Pre-augmentation Soft Tissue Expansion (STE): A Report of Four Pilot Cases

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BACKGROUND & OBJECTIVE

Soft tissue expanders have been introduced in implant therapy, as pre-augmentation devices, to avoid the complications associated with bone-grafting procedures [1-4]. The currently used soft tissue expanders made of hydrogel, which is the same material used to fabricate contact lenses, are designed and manufactured since 1999 under the name of Osmed® (Ilmenau, Germany), which is the first commercially available self-inflatable osmotic expander and has been FDA-approved since 2001. To date, there is scarce clinical evidence describing soft tissue expansion (STE) prior to bone augmentation procedures: only two case series [1, 3] and one randomized controlled clinical trial [2] are available in literature. However, these studies have evaluated the outcomes of bone regeneration, but neither has provided volumetric analysis of soft tissues. Therefore, we present a report of four pilot cases on STE, with volumetric analysis by optic scanning to evaluate the changes in soft tissues post-expansion.

MATERIALS & METHODS

From the pool of patients attending the Dental Clinic of the Ospedale Maggiore Policlinico, University of Milan, Milan, Italy, four participants requiring alveolar bone augmentation and dental implant placement were included in this clinical investigation. Soft tissue expanders were implanted in subperiosteal pouch as previously described [3]. After reaching their final volume, expanders were removed followed by vertical and/or horizontal bone augmentation. Tension-free primary closure was achieved in all cases without utilizing deep periosteal and/or vertical releasing incisions. Dental implants were placed 6 months following bone augmentation. Cone beam computed tomography (CBCT) scans were taken for all patients, before placement of soft tissue expanders and 4–6 months following bone augmentation procedures. Soon after dental implant placement intraoral or panoramic radiographs were taken. Vertical and horizontal bone gains were calculated on CBCT scans, as previously described [1] and volumetric analysis of soft tissue gain was done by optic scanning, as previously described but with some modifications [5, 6]. Materials & methods are seen from figure (1) to figure (3).

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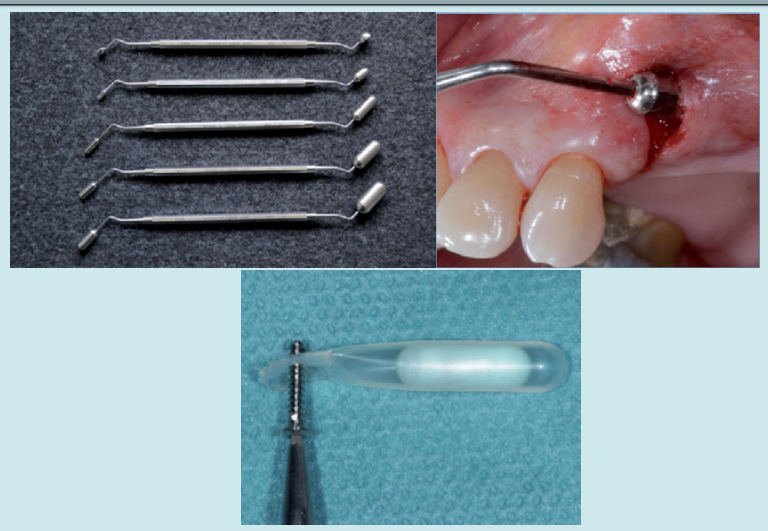

Figure 1. Surgical templates to choose the expander and prepare the surgical site. Flat end of the expander is fixed to the underlying bone with a screw.

