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Implant Placement in Anterior Aesthetic Region and Assessment using Cone-Beam Computed Tomography Scan Technology: A Case File

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Abstract

The esthetics and functional integrity of the periodontal tissues may be compromised by the dental loss. Dental implants have become an additional tool in the armamentarium of treatment options to offer the patient for the replacement of a missing tooth or teeth. Diagnosis and treatment planning is the key factors in achieving the successful outcome after placing and restoring implants placed immediately after tooth extraction. The introduction of cone-beam computed tomography (CBCT) for the maxillofacial region provides opportunities for dental practitioners to request multiplanar imaging. This case report demonstrates the use of CBCT scan technology in immediate implant placement in the maxillary anterior teeth region.

Keywords: Cone-beam computed tomography, extraction, immediate implant

Introduction

Dental Implants are today considered as a reliable treatment option to replace missing teeth both for esthetics and function.1 Earlier in 70s and 80s implants were placed in healed alveolar ridges.2 It was in the 90s that implant placement started in fresh extraction sockets or in partially healed alveolar ridges predominantly for implants in the esthetic zone.3,4 Implant placement in anterior maxilla area is challenging because of esthetic concern and unfavorable bone topography. The success of an implant restoration depends on proper implant placement and the hard and soft tissue architecture that surrounds the fixture.5 The conventional panoramic radiograph remains an excellent diagnostic method to examine intra oral structures. However, the two-dimensional panoramic radiograph imaging is not accurate, and the distorted image can lead to incorrect diagnosis resulting in wrong treatment. The advanced images afforded by the three dimensional (3D) cone- beam computed tomography (CBCT) scan gives the clinician exact details of the hard and soft tissue structures necessary for proper diagnosis and accurate treatment planning. CBCT creates real time images in axial, coronal, sagittal, and oblique planes-known as multiplanar reformation that provides accurate 3D information.6

In maxillary anterior, there is a risk of damaging buccal plate during the extraction of a prominent root. In 2007, Elian et al. classified extraction sockets as Type 1: Where the buccal bone and the soft tissue around are intact, Type 2: Where the buccal soft tissue is present, but the facial bone plate is lost during extraction, and Type 3: Where both hard and soft tissue is lost after extraction and usually requires regenerative procedures to restore.7

Advantages, indications and contraindications of immediate implant placement

It reduces the resorption of the alveolar process after extraction, resulting in better function and esthetics. It reduces the waiting period of 10-12 months for the extraction socket to completely heal with new bone formation thus reduces the treatment time. Repeat surgery for implant placement is not required thus reducing psychological stress of the patient leading to better patient acceptance.8,9

The relevance of immediate implant placement in implant dentistry is increasing as it has provided the opportunity to achieve better and faster functional results with increased patient compliance.

Immediate implant placement is indicated in traumatic tooth fracture, endodontic failure, root fracture, or extensively decayed tooth with intact alveolar bone around. Immediate implants can also be placed simultaneous to the removal of decidous retained tooth with missing permanent.8,9

Immediate placement should be avoided in tooth with active periapical infection or periodontaly compromised tooth with insouciant hard and soft tissue around which can lead to compromised primary stability.10

Before extraction, the tooth and the surrounding structure should be clinically and radiographically examined to assess the recipient site.

Advantages of CBCT scan

CBCT has become the most trusted technique in treatment planning and diagnosis in implant dentistry. It gives accurate images of highly contrasted structures and is useful in bone analysis.11

It generates 3D images of oral structures, soft tissues, nerve pathways, and bone in the craniofacial region in a single scan. CBCT scan technology has several advantages over conventional CT:

It reduces the irradiated area size and lower the radiation dose by collimation of the primary X-ray beam focusing on the target area. It produces isotropic volumetric image, the voxels generated have an equal dimension in all three planes. Resolution of the image is determined by the size of a voxel. A small voxel size, along with the isotropic feature, leads to high resolution, and accuracy of CBCT images. CBCT has rapid scan time (10-70 s) as it receives all the images in single rotation.

