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The DTR Technique – Drilling Through Roots of Posterior Teeth for Anatomically Guided Implant Placement – Case Series with 8 Year Follow Up

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Heimke; Immediate implant placement; Multirooted

1. Introduction

The surgical placement of dental implants for damaged or missing teeth is a well-established technique that has been well-documented in the literature, demonstrating a high percentage of success. In recent decades, there has been an increasing acceptance of immediate implant placement (IIP) following the first evidence of placing implants into newly extracted sockets provided by Schulte and Heimke and Schulte et al. They coined the term "immediate implant placement" to describe this procedure [1]. The procedure is widely advocated, reviewed, and documented as a predictable procedure for the replacement of hopeless teeth, particularly for single-tooth replacement in the esthetic zone but also in molar regions [2]. The benefits include a reduction in the number of surgeries required and a reduction in treatment time with increased patient satisfaction [3]. A recent systematic review has reported a cumulative survival rate for immediately placed molar implants to be similar to implants placed in healed molar extraction sites [4].

For initial stability, the implants must be placed precisely in three dimensions, especially in multirooted teeth with periapical pathology and thin interradicular bone. Under these circumstances, the osteotomy drill could deviate away from the ridge or surface of the bone septa and unintentionally follow the remaining root space, presenting difficulty [3]. Consequently, the implant is placed in an unfavourable location, leading to problems in both the biomechanical and occlusal aspects. The placement of implants in the molar regions of the upper and lower jaw poses many clinical difficulties due to specific anatomical characteristics of the area, including the existence of large extraction sockets and reduced bone heights underneath the socket. The process of creating the space for the implant in the presence of thin bone partitions between teeth might also be difficult [4].

Hence, the surgical treatment must use the anatomy of the root trunk to guide the drilling into the interseptal bone of a multi-rooted tooth. By using the teeth as a surgical guide, we use a novel method of perforating the roots of multirooted teeth to form the implant bed and place the implant into the prepared region. This approach will ensure the implants are securely placed in an ideal position, regardless of the size and shape of the extraction socket [5].

Thus, the objective of this article is to present a retrospective analysis of 250 cases of immediate implant placement over the span of 8 years using the anatomical-guided implant site preparation technique (drilling through roots, DTR) as an aid to placing dental implants in multi-radicular teeth.

2. Material and Method

This retrospective analysis used patient's electronic dental records to select patients who underwent immediate implant surgery. The selected patients were above 18 years old, in good health, had complete demographic and medical history records, and had available data related to implant therapy. The study focused on unrestorable teeth and the position and condition of the roots for decision-making for the DTR method.

Preoperative radiography and/or cone-beam computed tomography (CBCT) scans were taken to detect anatomical risk factors and the potential for immediate implant placement. Additionally, a comprehensive clinical evaluation was carried out to determine whether any adverse circumstances existed that would restrict the use of the anatomically guided site preparation procedure.

Inclusion criteria for DTR: 1. Tooth without any active pathology or active infection. 2. Root integrity. 3. Bone coverage of at least 2/3 of the root

Exclusion criteria for DTR: 1. Unfavourable position of the tooth or remaining roots, 2. Fused roots, 3. Root ankylosis.

2.1. Procedure

Using a Lindemann burr, the tooth was decoronated at the level of the gingival margin at the implant insertion location after local anesthesia. Subsequently, the osteotomies were carried out straight through the tooth's original root complex, without the need to raise any tissue flap. This process is also known as pre-extractive inter-radicular implant bed preparation. The preserved roots served as a guide for the osteotomy drills, enabling accurate placement and alignment of the implant site preparation about the visible portion of the tooth.

Based on the preoperative radiographic evaluation, the drilling was done deeper than the socket's fundus. Once the drilling process was finished following the manufacturer's recommendations, the remaining root aspects were removed with great care. The socket was cleaned with a curette and an implant was inserted (Figure 1 and 2), Depicts the schematic representation of the steps of DTR and the completed case respectively

In all cases selected for the retrospective study, only those were considered wherein adequate torque was achieved, allowing for non-submerged healing. In all, cases no additional treatment was applied to the existing peri-implant defect, but sutures were placed to approximate wound margins and avoid food impaction. Chlorhexidine rinses were prescribed three times a day for 1 week, and the patient was instructed to avoid mechanical trauma and toothbrushing at the surgical site. Analgesic medication was prescribed as required. The sutures were removed after 1 week. 3 to 4 months after the surgical intervention, the patient presented with healthy peri-implant tissue conditions, and the prosthetic treatment was completed. Final impressions were taken, and the implant crown/bridge served as the definitive restoration.

