

LATERAL APPROACH SINUS LIFT WITH SIMULTANEOUS IMPLANT PLACEMENT FOLLOWING PRE- IMPLANT EVALUATION USING DIGITAL VOLUME TOMOGRAPHY

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ABSTRACT:

In dentistry, treatment modalities changed markedly when osseointegration became the basis for a predictable outcome of oral implant treatment. DVT (Digital Volume Tomography) is an effective, time saving and indispensable procedure in dental implantology which determines the available bone height at the implant sites accurately along with the osseous morphologic variations like Septae in the maxillary sinus, which cannot be demonstrated on conventional radiography.

In this case MPR (multiplanar reformatting) was used for the accuracy and measurements of the ridge for pre and post implant assessment.

Key Words: Pre- implant assessment, Digital Volume Tomography (DVT)

INTRODUCTION

The modern era of dental implantology was ushered in by the pioneering work of Branemark and his co-workers. They demonstrated the relationship between bone and implant that now is known as osseointegration. Since then the use of implant has gained immense popularity and wide acceptance.^[1]

There are many researches related to the remarkable progress done in the field of implant dentistry, but the maxillary posterior regions present unique challenging conditions in rehabilitation as compared to other regions of the jaw.^[2] So for the long term success, it is important to be able to place implants in maxilla with high degree of precision. Radiographs are critical tools for assessment of bony architecture. They are

useful in all the three phases that is, pre-evaluation, implant treatment and maintenance.

Conventional panoramic radiography is still the most commonly used imaging modality in the treatment planning for implant placement. However, it does not provide the precise determination of quantity and quality of the available bone at implant site which is critical for the long term success of implants. Hence, in the present case pre and post treatment evaluation of implant site was done using Digital Volume Tomography (DVT) which is a potentially low-dose cross-sectional technique for visualizing the bony structures in the head and neck.^[3]

CASE DETAIL

A 32 year old male patient visited the department of Oral Medicine & Radiology

for replacement of missing tooth in upper left back region of jaw. His past dental history revealed that he had undergone extraction for the tooth 5 years back due to a carious aetiology. Intraoral examination showed that 26 was missing and his systemic history was not contributory. Patient was then explained was done in about the various treatment options that he can opt for. He opted for implant supported prosthesis.

A DVT scan was done prior to the implant placement for pre-implant assessment of the implant site using Phillips AlluraXper FD20 3D RA, Digital Subtraction Angiography unit (Netherlands). The 3D images were reconstructed into axial, coronal, sagittal planes using Exper 3D CT software at the computer work station. Constant exposure of 4-5 second at 80 kVp ,10 mA , Field of View 12", Rotation - 270° was used for the scan.

Pre-implant assessment was done measuring the available bone height, width, cortical width, proximity to the maxillary sinus.

Proximity to the maxillary sinus was assessed using Misch Criteria (table 2). As the available height at implant site was between 5 to 10 mm, the patient fell under SA3 group according to which he was advised a sinus lift procedure (table 1)

There was no sinus pathology/ septa at the floor of the sinus. Entire findings were noted and patient was referred to department of Periodontics for implant placement.

In the department of Periodontics the patient was treated with Lateral sinus augmentation using decalcified freeze dried bone allograft (DFDBA) bone block along with simultaneous implant placement. The surgical procedure was uneventful. After a period of 6 months patient again underwent a DVT scan for assessment of final loading and successful osseointegration of the implant. The DVT scan revealed a healthy osseointegration with no signs of peri-implantitis . Bone augmentation of about 4.17 mm was noted. Patient was sent to Periodontics department for the second stage surgery and final prosthesis placement. The procedure was uneventful.

DISCUSSION

In dentistry, treatment modalities changed markedly when osseointegration became the basis for a predictable outcome of oral implant treatment. Accurate preoperative radiographs are essential in the treatment planning process to determine the optimum size, location, and angulation of fixtures. The use of DVT allows controlled narrow-to-wide cuts to be made in a coronal, sagittal, or oblique plane. In this case MPR (multiplanar reformatting) was used for the accuracy and measurements of the ridge for pre and post implant assessment. The coronal cut sections were taken for the measurement of the height, width at implant sites as well as to assess the proximity to the adjacent vital structures as observed also in previous studies.^[4]

With the introduction of osseointegrated implants in the 1960s, radiologic interpretation became even more important as a diagnostic tool in avoiding injury to vital structures while optimizing the location of the fixtures. Because of its accuracy in reproducing anatomic detail and the limitations of panoramic imaging the role of CT has expanded and now is a valuable adjunct in dental implantology. [5]

Considering all these points, the present case report displays the accuracy of Digital Volume Tomography (DVT) in pre and post treatment evaluation of implant site.

