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Novel Graft Material with New Protocol in GBR; Use in Sinus Augmentation Using a Lateral Window

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Topic: Implant therapy outcomes, surgical aspects

Abstract

Research showing the osteo-conductive nature and osteo-inductive potential of Calcium Phosphate particulate graft materials is widespread,[1,2] but new research exhibiting the effect on improved angiogenesis[3] has helped explain clinical outcomes. Thus we see up-regulation of the host response to bone regeneration resulting in a high percentage of host bone sooner, quality not merely quantity of the new bone needs to be assessed.

Background and Aim

Background: The placement of dental implants in the posterior maxillary region is often hampered by the presence of the maxillary sinus and a reduced quantity of viable bone. Since the early 80s, when Dr. Hilt Tatum first described the procedure, sinus augmentation has been performed to increase the amount of available bone to enable implant placement. Numerous particulate bone grafting materials have been shown in many studies over the years to assist the host to regenerate bone by acting as a scaffold leading to the presence of new hard material to affix the dental implants.

Aims: To evaluate the efficacy of a novel bi-phasic synthetic (alloplastic) particulate bone graft material consisting of Beta Tri-Calcium Phosphate and Calcium Sulfate which sets *in-situ*, in sinus augmentation using a lateral window approach .

Methods and Materials

In a series of ten patients requiring sinus augmentation with a residual host bone from 2mm – 6 mm in height, the exact same protocol was employed using the bi-phasic grafting material EthOss®, (Regenamed Ltd, Ilkley, UK).

This protocol was to raise a full thickness flap and enter the sinus using the DASK® system (Dentium, Seoul, Korea) to safely create the Osteotomy in the lateral wall. The Scheiderian lining was then lifted using traditional hand instruments and the implant osteotomies created again using the the internal kit of the DASK system, for safety reasons. DIO (DIO Implant systems, Busan, Korea) implants (4.5mm by 10 mm) were then placed along with the particulate graft and ISQ readings were taken (Osstell ISQ™, Göteborg, Sweden). The graft material was then used to seal the lateral window and a sterile gauze was used to compress the graft which subsequently set *in situ*.

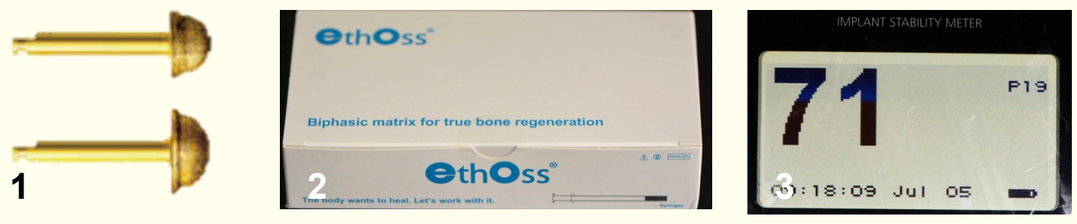
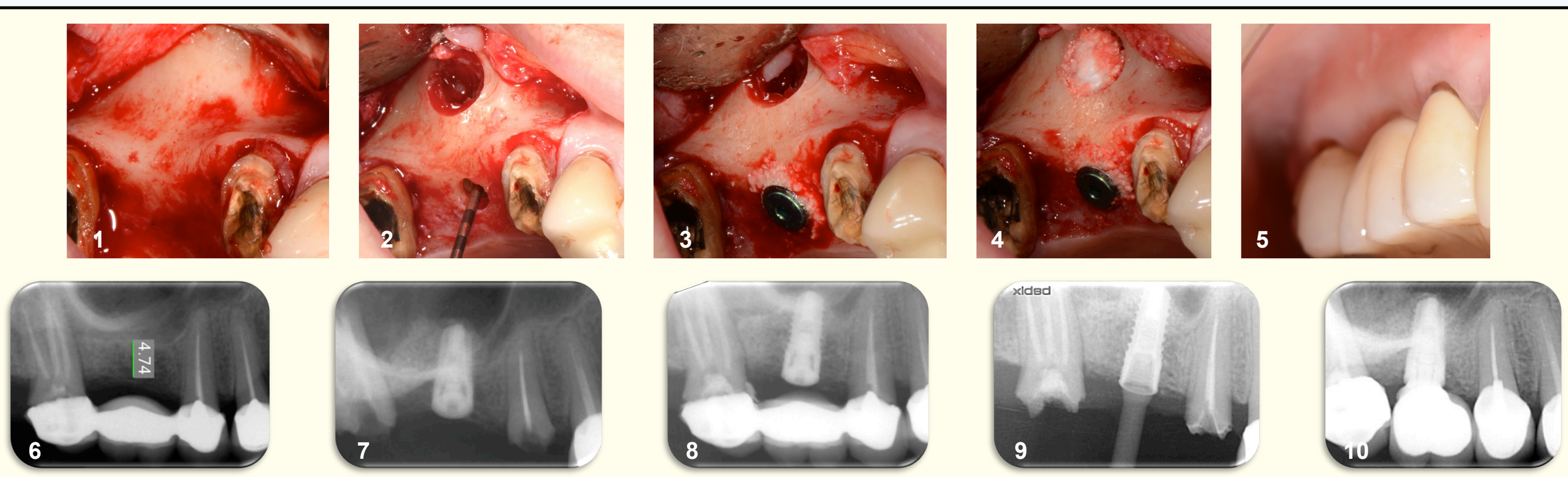


Photo 1: The Dask burrs for minimally invasive lateral osteotomy.
Photo 2: A 3-syringes box of EthOss.
Photo3: The Ostell ISQ measuring device.