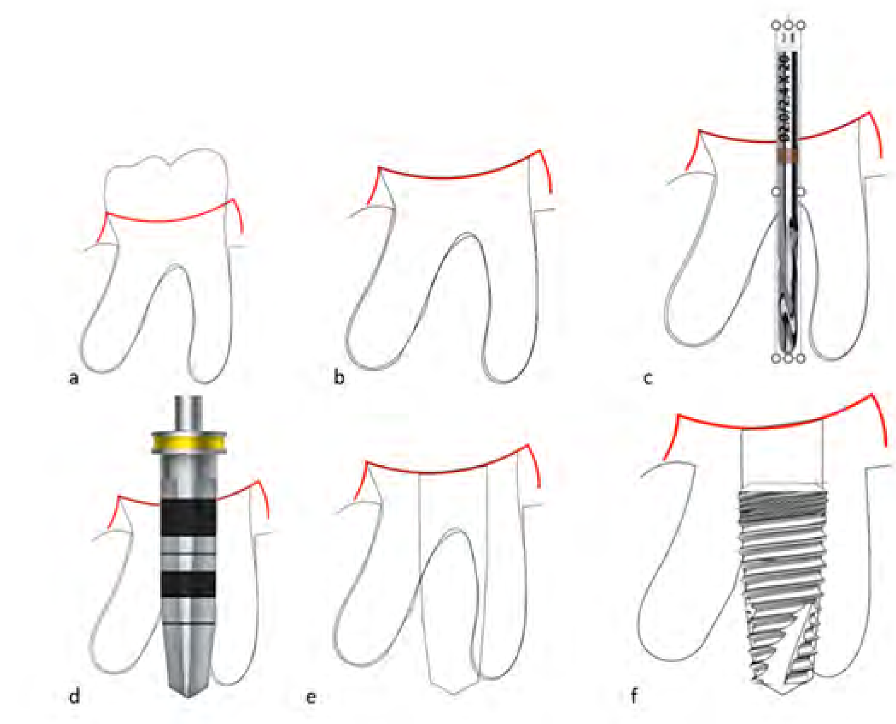


Figure 1: Schematic representation of the Steps of DTR : a: unrestorable tooth requiring extraction , b-coronal decortication done , c- pilot drill through the roots , d- final drill , e- final osteotomy prepared and root fragment's removed , f- implant placed subcerstally into the prepared bed.

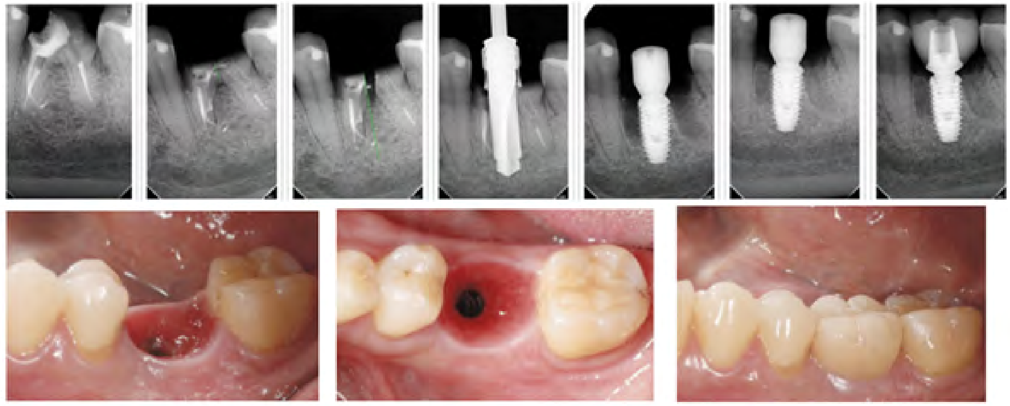


Figure 2: Step by Step case presentation of DTR with final Crown

2.2. Implant Survival

Implant survival was defined as the implant maintained in place and supporting the restoration at the most recent recall appointment and no indication for implant explantation was recorded.

