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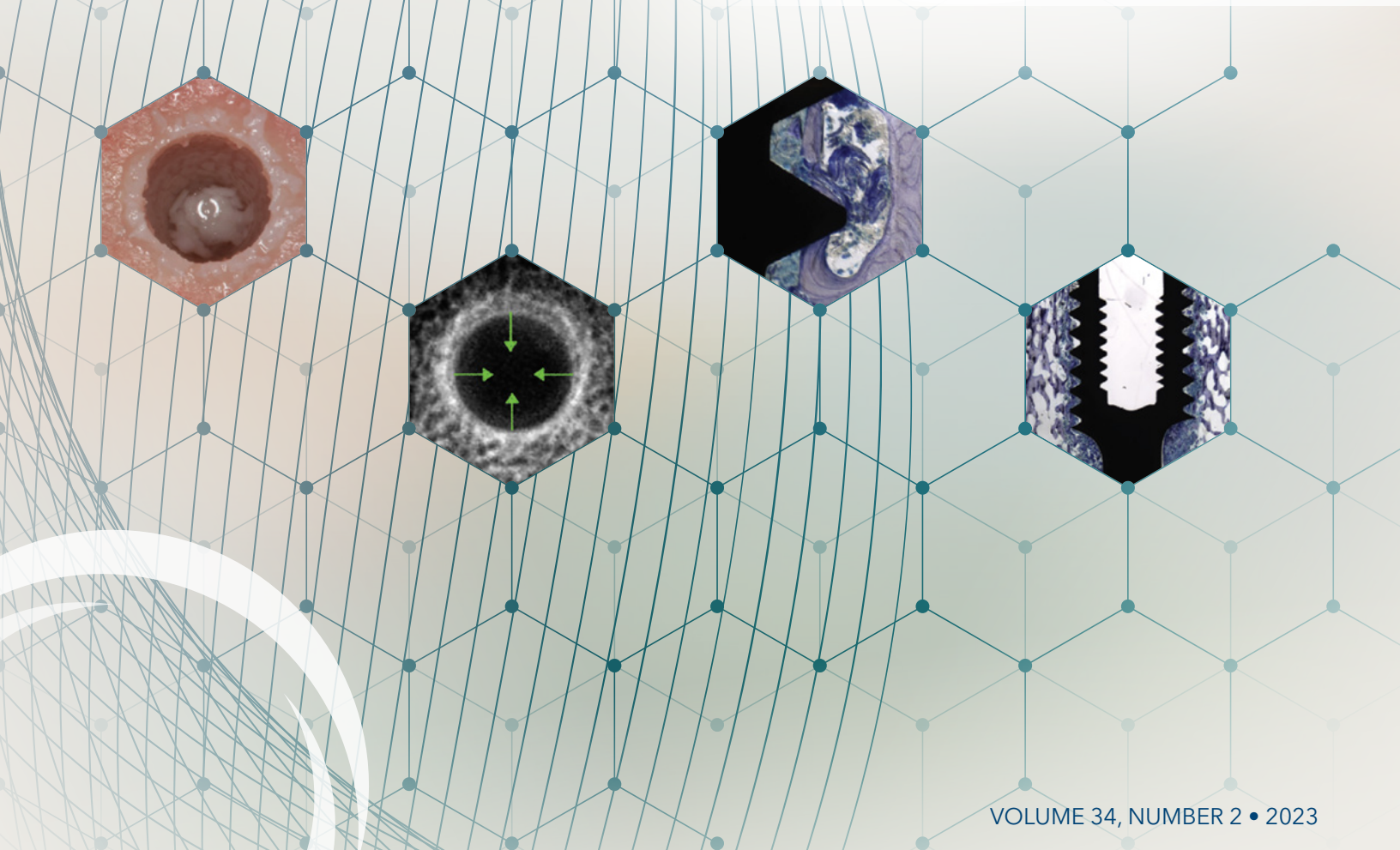
The unfolding science of osseointegration

- *The science of osseodensification*
- *The immune foreign body reaction theory of osseointegration*



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Osseodensification: Does it stand up to scientific scrutiny?

By: E. Dwayne Karateew, DDS; Arndt Guentsch, DMD, MHBA, PhD; and Salah Huwais, DDS;
Academy News *Guest Contributors*

Osseodensification, a universal additive bone instrumentation method, was introduced by Huwais. It utilizes specially designed burs that induce a time-dependent hydrodynamic wave ahead of the point of contact, which enhances bone plasticity and allows for osteotomy creation through compaction autografting bone into the trabecular spaces (Huwais et al. 2017).

Biomechanical and histological in-Vitro evidence: It has been demonstrated that osseodensification compaction autografting leads to bone spring-back into the implant body increasing bone to implant contact by three folds (70%) day of surgery, thus enhancing its primary stability measured by insertion and removal torque (Huwais et al. 2017, Slete et al. 2018, Caceres et al. 2020). (Fig. 1).

