loading does not apply one to one where shorter implants and/or simultaneous bone augmentations are used. Alternatively, to avoid bone augmentation and to shorten the length of a distal cantilever, posterior implants may be placed in a tilted position along the anterior wall of the maxillary sinus.

Scientific evidence suggests that there is no increased risk of implant loss for posterior tilted implants in the mandible and maxilla, but cleaning access may be limited. This statement is made with the understanding that the treatment is challenging. When bone height is limited, a treatment protocol with at least 2 anterior straight and 2 tilted implants in the premolar region can be considered a valid option as long as the clinician has the appropriate education, experience, and skills. Patient's requests and complaints, general health, potential limitations and treatment history must be analyzed and the patient must be informed about alternative treatment options.

**Indications:**

- In situation where a straight implant (>8 mm) cannot be placed parallel to the other anteriorly placed implants without performing bone augmentation procedures.
- To avoid sinus augmentation procedures (implants can be positioned and tilted anterior to the anterior sinus wall).
- To avoid augmentation procedures of atrophic mandibles (implants can be positioned and tilted anterior to the mental foramen)
- In cases where full arch restorations with 4 to 6 dental implants is possible

**Literature/References (Selected publications)**

- Support for the underlying treatment concept; fully edentulous dental arches (maxilla and mandibles), restored by the use of 4 dental implants. Two implants in the interforaminal region in a straight position, the axis of two posterior implants will be placed tilted distally. The correction of the axis of the posterior tilted implants is reached by the use of special angulated abutments. The prosthetic reconstruction is done immediately after the implants are placed (Malo et al., 2012; Malo et al., 2011; Malo et al., 2013; Patzelt et al., 2014; Tallarico et al., 2015)
- Successful osseointegration of Straumann® Roxolid® SLActive® Implants in the edentulous jaw (Akoglu et al., 2011; Al-Nawas et al., 2012; Calvo Guirado et al., 2014; Chiapasco et al., 2012; Cordaro et al., 2013; Karabuda et al., 2011; Quirynen et al., 2014)
- Treatment of the edentulous jaw with 4 to 6 straight positioned Straumann® implants (Calvo Guirado et al., 2014; Kinsel and Liss, 2007)
- Angulation of Straumann® implants (Piano et al., 2015; ten Bruggenkate et al., 1991; Wismeijer et al., 2010)
- Immediate function with Straumann® SLA/SLActive® implants (Ganeles et al., 2001; Nicolau et al., 2011; Piano et al., 2015; Stoker and Wismeijer, 2011)
- Successful use of short implants (Slotte et al., 2012; ten Bruggenkate et al., 1998; Cannizzaro et al., 2015)
- Successful mid- and long-term follow-up of edentulous patients with Straumann® implants (Buser et al., 2012; Fischer and Stenberg, 2011; Quirynen et al., 2014; van Velzen et al., 2014)

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