2.3. Statistical Analysis

A total of 250 implants were placed, in 24 males, and 26 Females. Tapered implants (rough, active, and acid etched, sandblasted) of varied lengths and diameters were placed, which included Noble BioCare (Noble ActiveTM.USA), Bioner TOP DM (,spain), Biohorizons (Birmingham, AL, USA), Dentium (Korea) , Paltop PCA(Israel) , Aon Conemorse (Italy) , Bicon (USA) , Neobiotech implants (Korea) . Data was be analysed using Statistical Package for Social Sciences (SPSS) version 21 (IBM Corp., Armonk, NY). Descriptive data will be reported for each variable. Summarized data will be presented using tables and graphs. The Kaplan-Meier survival analysis was done and implant survival probability was calculated as the number of subjects surviving divided by the number of patients. Categorical variables were assessed using chi square test. Level of significance set at $p < 0.05$

3. Results

A total of 262 dental records for implants were screened for eligibility in the study. Records of dental implants were excluded from the analysis due to incomplete data and duplicates (n =12). Therefore, 250 records of dental implants placed at private clinics in New Delhi and Venezuela were available between 2016 and 2023 and were included in the present investigation.

Table 1 and Figure a show that among Group A: FBR (n = 16), 6.3% belonged to 21–30 years, 25% belonged to 31–40 years, 18.8% belonged to 41–50 years, 12.5% belonged to 51–60 years, and 37.5% belonged to 61 years and above. The mean age was 51.81 ± 13.7 years. Group B: SC (n = 34), 2.9% belonged to 21–30 years, 32.4% belonged to 31–40 years, 23.5% belonged to 41–50 years, 17.6% belonged to 51–60 years, and 23.5% belonged to 61 years and above. The mean age was 49.11 ± 12.56.

Table 2 and Figure b show that among Group A: FBR (n = 16), 43.8 were females and 56.3% were males. Group B: SC (n = 34), 50% were males and 50% were females.

Table 3 and Figure c show that among Group A: FBR (n = 16),, 50% belonged to the first quadrant, 25% belonged to the second quadrant, 6.3% belonged to the third quadrant, and 18.8% belonged to the fourth quadrant. For Group B: SC (n = 34),, 47.1% belonged to the first quadrant, 35.3% belonged to the second quadrant, 14.7% belonged to the third quadrant, and 2.9% belonged to the fourth quadrant.

There were 5 losses to follow up seen in the SC group. A log rank test was run to determine if there were differences in the survival distribution for the different types of groups: The survival distributions for the two groups were statistically insignificant ($\chi2$ (2) =2.562, p =.109) Table 4 and Figure D and E.

Table 1: Age Distribution

	GROUP A: FBR		GROUP B: SC	
	N	%	N	%
21-30 years	1	6.3	1	2.9
31-40 years	4	25	11	32
41-50 years	3	19	8	24
51-60 years	2	13	6	18
61 years and above	6	38	8	24
Total	16	100	34	100
MEAN AGE	51.81 ± 13.7		49.11 ± 12.56	