Histological *in-Vivo* large animals' evidence: There is an initial increase in implant stability and BIC is maintained throughout three, six, and 12 weeks healing regardless of the implant macro or micro geometry, (Witek et al. 2019, Lahens et al. 2018, Oliveira et al. 2018, Alifrage et al. 2018, Tian et al. 2018, Trisi et al. 2016, Lahens et al. 2016, Gendy et al. 2017), and leads to a subsequent increase in implant BAFO which translates to enhanced osseointegration (Mullings et al. 2021).

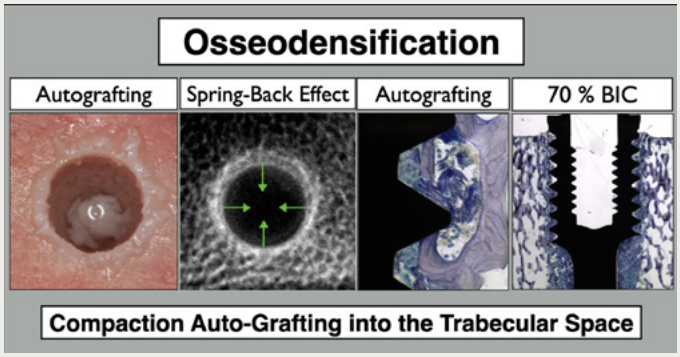

Fig. 1.

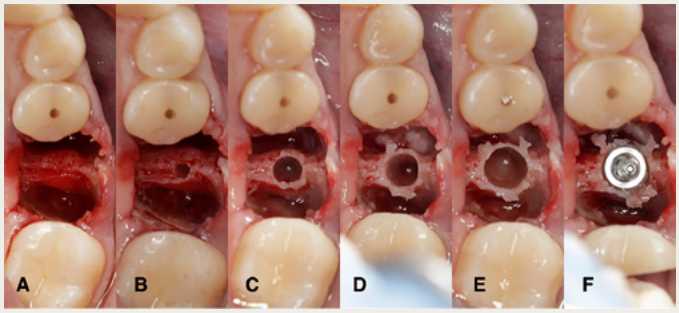

Fig. 2.

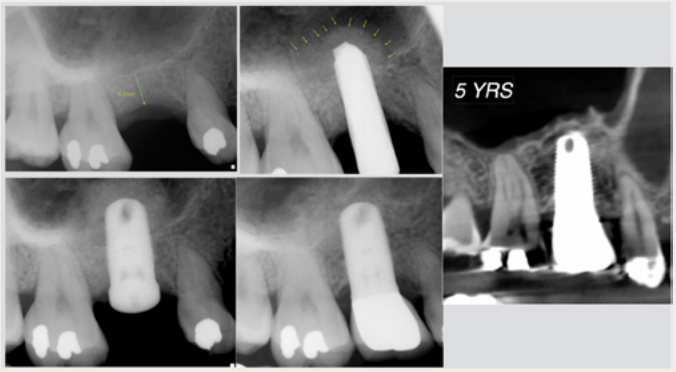

Fig. 3.

Fig. 4.

Clinical Evidence: Prospective clinical trials have demonstrated, including a long-term prospective study, that osseodensification is a universal bone instrumentation that produces increased implant primary stability measured by insertion torque and subsequently increases its secondary stability measured by ISQ throughout the healing period regardless of implants macro or micro geometry, with 97.7% long term success rate (Bergamo et al. 2021, Ibrahim et al. 2020 and Tenello et al. 2019).

Osseodensification Clinical Protocols: Osseodensification has demonstrated efficacy in several clinical scenarios, including *alveolar ridge plastic expansion*, which allows for implant placement with narrow ridges with adequate amount of trabecular bone without creating dehiscence (Koutouzis et al. 2019 and Jarikian et al. 2021). This increase in bone plasticity also facilitates upper and lower *molar septum expansion and immediate implants placement*. Bleyan demonstrated, the ability of osseodensification to expand molars septum with adequate amount of trabecular bone in conjunction with immediate implants placement in multirooted sockets resulting in 93.1% success rate over 5 years follow-up (Bleyan et al. 2022). (Fig. 2). It has been reported that there is a 98.1% total implants survival rate in 24 months follow-up of 211 implants immediately placed with osseodensification (Formiga et al. 2022).

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The hydraulics created by the densifying burs facilitates compaction autografting in both lateral and apical directions resulting in the adequate elevation of the maxillary sinus membrane and subsequent *crestal sinus grafting* with autogenous bone or in conjunction with allograft or alloplastic putty (Huwais et al. 2018). Several clinical prospective and long-term retrospective studies (Kumar et al. 2017, Huwais et al. 2018, Gasper et al. 2018, Neiva et al. 2018. Arafat et al. 2019. Alhayati et al. 2022) have reported adequate sinus grafting in initial residual bone heights range of 2-8 mm with implants survival rate of 97% utilizing osseodensification. (Fig. 3).

Osseodensification Guided Surgery System:
C-Sleeves allow for sufficient irrigation to facilitate the hydraulic effect. The surgical keys are attached to the burs to allow for the adequate luxating needed and are used in incremental steps to deliver highest accuracy and predictable implant placement (Guentsch et al. 2022, Guentsch et al. 2023). (Fig. 4).

References for this article are available via scanning this QR code.

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