

Osseodensification Protocols for Enhancement of Primary and Secondary Implant Stability- A Retrospective 5-year follow-up Multi-center Study

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Abstract

The aim of this study was to evaluate long-term the effects of osseodensification-enhanced implant primary stability with different implant systems with different micro and macro geometries. 254 single implants were placed in 184 patients using osseodensification protocols in both maxilla and mandible. Follow-up assessments ranged between 13-65 months. The primary outcome variable was implant stability measured by insertion torque value (ITV) and implant stability quotient (ISQ) followed by implant survival rate. Insertion torque was measured at the day of surgery and ISQ was measured at 1, 2, 3, 4, 5, and 6 weeks post-op. Six implants failed, leading to no ISQ reading weekly. Two other implants could not have ISQ reading performed weekly due to the need of ridge augmentation/GBR at the time of surgery. This multi-center retrospective study demonstrated that Osseodensification is a safe and viable method for increasing primary stability, leading to predictable treatment outcomes.

Background and Aim

Dental implants have been extensively studied as a treatment strategy for rehabilitation of missing teeth. Optimal primary stability is a key factor for successful osseointegration, and is traditionally achieved with bone compression.

A novel biomechanical bone preparation, Osseodensification, has been developed to assist the surgeon at the placement of dental implants with the goal of improving primary stability without creating bone compression. The aim of this study was to evaluate long-term the effects of osseodensification-enhanced implant primary stability with different implant systems with different micro and macro geometries.

Methods and Materials

In this multi-center retrospective study, 254 single implants were placed in 184 patients using osseodensification protocols in both maxilla and mandible. Six implant systems were used with different micro and macro geometries. All implants were placed following osseodensification protocols in order to minimize compression at the crestal bone around the implants. Follow-up assessments ranged between 13-65 months. The primary outcome variable was implant stability measured by insertion torque value (ITV) and implant stability quotient (ISQ) followed by implant survival rate. Insertion torque was measured at the day of surgery and ISQ was measured at 1, 2, 3, 4, 5, and 6 weeks post-op. Cases were restored when ISQ reached > 68. Follow-up of 5 years included clinical assessment with radiographs to assess bone levels and implant functionality.

Mean Values

System	ITQ	ISQ - 0	ISQ - 6
Zimmer	64.94	77.12	72
Megagen	54.45	76.84	76
Neoss	48.24	77.51	79
Nobel	43.87	77.23	76
Implant Direct	63.41	77.9	76
Astra EV	45.12	78.13	76

ITQ: Insertion Torque; ISQ-0: RFA values at implant placement; ISQ-6: RFA values at 6 weeks.

Results

A total of 254 implants (117 mandible, 137 maxilla), were placed in 184 patients. The different implant systems and design architectures included 62 Zimmer Biomet TSV, 57 Megagen Anyridge, 45 Implant Direct Legacy II, 26 Neoss, 26 Nobel Replace, and 38 AstraTech EV.

Higher primary stability was observed on Implant Direct Legacy II, Zimmer Biomet TSV, and Megagen Anyridge, respectively, when compared to the other implant systems.

The majority of implants was located on posterior sites. The mean ISQ at the time of implant placement (0 week) was 77Ncm and it was maintained over the 6 following weeks.

Six implants failed, leading to no ISQ reading weekly. Two other implants could not have ISQ reading performed weekly due to the need of ridge augmentation/GBR at the time of surgery. Overall success rate was 97.7%.

Conclusion

This multi-center retrospective study demonstrated that Osseodensification is a safe and viable method for increasing primary stability, leading to predictable treatment outcomes. Osseodensification leads to positive results with implant systems of different micro and macro geometries.

References

- A Multicenter Retrospective Clinical Study with Up-to-5-Year Follow-up Utilizing a Method that Enhances Bone Density and Allows for Transcrestal Sinus Augmentation Through Compaction Grafting.* Huwais S, Mazor Z, Ioannou AL, Gluckman H, Neiva R. Int J Oral Maxillofac Implants. 2018 Nov/Dec;33(6):1305-1311.
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