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“Monday Morning Pearls of Practice by Bobby Baig”

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Tilted (Angluated) Implants: Review of Success Rate and Marginal Bone Loss

Purpose:

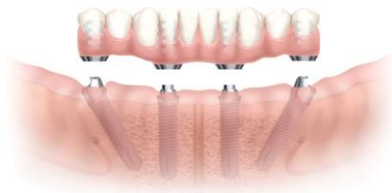
To **compare** patients treated with **tilted implants** versus those treated **conventionally with axial implants**, analyzing the success rate and marginal bone loss.

Introduction:

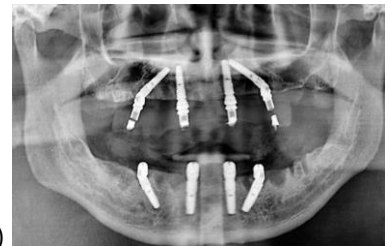
The term **tilted implants** refers to implants placed at an angle of normally **15 degrees** or **more** with respect to axially or vertically positioned implants. According to many authors, the use of tilted implants in the posterior maxillary sector offers advantages over axial implants.



a)



b)



c)

Advantages of using tilted implants over axial Implants:

1. The placement of tilted implants offers both **surgical and prosthodontic benefits**.
2. In effect, the combination of tilted and axial implants **allows the use of longer implants**, increasing the osseointegration by **increasing** in the **surface area**.

3. **Improves primary stability** by anchoring in more than one cortical layer.
4. **Avoids cantilever** extremities by placing the implants more distal and with **better load distribution** over the dental arch.
5. **Avoids** the use of bone **grafts** and **sinus lift** procedures with the resulting reduction in morbidity.
6. Tilting of the implants may **engage greater quantity** of **residual bone**, which may be beneficial to implant stability. Moreover, a more even distribution of stress around implants is achieved.
7. It was also suggested that the reason for the **high survival** of tilted implants may be the **increased contact** between cortical bone and tilted implants, increasing the initial stability, which may be true for the maxilla, but not necessarily for the mandible.

Marginal Bone loss:

1. Full-arch prosthesis that the reduction of the cantilever length achieved by tilting of the distal implants **allows** for a **more widespread distribution** of the **occlusal forces** under loading, and consequently for a reduction of the stresses at the implant neck.
2. Analyzing tilted implants in splinted full-arch prostheses observed more **favorable results** for tilted implants **concerning marginal bone loss**, due to **the splinting effect**.
3. The cantilever length of the prosthesis also has some influence; as shorter cantilevers have been correlated to a reduced peri- implant bone loss.
4. The present review of the data did not find an apparent significant effect of tilted dental implants on the occurrence of greater marginal bone loss in comparison with axially placed implants.
5. However, these results should be interpreted with caution due to the lack of use among the included studies of a standardized technique aiming to obtain a precise and reproducible bone loss measurement, and also due to the variability of the follow-up period among the studies.

Success Rate:

1. It has been considered that loaded tilted implants can fail due to the presence of unfavorable forces applied to the bone surrounding the implants. However, this theory was rejected by **Celleti et al in 1995**, whom used these implants splinted so as to adequately distribute prosthetic loading.
2. In the year **2009 Agliardi et al** published the largest series to date, with 61 rehabilitated maxilla's in which four implants were placed: two more anterior in an axial position and two more posterior in a tilted position parallel to the anterior wall of the maxillary sinus. The success rate was **100%** for both the axial and the angled implants, after a mean follow-up of 27.2 months.
3. **Penarrocha et al 2010**. In turn rehabilitated 10 patients with over dentures on four tilted implants. Only one implant failed, after 12 months of follow-up, the corresponding success rate being **97.7%**.
4. **Malo et al. (2005)** published a study of 32 patients with the placement of 128 dental implants (64 angled and 64 axial), the reported success rate being **95.3% and 100%**, respectively. The marginal bone loss was 0.9 mm on average, with no differences between the tilted implants and the axial implants.
5. **Rosen and Gynther (2007)**, in a study involving follow-up for as long as 12 years, with the placement of 103 tilted implants, recorded a success rate of **97%**. Their mean marginal bone loss was 1.2 mm. These authors concluded that angled implants placed in the extremities of atrophic maxilla's constitute a viable and evidence-based treatment option, and may be viewed as an alternative to bone grafting.
6. **Malo et al; 2014**. A total of 324 patients were rehabilitated with 1,296 implants supporting 324 full-arch fixed immediately loaded mandibular prostheses. Sixty-four patients (19.8%) were lost to follow-up. Prosthetic survival was 323/324 (**99.7%**), and 14 patients lost 18 implants, with an estimated cumulative survival rate of **95.4%** at 7 years. Variables associated with implant failure were smoking. Mean MBL at 5 years was 1.81 mm, and smoking was associated with MBL \geq 2.8 mm.

Conclusion:

1. Based on the findings there is **no evidence of differences** in success rate between tilted and axial implants in either the prospective or retrospective studies subjected to review.
2. The **marginal bone loss** observed with the tilted and axial implants likewise proved **very similar**.
3. It thus can be concluded **that tilted implants** exhibit the same evaluative behavior **as axial implants**.

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