

Effects of Connective Tissue Grafts Following Immediate Implant Placement at Maxillary Central Incisor Sites

Ping Wang¹, Debora Dias², Robert Levine^{1,3}, Mauricio Araujo²

1. Maurice H. Kornberg School of Dentistry, Temple University, Philadelphia, USA

2. State University of Maringa, Parana, Brazil

3. Pennsylvania Center for Dental Implants and Periodontics, Philadelphia, USA

INTRODUCTION :

The maxillary central incisor region is of major importance in aesthetics and patient satisfaction. However, it is also a common area for aesthetic complications with immediate implant placement (IIP). Thus, replacement of a single failed maxillary central incisor with IIP is classified as a complex-level procedure according to the straightforward, advanced and complex (SAC) classification. Once an aesthetic complication occurs, it is usually difficult if not impossible to restore the soft and hard tissue to their original levels. Connective tissue grafts (CTG) are frequently used as a remedy therapy to correct gingival recession and rescue the aesthetic complications. As previously proposed by Levine et al., CTG placed under the buccal flap is recommended as one of the “10-keys” for IIP in the aesthetic zone to minimize the risk of soft tissue recession. To the best of our knowledge, there is no study in the literature on the use of CTG following IIP at the maxillary central incisor region alone.



AIMS :

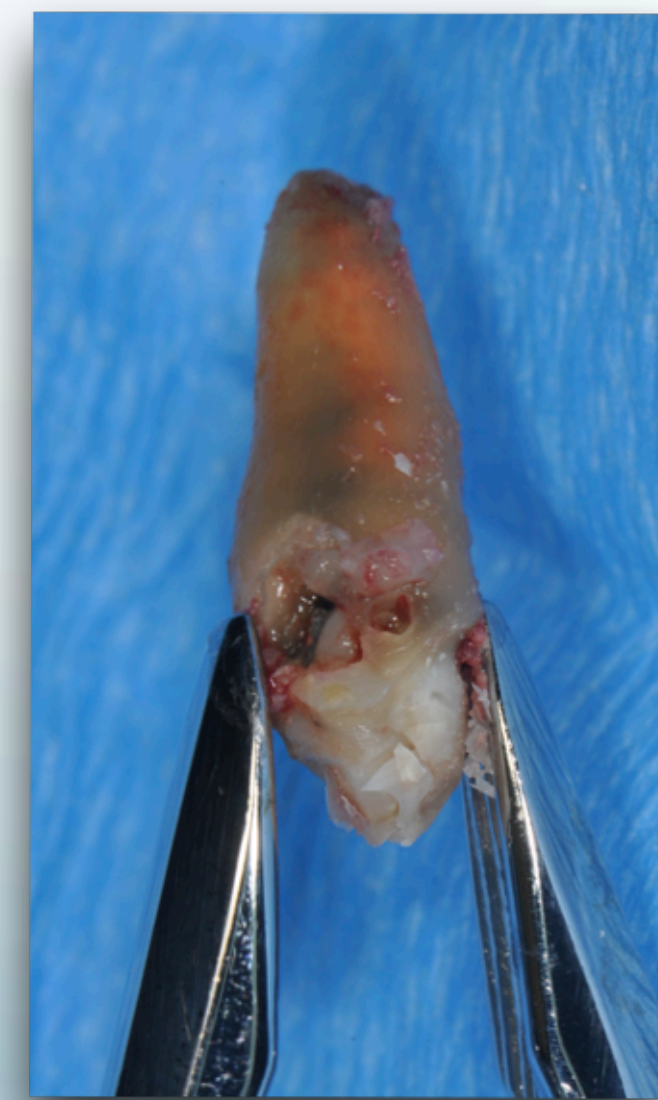
The aims of this retrospective study were to assess at maxillary central incisors the effects of the use of CTG following IIP on (i) the esthetic outcomes (PES/WES), (ii) buccal bone width, (iii) mid-buccal mucosal level and (iv) patient-centered outcomes.