Reports suggest that CBCT has about 98% reduction in radiation dose as compared with "conventional" fan-beam CT systems.12-14 This reduces the effective patient radiation dose to approximately that of a film-based periapical survey of the dentition (13-100 μSv) or 4-15 times that of a single panoramic radiograph (2.9-11 μSv).14-16

Case Report

A 22-year-old male patient in excellent health reported with tooth fracture in maxillary anterior jaw region 11# and the clinical crown had been lost (Figure 1). The patient's medical history was unremarkable and on dental hard tissue examination there were no other significant findings. Periodontal status- oral hygiene was good. No marginal gingival inflammation was detected. No periodontal pockets were present, no other tooth mobility found. The patient desired fixed type replacement which preserved the neighboring healthy teeth.

Treatment planning

After the clinical examination and review of the initial periapical radiograph, the possibility of an extraction of the remaining root structure of tooth 11# and subsequent implant placement seemed feasible. The patient was advised of the potential benefits of a CBCT scan, this information would yield the information necessary to recommend the optimal treatment plan, based on a comprehensive assessment of the bone for the potential implant placement. Based on this decision was made to take CBCT scan.

The cross-sectional CBCT data was visualized which revealed that the thickness of the palatal and buccal plate were intact (Figure 2). There were no deficits in the bony structure around the entire circumference of the residual root. Cross-sectional image dictated the existing tooth position in relation to the surrounding bone. When we viewed the proposed recipient site, it was realized that the anatomy was ideal for immediate implant placement, and the amount of available bone apical to the existing tooth which could be utilized to provide stability for the immediately placed implant was adequate.

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Patient's consent was taken, and Study cast model was prepared.

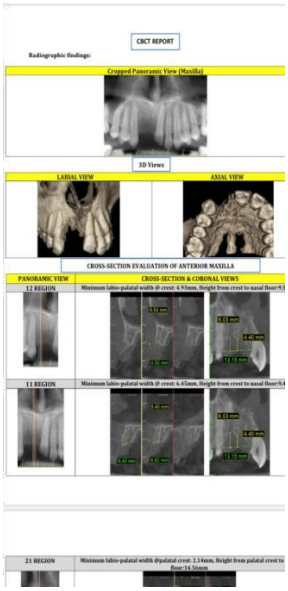
Initial phase 1 therapy was performed. Supragingival and subgingival scaling was done in all quadrants.

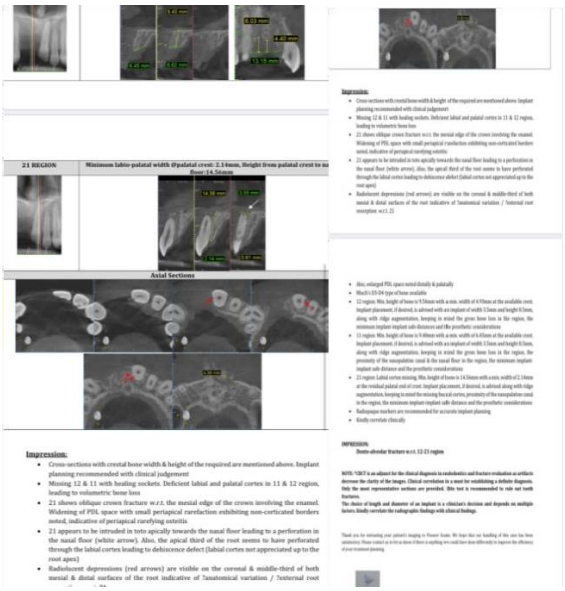
Surgical procedure

At the day of surgery, the patient was prepared and draped. The patient was appropriately anesthetized with local anesthesia. The remaining root 11# was atraumatically removed (Figure 3). The socket was checked for any residual granulation tissue. Osteotomy site was marked. 2.0 diameter pilot drill was used to start the bone preparation, labiolingual and mesiodistal angulation was assessed using paralleling pins. The osteotomy was done in a sequential manner. Implant site was flushed with normal saline and betadine to remove any debris and diameters and 13 mm length implant was placed in the osteotomy site (Figure 4). The site was closed. Immediate RPD was delivered. CBCT was done after4 months of implant placement, and 3D peri-implant osseointegration was analyzed (Figure 5). The final prosthesis was delivered after 6 months of the implant placement (Figure 6).