Panoramic images are 2D views and cannot demonstrate the buccolingual width of the alveolar ridge. DVT provides a 3D environment to visualize the buccolingual width of the alveolar ridge. Moreover, the buccal and lingual cortical plates are best visualized in DVT cross-sectional images but, cannot be seen in OPG. [6,7,8]

A recent study looked specifically at the correlation between cortical bone thickness and success rates of mini-implants. The cortical bone thickness was

measured in limited areas. A minimum of 1mm of cortical bone was shown to be necessary for increasing success rates. [9]

CONCLUSION

Maxillary sinus augmentation requires accurate diagnosis using clinical and radiographic means and proper treatment planning. Surgical procedure should be atraumatic and gentle to avoid post-operative complications. With all precautions sinus augmentation followed by simultaneous implant placement is a very predictable treatment for missing maxillary posterior teeth.

In conclusion it can be hypothesized that the choice of an imaging modality to evaluate the implant sites should be weighed carefully. DVT is an effective, time saving and indispensable procedure in dental implantology which determines the available bone height at the implant sites accurately along with the osseous morphologic variations like Septae in the maxillary sinus, which cannot be demonstrated on conventional radiography.

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TABLES :

TABLE 1: IMPLANT SITE MEASUREMENTS USING DIGITAL VOLUME TOMOGRAPHY (DVT) ALONG WITH TREATMENT CONSIDERATIONS						
IMPLANT SITE	HEIGHT (mm) ALVEOLAR CREST TO THE FLOOR OF SINUS	BUCCO-LINGUAL WIDTH (mm) BUCCAL CORTEX TO LINGUAL CORTEX	CORTICAL WIDTH (mm) OUTER CORTEX TO INNER CORTEX		SA GROUP ACCORDING TO MISCH CRITERIA	TREATMENT ADVISED
			BUCCAL	PALATAL		
26	5.75	11.27	1.09	1.14	SA3	Lateral approach sinus lift with simultaneous implant placement

TABLE 2: Criteria for proximity to maxillary sinus		
Groups	Height available At the implant site (mm)	Treatment available
SA 1	>12	Conventional implant procedure
SA 2	10-12	Crestal approach sinus lift with simultaneous implant placement
SA 3	5-10	Lateral approach sinus lift with simultaneous implant placement
SA 4	<5	Lateral approach sinus lift with an extended delay of implant placement

FIGURES:



Fig 1: Coronal view of DVT scan showing measurement of bone height and width of implant site

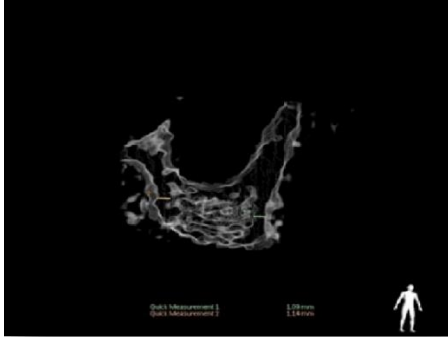


Fig 2: Coronal view of DVT scan showing width of buccal and palatal cortices at the implant site

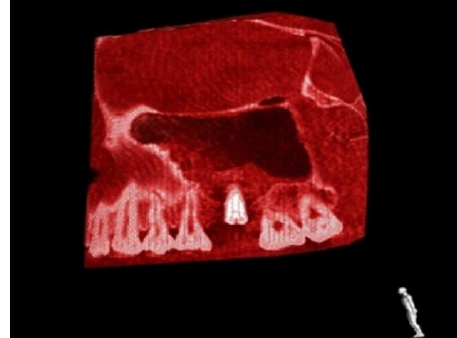


Fig 6: Saggital view DVT scan showing bone augmentation around the implant

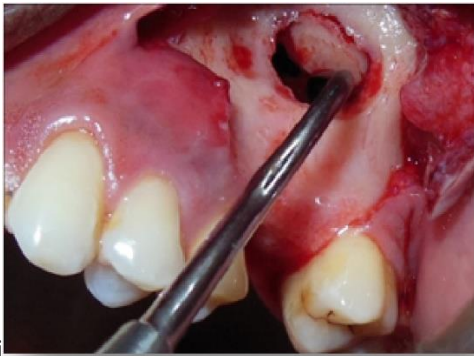


Fig 3: Window created and sinus lift done through lateral approach



Fig 7: Abutment connected in position after 6 months

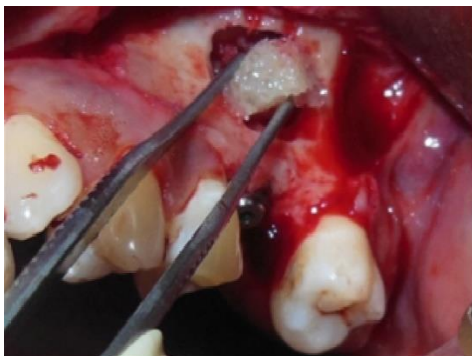


Fig 4: Sinus cavity packed with DFDBA bone block



Fig 8: Final prosthesis successfully given



Fig 5: Occlusal view showing implant in position