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MATERIALS AND METHODS :

Twenty-eight patients (8 males, 20 females) who had a single maxillary central incisor replaced by an IIP with at least one year in function (1-15 years, mean follow-up 6.2 ± 4.2 years) were included in this retrospective cohort study. The central incisors were extracted using a minimally-invasive technique. Subsequently, implants were placed along the palatal wall and the resulting gap from the implant surface to the inner surface of the buccal walls was filled with anorganic bovine bone combined or not with a CTG under the buccal soft tissue. All surgeries were performed by one experienced periodontist (R.L.) in a private practice setting. The implant sites were divided into 2 groups in accordance to the placement of the CTG, Group A: with CTG (n = 17) and Group B: without CTG (n = 11). At the recall exams, intra-oral photography and CBCT scans were obtained. Clinical aesthetic assessment was conducted using the pink and white esthetic scores (PES/WES) by 4 prosthodontists who were not involved in the treatment of patients and were blinded to the grouping of the patients. A calibrated examiner assessed the thickness of the buccal plate at the implant shoulder and, 2, 4 and 6 mm below on CBCT, and conducted the measurement of the mid-buccal mucosal level at the implant site in comparison to the contralateral central incisor site. All patients participated in a subjective outcome questionnaire regarding their satisfaction with the aesthetic outcomes. Mean values and standard deviations were obtained for each variable, site and group. A Shapiro-Wilk normality test was performed. Intergroup comparison of normal distributed variables were evaluated using Student's t-test. Otherwise, a non-parametric test (Mann-Whitney U test) was used. For analyses through time (T0: before treatment; T1: after treatment at the recall visit), a paired student's t test or Wilcoxon was used. The level of significance adopted in the tests was 5%, i.e., associations whose $p < 0.05$ were considered significant.

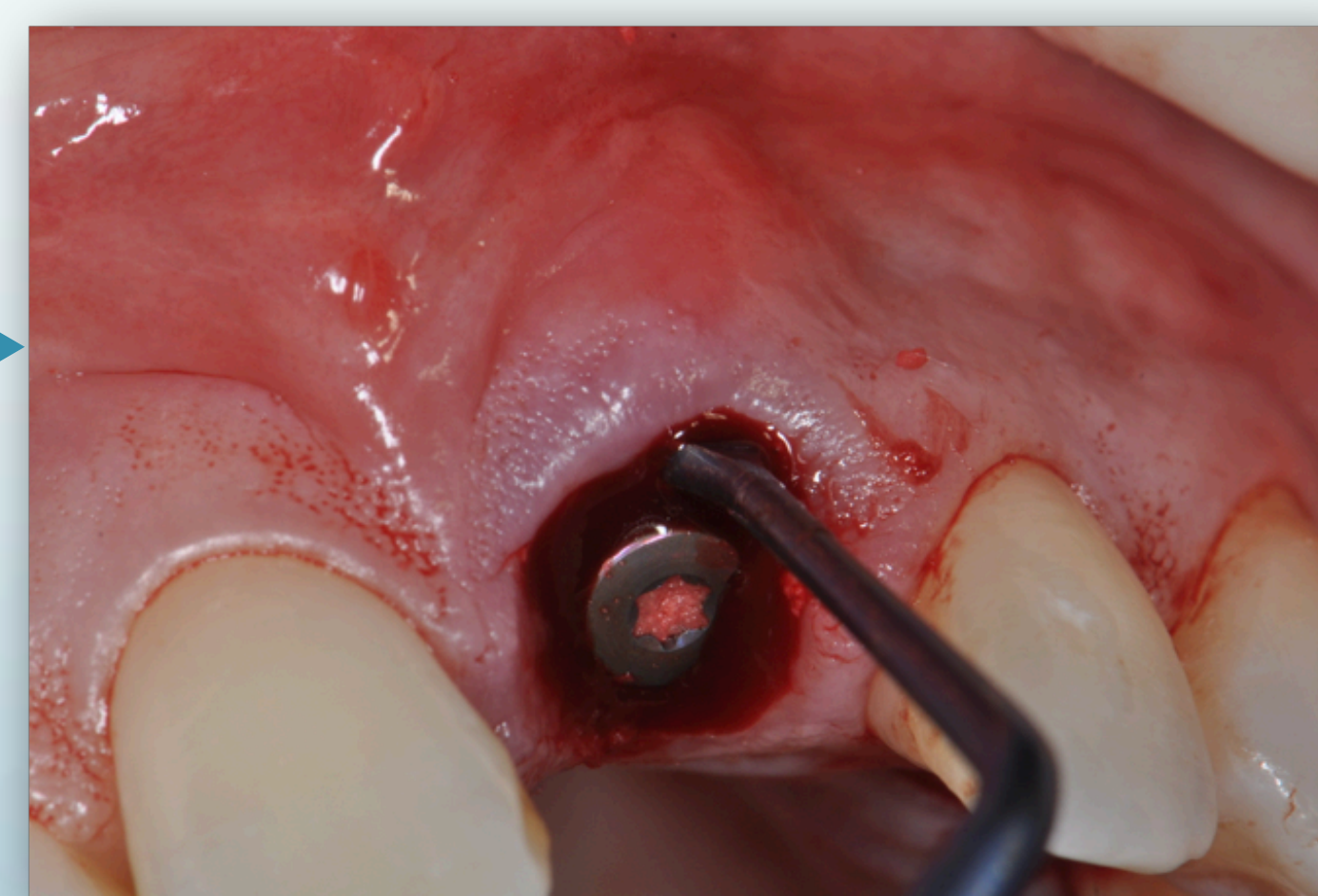
Single failed maxillary central incisor due to root resorption