Case 1*: 38-year-old female non-smoker, lost upper right first molar 10 years ago* (fig. 1)*. Radiograph of the healed site with 4.74 mm of residual ridge* (fig. 6)*. Lateral window osteotomy created with the Dask burrs safely using hydraulic pressure* (fig. 2)*. DIO implant (DIO SM 3.8 by 12 mm implant placed at 25 Ncm, 41 ISQ) placed into implant bed preparation osteotomy after grafting with Ethoss* (fig. 3)*. Subsequently the sinus was further grafted with EthOss which set hard for improved stability of the site* (fig. 4)*. X-ray immediately post-op* (fig. 7)*. Ten weeks later radiological view showing consolidation of the graft and new hard tissue* (fig. 8)*. Osstell reading taken using a Type 47 Peg (ISQ 75), again the x-ray showing new bone formation* (fig. 9)*. Clinical and radiological views at 9 months loaded* (figs. 5 and 10) ***showing stable outcome.***

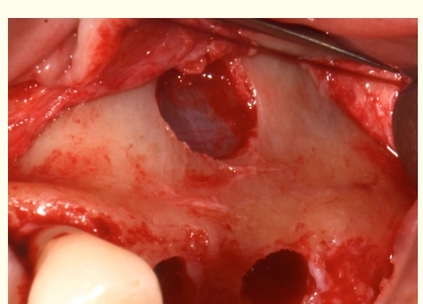
Results

All the cases were successfully loaded. The case average ISQ reading (each case has is an average of two readings, buccal and occlusal) was 42 at implant placement and at loading 10 weeks later was 74, which indicated a successful outcome in osseointegration and regeneration of new bone in the sinus. All cases appeared radiologically sound and, as the graft material will be mostly resorbed, long term assessment can be conducted by using routine radiographs.

It is expected that the material will be fully resorbed in 9- 18 months dependent on the patient physiology.

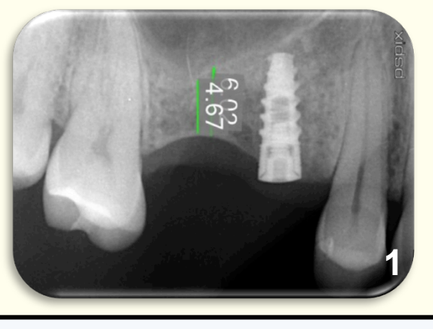
Due to the one stage protocol employed in the study it was not possible to take a core sample, although a core from a different two stage case showed 50% new host bone at ten weeks post –op.

Patient (site)	Place ISQ	Load ISQ	Residual Bone Height	Loaded
1. MK (16)	48	75	4.74 mm	9 Weeks
2. CT (25)	48	74	3.35mm	11 Weeks
3. CT (26)	55	71	5.87 mm	11 Weeks
4. MP (16)	50	76	4.67 mm	10 weeks
5 .AM (16)	44	75	5.77mm	10 weeks
6. GT (16)	42	72	4.35 mm	11 weeks
7. OE (24)	40	74	2.34 mm	11 Weeks
8. AG (16)	49	76	3.95 mm	10 weeks
9. GT (26)	40	69	3.20 mm	11 weeks
10. AM (26)	53	76	5.65 mm	10 weeks
Mean	**42**	**74**	**4.39 mm**	**10.5 weeks**



Case 2: 42-year-old female, non-smoker. Lateral window using the Dask burrs (fig. 1)***.***

Grafted with EthOss. The window is occluded with the in situ hardening alloplastic material (fig. 2)***.***



Case 2: 40-year-old female, non-smoker. Residual bone measurement on digital x-ray (fig. 1)***.***

Radiograph showing new host hard tissue at 6 months loaded (fig. 2)***.***

Conclusions

The results of this study appear to be in line with other studies where b-TCP and CS have been used in sinus augmentation. The graft stability and biocompatibility may have resulted in reduced post–operative morbidity described by the patients (none of them required any analgesic the following day). The ability of being able to use the self-hardening material to seal the “window” may possibly also have benefits in the procedure.

The ability of the material to provide a stable scaffold, for host bone regeneration whilst itself being bio-absorbed, along with its osteo-inductive potential allowed for implant loading at about 10 weeks in all cases.

References

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