Samples are age matched with p = 0.819

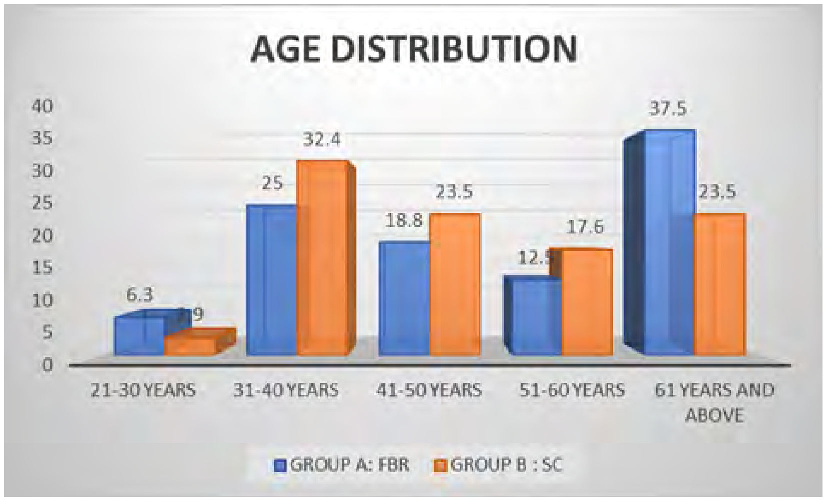


Table 2: Gender Distribution

	GROUP A: FBR		GROUP B : SC	
	N	%	N	%
FEMALES	7	44	17	50
MALES	9	56	17	50
TOTAL	16	100	34	100

Samples are gender matched with p = 0.457

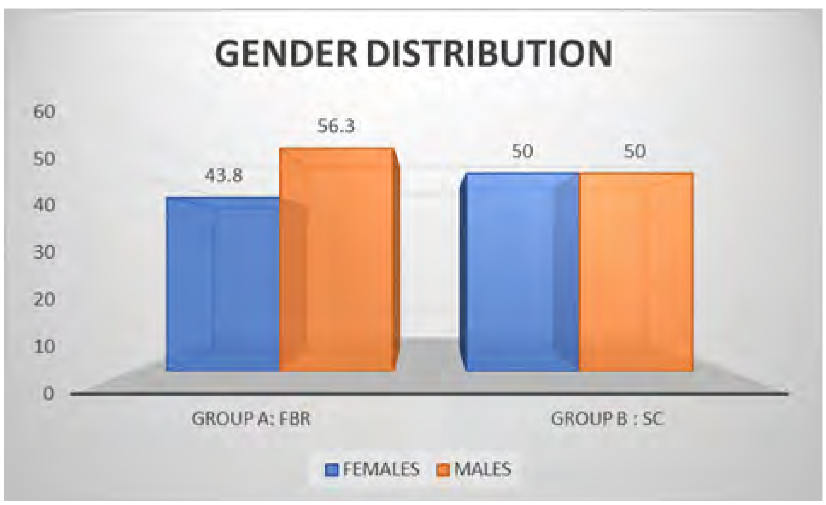


Table 3: Site Distribution

	GROUP A: FBR		GROUP B : SC	
	N	%	N	%
18-Nov	8	50	16	47.1
21-28	4	25	12	35.3
31-38	1	6.3	5	14.7
41-48	3	18.8	1	2.9
TOTAL	16	100	34	100