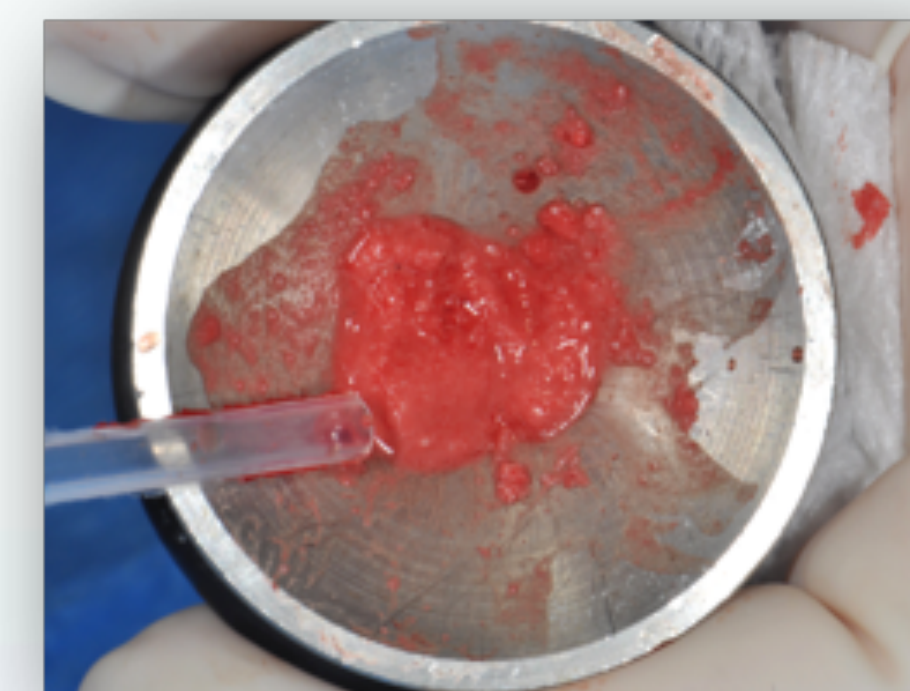
Flapless minimally-traumatic extraction



Prosthetically guided implant placement



Bone graft in the buccal gap