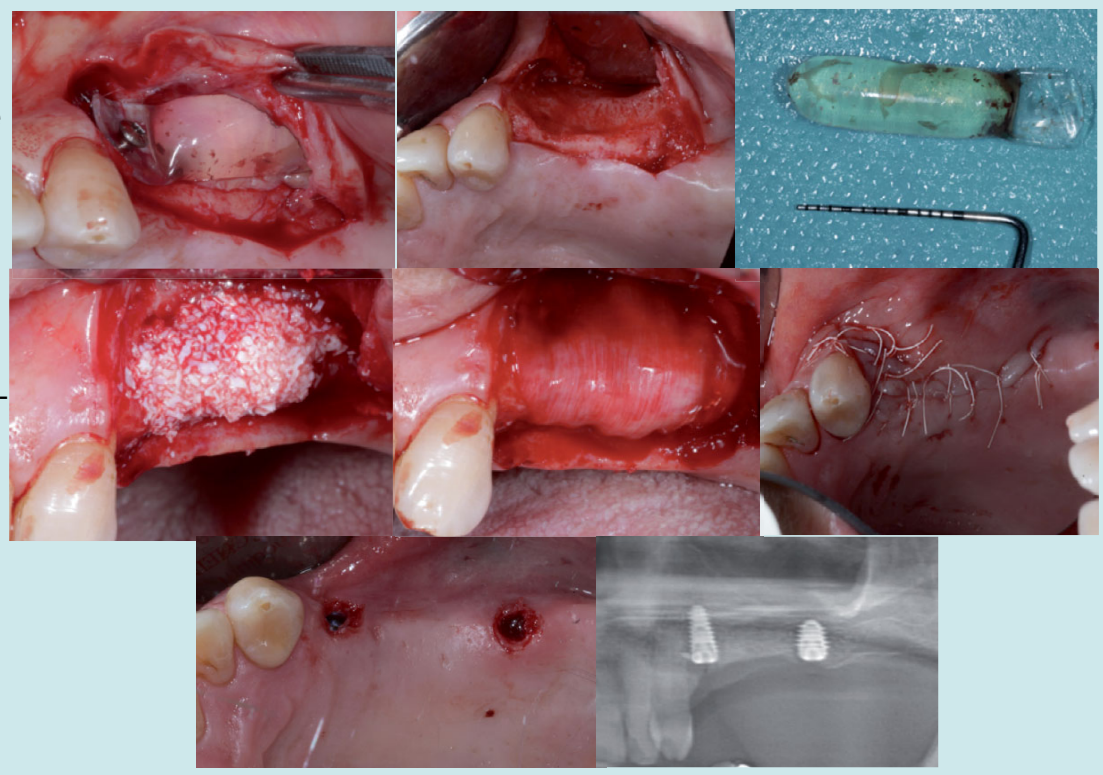

Figure 2. Simultaneous expander removal & bone augmentation. Dental implants were placed 6-months post-augmentation.

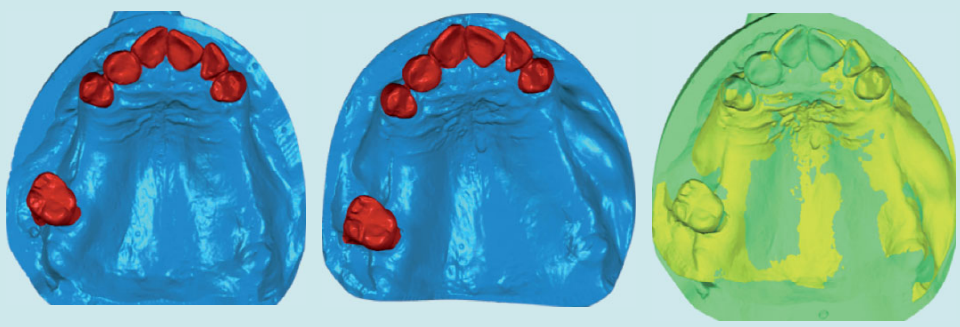

Figure 3.Volume analysis by optic scanning through superimposition of pre- & post-expansion models.

RESULTS (For three successful sites out of four cases)

Expansion Zone	Initial Expander Volume	Final Expander Volume	Expansion Days	Soft Tissue Volume Increase	Expansion Success
Right Posterior Maxilla	0.045 ml (45 mm^3)	0.24 ml (240 mm^3)	20 days	259.4 mm^3	Successful
Left Posterior Maxilla	0.15 ml (150 mm^3)	0.7 ml (700 mm^3)	40 days	436.1 mm^3	Successful
Right Posterior Mandible	0.25 ml (250 mm^3)	1.3 ml (1300 mm^3)	60 days	755.9 mm^3	Successful

CONCLUSIONS

The mean soft tissue volume increase was 483.8 ± 251.7 mm^3. Horizontal bone gain averaged 3 mm in two successfully expanded sites while one case had a vertical bone gain of 8 mm. For the three successful expansion sites, soft tissue volume increase corresponded only to the 0.24 ml (240 mm^3) cylinder expander (volume increase= 259.4 mm^3), while this increase was almost half of the final expander volume for the 0.7 ml (700 mm^3) and 1.3 ml (1300 mm^3) cylinder expanders (volume increase= 436.1 mm^3 and 755.9 mm^3, resp.). These findings suggest that it is difficult to reach a complete volume increase with bigger final volume expanders, probably due to higher pressure distribution to the underlying bone surface. Despite promising outcomes in bone and soft tissue gain, the present technique needs improvement before being applied routinely in everyday dental practice.

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