Figure 1: Pre-Operative view

Figure 2: CBCT reports revealing with intact buccal and palatal cortical plate





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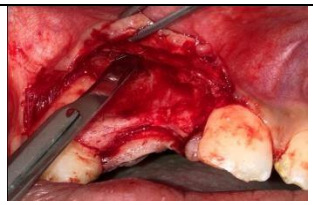
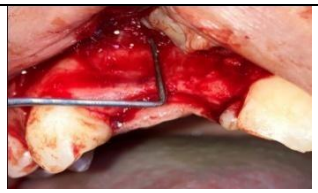
		
Figure 1: Pre-Operative view	**Figure 2:** Surgery	**Figure 3:**Exposure Of Bone
		
Figure 4: measuring of bone dimension	**Figure 5:** measuring of bone dimension	**Figure 6:** Implant Placement
		
Figure 7: Suturing	**Figure 8:** RVG after placement	**Figure 9:** After 4 Months Of Placement

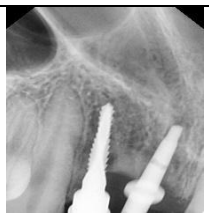



Figure 10: RVG after 4 months of placement revealing peri- implant bone adaptation	**Figure 11:**Abudment Placement	**Figure 12:** Post-Operative view after final prosthesis

Discussion

Atraumatic extraction followed by implant placement in the anterior maxillary region is a challenge for dental clinicians. Precise implant placement in a 3D plane is the key for better esthetics, function, and patient satisfaction. Immediate implant placement in upper anteriors requires a thorough knowledge of anatomic, biologic, surgical, and prosthetic principles. Immediate placement of dental implants in the esthetic zone is a technique sensitive procedure. However, immediate implant placement offers several advantages including preservation of alveolar bone, reduced treatment time, early prosthetic restoration with better esthetics thus better patient acceptance. CBCT helps us to access all the required measurements in doing implantation. It provides highly accurate 3D images of the area concerned from a single, low-radiation scan, thus delivers a comprehensive detail of the patient's jaw and the anatomical landmarks necessary to properly plan and provide treatment ensuring a better prognosis and outcome for implant placement. On the other hand occlusal adjustment, oral hygiene maintenance and regular recall check-ups should be considered prerequisites for maintaining a long lasting restoration.[17]

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Decisive factors for the success of immediate implant are a lack of infection in periodontal tissues and an intact tooth

socket. The evaluation of alveolar bone with CBCT helps the implantologist to assess the quality and quantity of cortical and cancellous bone, especially in the buccolingual dimension. CBCT has significantly contributed in the success of dental implant therapy in recent times.[18] As a wide range of techniques in implant treatment is being applied, CBCT must be recommended as a diagnostic tool for implant treatment planning.[19,20] This involves using CBCT in the diagnostic work up of a provisional dental implant treatment plan and then confirming and finally implementing it using appropriate software.[2]

Conclusion

Implant treatment must fulfill both functional and esthetic concerns of the patient to be considered a primary treatment modality. Immediate implant placement proves to be a viable and predictable solution to the tooth loss with better patient acceptance. CBCT scan of the anterior maxilla is recommended prior to surgical placement of implant as this area pose a challenge to the clinician to restore the implant with proper function and esthetics.