Group A (n=17)
CTG placed under the buccal flap



Group B (n=11)
No-CTG

Final outcome at recall



1. Esthetic outcome PES/WES

2. Buccal bone width measurement on CBCT

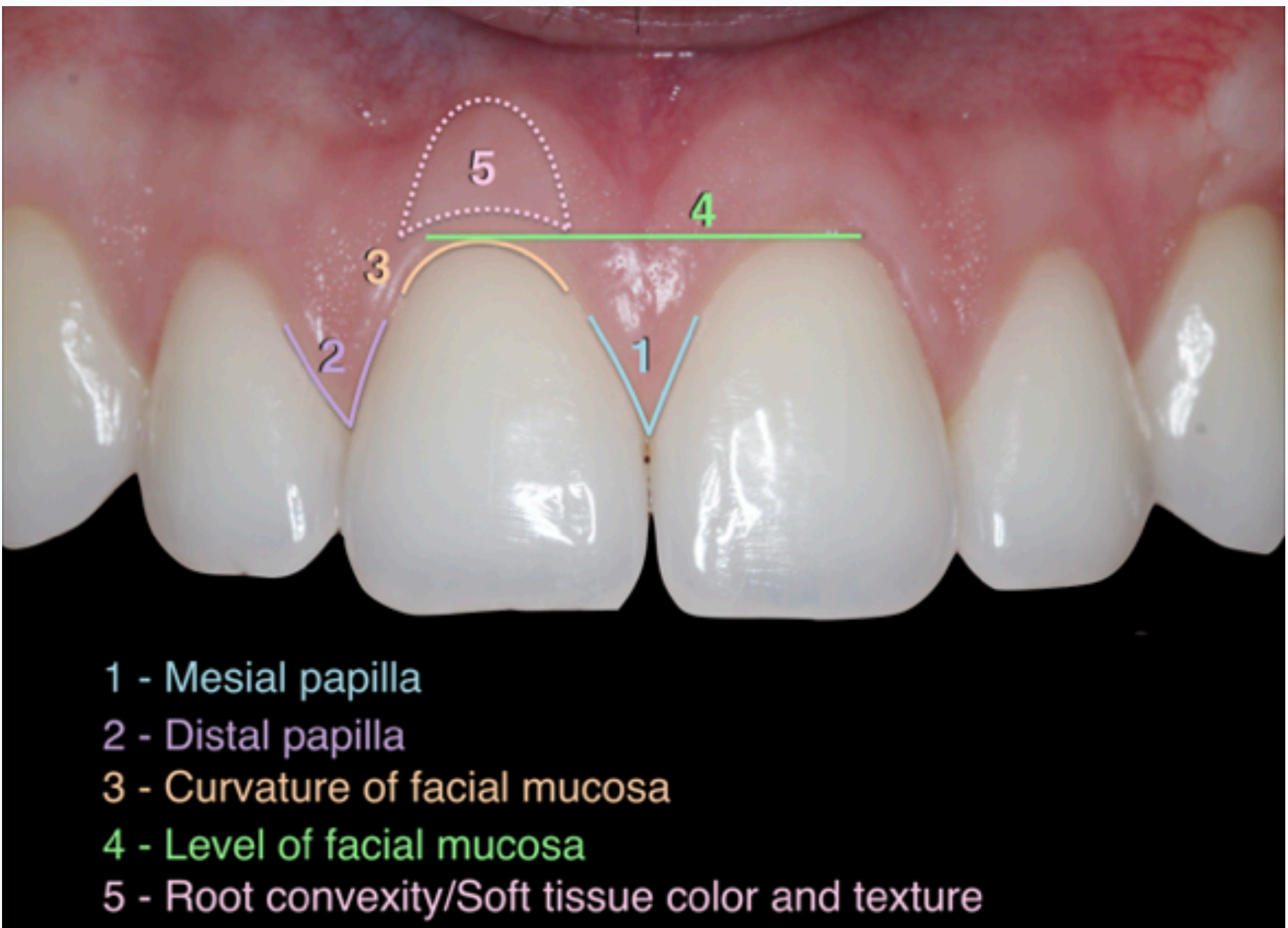
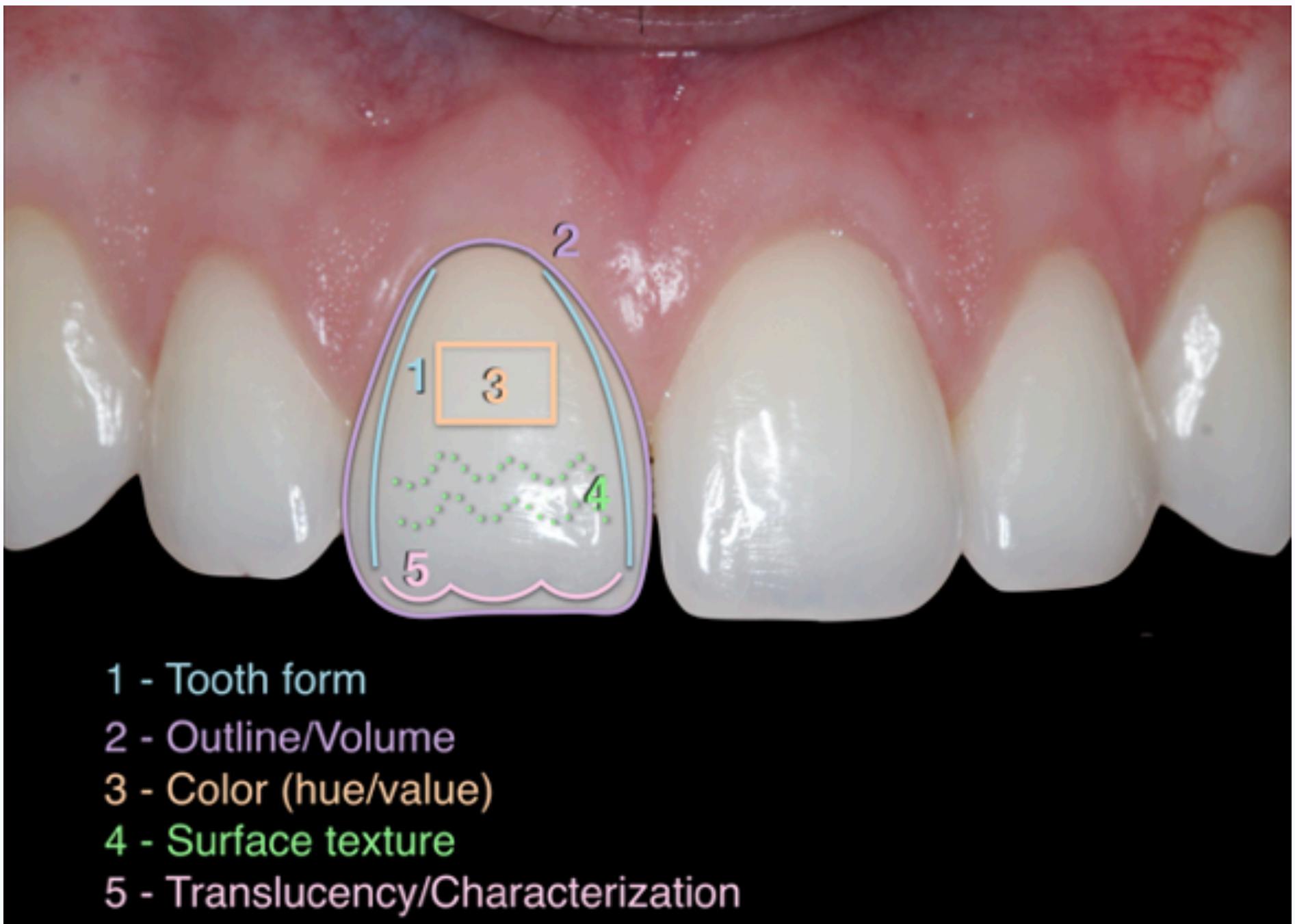
3. Measurement of mid-buccal mucosal level

