3D Voxel-based maxillary Superimposition For Sinus-lift Graft Assessment: A Case Report

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ABSTRACT

Cone-beam computerized tomography (CBCT) images in implant dentistry have several advantages, including visualizing bone structures without images overlapping as seen with traditional 2D radiographs. CBCT images allow for a more accurate assessment of the alveolar ridge dimensions previously implant placement. New advancements in the voxel-based regional superimposition of CBCT scans can now be applied for a three-dimensional evaluation of bone grafts. Since this regional superimposition method uses a small CBCT field of view, the treatment outcomes can be performed with less radiation exposure for the patients. This case report demonstrates the application of an innovative voxel-based superposition technique of CBCT scans to assess a bone graft procedure.

MATERIALS AND METHODS

A 49-year-old man with no significant medical history presented for placement of a bone graft and implants. Clinical and radiographic examination showed inadequate bone volume for implant placement in the upper left first molar site due to a mesially tipped upper left second molar (Figure 1). The patient was referred for orthodontic treatment to open the space in the upper left first molar area for a bonegraft and implant placement and to achieve ideal occlusion and function. The maxillary left second molar was fully uprighted after 12 months of orthodontic treatment, and the first molar space was suitable for an implant-supported restoration (Figure 1b). The implant site was further developed by elevating the floor of the sinus via a lateral window technique. Following completion of bone graft maturation, the CBCT scan showed adequate volume in the implant site as well as favorable root orientation of the adjacent teeth (Figure 1b). The superimposition of the CBCT scans is shown in Figure 1c.

