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Usage of Er:YAG Laser in Maxillary Sinus Surgeries: A Clinical Comparison of VSP vs Gaussian Pulse Profiles

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SUMMARY

Background: The Erbium laser (Er:YAG, 2940 nm wavelength) with its high absorption in water and low penetration depth in soft and hard oral tissues, enables high ablation depth control in bone surgery. This precise control offers a big advantage, especially in lateral approach sinus-grafting procedures, where often a thin bone wall is present. The pulse duration control offered by erbium lasers dramatically affects clinical results in terms of ablation capability. Temporal profiles of dental Er:YAG lasers reveal that there are two distinct types of pulse profiles, Square Pulse and Gaussian.

The aim of the present retrospective study is to make a clinical comparison of Square Pulse Er:YAG versus Gaussian Er:YAG in maxillary sinus surgeries.

Material and Methods: The study consists of two groups: Square Pulse vs Gaussian. In the Square Pulse group, an articulated-arm-based Er:YAG device (LightWalker, Fotona) that produces a Variable Square Pulse (VSP) beam profile is used. The Square Pulse group consists of 7 cases with 10 sinus lifting procedures. The laser power settings used were 400 mJ x 10 Hz = 4 W, 50 μsec pulse duration, 44% air, 33% water spray. In the Gaussian group, a fiber delivery Er:YAG device (VersaWave, Hoya ConBio), which has not been available commercially since June 2011, was used. In the Gaussian group, there were 6 cases with 9 sinus lifting procedures. The power settings of the Gaussian group were 400 mJ x 15 Hz = 6 W, 300 μsec fixed pulse duration, under copious water/air cooling.

The surgeon evaluated the clinical usefulness of the surgical instruments by Visual Analog Scale (VAS) according to the parameters of handling, visibility of the surgical field, irrigation, bone cutting speed, working time duration, scoring each on a scale from "poor" 0 (zero) to "perfect" 10. The membrane rupture rate was registered as either absent or present.

Results: The Square Pulse group showed only one membrane rupture and shorter preparation times.

Conclusion: According to the data collected during sinus surgeries, VSP Er:YAG was found to be more effective in comparison with a fixed pulse duration Gaussian profile laser beam.

Keywords: dental implant, implant, surgery, sinus lift, sinus lifting, sinus graft, laser, Er:YAG, erbium, variable square pulse, pulse duration, ablation, Gaussian, beam profile

Fenestration of Un-erupted Maxillary Incisors

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SUMMARY

Un-erupted maxillary incisors may manifest as benign cysts that appear on the mucosa of a tooth shortly before its eruption. The majority disappear on their own. If they hurt, bleed or are infected, they may require surgical treatment to expose the tooth and drain the content. Here we present a clinical case of a seven-year-old child with an un-erupted permanent maxillary central left incisor. The overlaying firm keratinized mucosa was ablated with an Er:YAG laser (60-90 mJ/pulse, 30 Hz, SP, 400 μm) while hemostasis of the frenulum and incisive papilla was achieved by Nd:YAG laser (5 W,50 Hz, LP). The procedure did not require any sutures; there was no hemorrhage, swelling, infection or postoperative pain. The treatment of unerupted incisors with this technique facilitates the cooperation of pediatric patients and makes the treatment more predictable and safe.