Samples are site matched with p = 0.219

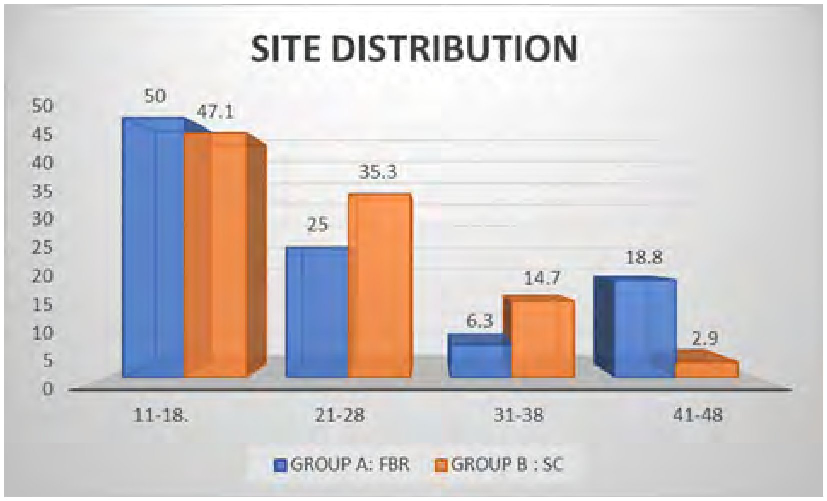
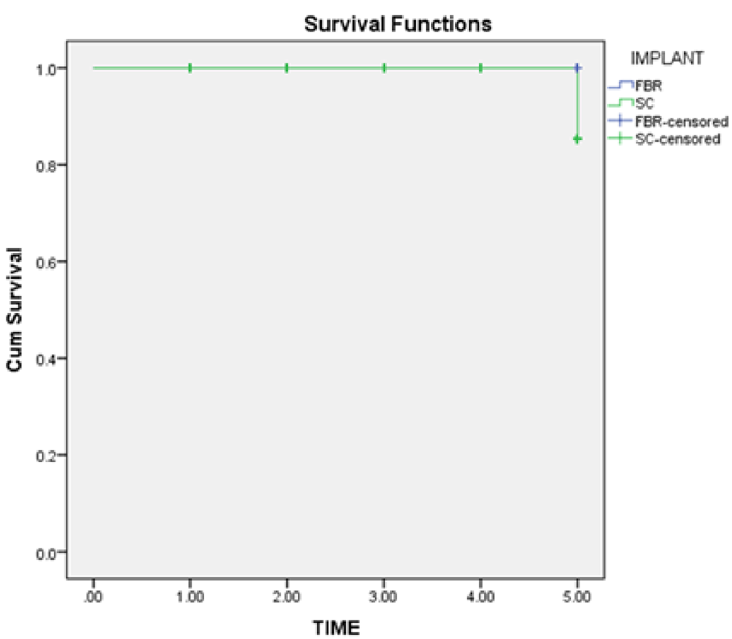
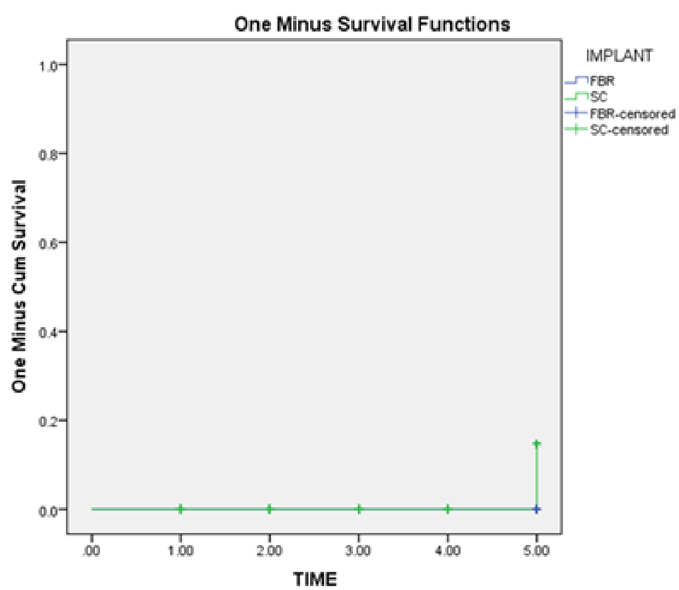


Table 4: There were 5 losses to follow up seen in SC group
NO OF EVENTS: FAILURE

Case Processing Summary				
IMPLANT	Total No:	NO: of Events	Censored	
			N	Percent
FBR	80	0	80	100.00%
SC	170	5	165	97.10%
Overall	250	5	245	98.00%





4. Discussion

The results of the retrospective study, with an overall success rate of 98%, support the previous clinical and histological studies with high success rates and predictable results. The placement of immediate implants into fresh extraction sockets has proven to be a predictable approach. This modality of treatment offers many advantages, not only surgical but also prosthetic. The psychological and economic impact of a reduction in the number of surgeries and treatment time is evident.

The main advantage is that the implant can be placed three-dimensionally in the correct position, with the osteotomy drills stabilized and guided by the retained root aspects. From the mesiodistal and bucco-lingual points of view, the implant will be placed throughout the center of the space to be restored. From the smooth-apical point of view, the initially retained root complex serves as an ideal template for the emergence profile of the tooth to be replaced [6-

8]. For example, using the crown of the molar and leaving it at the level of the gingival margin, it serves as a vertical stop to place the implant 4 mm below the gingival margin, thus guaranteeing the space of the implant supracrestal complex and that the three biological zones can be created: the deep zone, where the connective tissue will be found in contact with the cuff of the abutment (2mm); the intermediate zone, where the cervical emergence profile and the formation of the junction to the epithelium will begin (1.5 mm); and finally, the superficial zone, or gingival sulcus, where the subcritical and critical zones will be modelled for a final aesthetic result (Figure 3A and 3B).

Moreover, it should be noted that when this technique is applied, other considerations such as esthetic and functional outcomes, preservation of the alveolar process, and stability of the gingival tissues at the time of restoration are other advantages of the DTR aspects that must be considered when the treatment plan is designed.