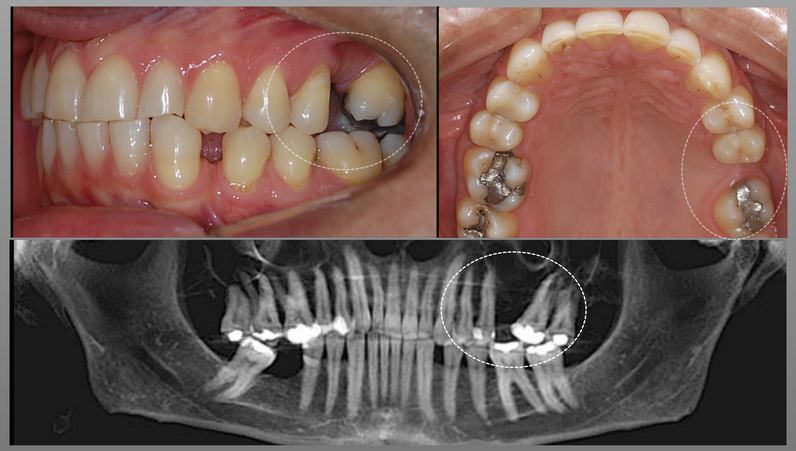


Fig 1- Mesially tipped #15 and absence of bone height

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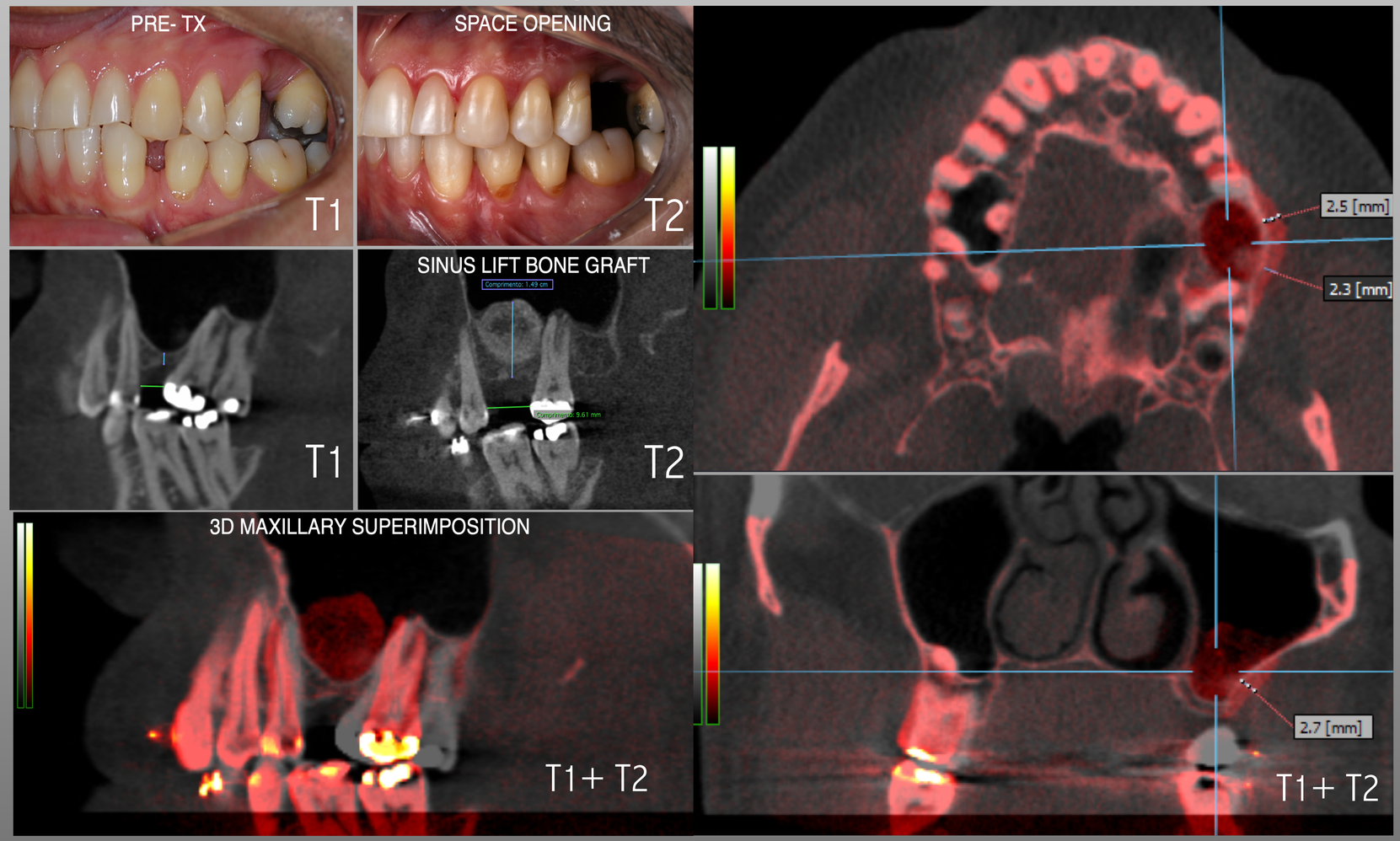
MATERIALS AND METHODS

The DICOM (Digital Imaging and Communications in Medicine) files of time point 1 (T1) and time point 2 (T2) are imported into the software OnDemand 3D v1.0.10.5261 (Cybermed Inc, Seoul, Korea). Both files are loaded at the same time using the ‘‘fusion module.’’

After selecting ‘‘manual registration,’’ T2 is moved as close as possible to T1 in the axial, coronal, and sagittal slices.

When one clicks on ‘‘auto registration,’’ T2 is automatically superimposed onto the T1 image. T2 with the new

orientation is then exported by selecting ‘‘reslicing’’ and exporting the ‘‘secondary image’’ only. Once all the previous steps are done, T2 has a new orientation that matches T1 and has the same common coordinates. Both images can be visualized simultaneously using the fusion module of the software.



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P2



CONCLUSION

The three-dimensional voxel-based maxillary superimposition can be a useful tool for integrated treatments. In this particular case report, the technique illustrates the result of teeth movement with an increase of the mesio distal distance and the success of the sinus lift graft in the posterior zone of the alveolar ridge.

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