References

1. Gotfredsen K. A 10-year prospective study of single tooth implants placed in the anterior maxilla. Clin Implant Dent Relat Res 2012;14(1):80-7.
2. Adell R, Lekholm U, Rockler B, Brånemark PI. A 15-year study of osseointegrated implants in the treatment of the edentulous jaw. Int J Oral Surg 1981;10(6):387-416.
3. Schwartz-Arad D, Chaushu G. The ways and wherefores of immediate placement of implants into fresh extraction sites: A literature review. J Periodontol 1997;68(10):915-23.
4. Nir-Hadar O, Palmer M, Soskolne WA. Delayed immediate implants: Alveolar bone changes during the healing period. Clin Oral Implants Res 1998;9(1):26-33.
5. Kan JY, Rungcharassaeng K. Site development for anterior single implant esthetics: The dentulous site. Compend Contin Educ Dent 2001;22(3):221-6, 228, 230-1.
6. Sonick M. A comparison of the accuracy of periapical, panoramic and computed tomographic radiographs in locating the mandibular canal. Int J Oral Maxillofac Impl 1994;9:455-60.
7. Elian N, Cho SC, Froum S, Smith RB, Tarnow DP. A simplified socket classification and repair technique. Pract Proced Aesthet Dent 2007;19(2):99-104.
8. Funato A, Salama MA, Ishikawa T, Garber DA, Salama H. Timing, positioning, and sequential staging in esthetic implant therapy: A four-dimensional perspective. Int J Periodontics Restorative Dent 2007;27(4):313-23.
9. Abu-Hussein M, Abdulghani A, Sarafianou A, Kontoes N. Implants into fresh extraction site: A literature review, case immediate placement report. J Dent Implants 2013;3(2):160-4.
10. Nowzari H. Esthetic implant dentistry. Compendium 2001;22(8):643-54.
11. Sukovic P. Cone beam computed tomography in craniofacial imaging. Orthod Craniofac Res 2003;6 Suppl 1:31-6.
12. Cohnen M, Kemper J, Möbes O, Pawelzik J, Mödder U. Radiation dose in dental radiology. Eur Radiol 2002;12(3):634-7.
13. Schulze D, Heiland M, Thurmann H, Adam G. Radiation exposure during midfacial imaging using 4- and 16-slice computed tomography, cone beam computed tomography systems and conventional radiography. Dentomaxillofac Radiol 2004;33(2):83-6.
14. Ngan DC, Kharbanda OP, Geenty JP, Darendeliler MA. Comparison of radiation levels from computed tomography and conventional dental radiographs. Aust Orthod J 2003;19(2):67-75.
15. Danforth RA, Clark DE. Effective dose from radiation absorbed during a panoramic examination with a new generation machine. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2000;89(2):236-43.
16. White SC. 1992 assessment of radiation risk from dental radiography. Dentomaxillofac Radiol 1992;21(3):118-26.

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17. Novaes AB Jr, Novaes AB. Immediate implants placed into infected sites: A clinical report. Int J Oral Maxillofac Implants 1995;10(5):609-13.

18. Hatcher DC, Dial C, Mayorga C. Cone beam CT for pre- surgical assessment of implant sites. J Calif Dent Assoc 2003;31(11):825-33.

19. Van Assche N, van Steenberghe D, Guerrero ME, Hirsch E, Schutyser F, Quirynen M, *et al.* Accuracy of implant placement based on pre-surgical planning of three-dimensional cone-beam images: A pilot study. J Clin Periodontol 2007;34(9):816-21.

20. Mandelaris GA, Rosenfeld AL. The expanding influence of computed tomography and the application of computer- guided implantology. Pract Proced Aesthet Dent 2008;20(5):297-305.

21. Jung RE, Schneider D, Ganeles J, Wismeijer D, Zwahlen M, Hämmerle CH, *et al.* Computer technology applications in surgical implant dentistry: A systematic review. Int J Oral Maxillofac Implants 2009;24 Suppl:92-109.

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