In the present retrospective study, for the DTR technique, sharp new drills were used to drill for the implant bed preparation, which was similar to Rebele et al. (2013), who recommended using a sharp new drill to drill through the dentin and cementum at the furcation region and claimed that drilling through the dentin and retained root aspects appeared to be similar to drilling through tissues, but it is slightly harder than dense cortical bone. 6 This also supports the results of Davarpanah and Szmukler-Moncler, who reported on implant placement in contact with ankylosed root fragments [9].

Furthermore, it is important to highlight that while using this method, the retained roots serve as an ideal template for the emerging profile of the tooth that will be substituted. This statement aligns with the findings of Rohra et al. (2017).

One inherent constraint of this approach is the inability to use an infected or mobile root as a template. If an infection occurs, it is not practical to carry out the procedure. since it might cause the infection to spread beyond the surrounding region. Before inserting the implant, it is crucial to eradicate all potential sources of infection to avoid complications.

It is important to be cautious while removing any previous endodontic filling material. While it is true that endodontic filling material might potentially lead to irritation in the adjacent region, it has been extensively proven that debris from the tooth structure or the tooth itself does not hinder the integration of dental implants. Instead, it is expected to contribute to local bone remodelling. Another disadvantage of this technique is the longer time necessary to place the implant.

In the present study, two implants failed; the failure could be attributed to the patient not complying with the post-surgery oral hygiene instructions. This coincides with Tolstunov's statement in 2006 that inadequate oral hygiene is a primary factor contributing to premature implant failure [11].

In this study, it is shown how the preparation of implant sites, using the DTRR method, allows implant placement in an ideal prosthetic position. With this technique, all implants have higher stability than the traditional technique of bed preparation after the removal of the tooth. Using this method also lowers the risk of surgical problems caused by a small interocclusal distance in the posterior segment. This is especially true when surgical guides are used, which makes it impossible to insert drills through the guides. Furthermore, this methodology demonstrates cost-effectiveness in comparison to the computer-guided intervention for implant placement This finding is consistent with the research conducted by Mahesh et al. (2016) and Joshi et al [12-13].

The DTR approach resulted in our final prosthesis being positioned optimally, ensuring uniform force distribution on the implant, achieving a perfect emergence profile, and effectively controlling plaque in the patients. This finding is consistent with Scarano's (2017) research [14].

Thus Based on the results of the present retrospective study and the literature, this unique technique of implant bed preparation may be seen as a simple but beneficial modification of the traditional approach. It enables optimal alignment of the implant during immediate placement at extraction sites with multiple roots.

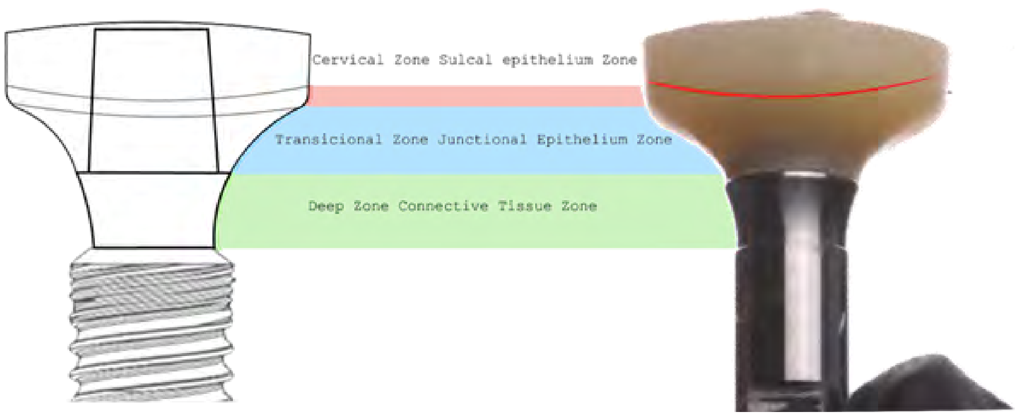


Figure 3A:

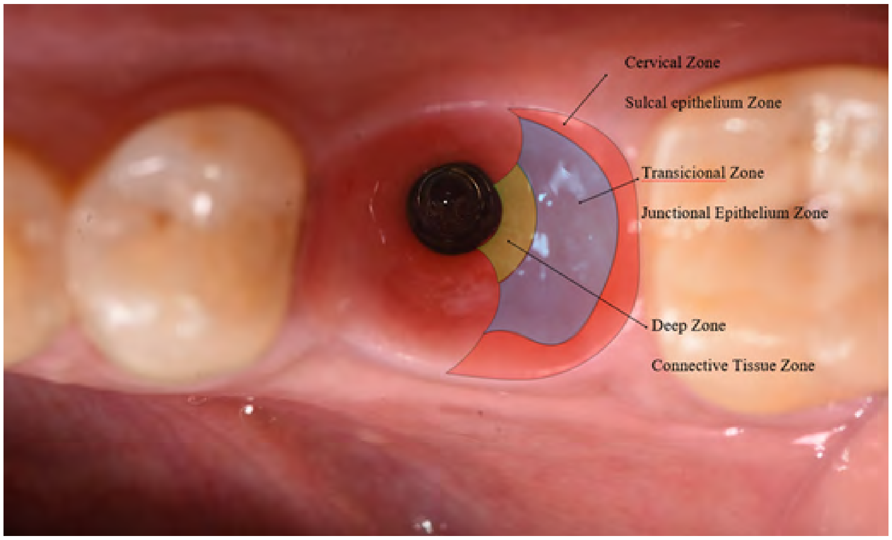


Figure 3B:

5. Conclusion

The study's findings led to the conclusion that tooth-guided rapid implant placement is a unique strategy for convenient and safe insertion, providing accurate three-dimensional positioning.

References

1. Schulte W, Heimke G. The Tübinger immediate implant. Quintessenz. 1976; 27: 17-23.
2. Atieh MA, Payne AG, Duncan WJ, de Silva RK, Cullinan MP. Immediate placement or immediate restoration/loading of single implants for molar tooth re- placement: A systematic review and meta-analysis. Int J Oral Maxillofac Implants. 2010; 25: 401-15.
3. Richard UK, Rudek I, Wang HL. Immediate Implant Placement: Positives and Negatives. Implant Dentistry. 2010; 19(2): 98-108.
4. Chatzopoulos GS, Wolff LF. Survival Rates and Factors Affecting the Outcome Following Immediate and Delayed Implant Placement: A Retrospective Study. J Clin Med. 2022; 11(15): 4598
5. Singh R, Sandhu HS, Singh SV. An immediate implant placement technique to rehabilitate multi-rooted teeth by pre-extraction interradicular implant bed preparation using remaining roots as a guide: A case presentation. IP Ann Prosthodont Restor Dent. 2021; 7(3): 181-7.
6. Rebele SF, Zuhr O, Hürzeler MB. Pre-extractive interradicular implant bed preparation: case presentations of a novel approach to immediate implant placement at multirooted molar sites. Int J Periodontics Restorative Dent. 2013; 33(1): 89-96.
7. Rodriguez-Tizcareño MH, Bravo-Flores C. Anatomically Guided Implant Site Preparation Technique at Molar Sites. Implant Dentistry. 2009; 18(5): 393-401.
8. Abdelazim A, Elsheikh S, Ragab H. Accuracy of tooth guided immediate implant placement at molar region (clinical trial). Alexandria Dental Journal. 2021; 46(1): 23-28.
9. Davarpanah M, Szmukler-Moncler S. Unconventional implant treatment: I. Implant placement in contact with anky- losed root fragments. A series of five case reports. Clin Oral Implants Res. 2009; 20: 851-6.
10. Rohra E, Mistry G, Joshi T, Khanvilkar U. Implant bed preparation for immediate implantation in molar region: An alternative approach. JDMS. 2017; 16: 48-50
11. Tolstunov L. Dental implant success-failure analysis: a concept of implant vulnerability. Implant Dent. 2006; 15: 341-6
12. Mahesh L, Kurtzman GM, Schwartz D, Shukla S. Residual roots as an anatomical guide for implant placement: case series with two-year follow-up. J Oral Implantol. 2016; 42: 285-8.
13. Joshi V, Suhag V, Gupta S. Multirooted tooth guided immediate implant placement in molar sites: A report of two cases. Int J Curr Res. 2017; 9: 44967-9.
14. Scarano A. Traditional Postextractive Implant Site Preparation Compared with Pre-extractive Interradicular Implant Bed Preparation in the Mandibular Molar Region, Using an Ultrasonic Device: A Randomized Pilot Study. Int J Oral Maxillofac Implants. 2017; 32(3): 655-660.