4. Patient subjective outcome questionnaire

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RESULTS:

Part 1: The Esthetic Scores



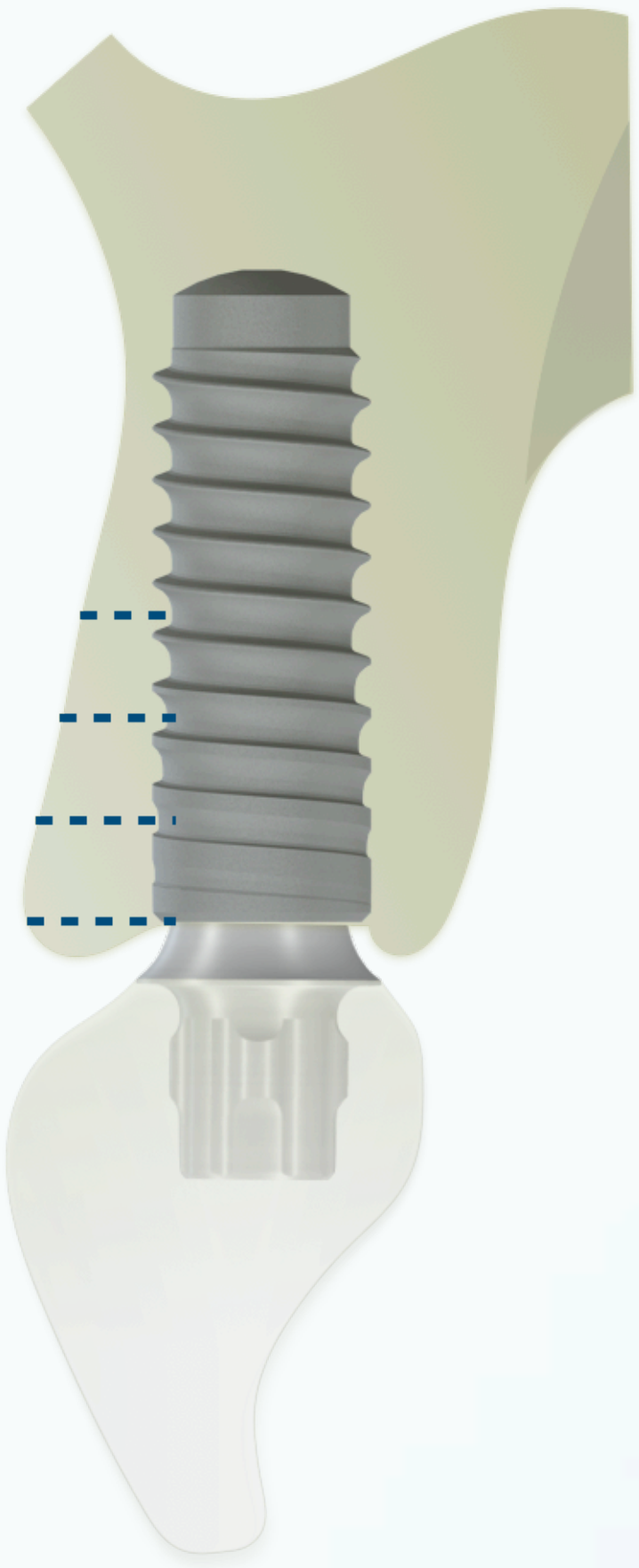
		PES						WES						Total PES/ WES
	Time	Mesial papilla	Distal papilla	Facial mucosa curvature	Facial mucosa level	Root convexity/ soft tissue color and texture	Mean PES	Tooth form	Tooth volume/ Outline	Color	Surface texture	Transluc ency	Mean WES	
CTG n = 17	Before	1.8	1.8	1.4	1.4	1.3	7.6	1.4	1.3	0.8	1.2	1.2	5.9	13.5
	After	1.6	1.7	1.3	1.3	1.4	7.3	1.6	1.4	1.5	1.6	1.6	7.7	15.0
NO CTG n = 11	Before	1,5	1,5	1,2	1,1	1,2	6,5	1	1	1,3	1,3	1,5	6,1	12,6
	After	1,3	1,3	1	1,2	1,5	6,2	1	0,9	1,3	1,3	1,4	5,9	12,1

- Before treatment, there was no significant difference of PES/WES btw the 2 groups.
- After treatment, the total PES/WES was significantly higher in CTG group than in no-CTG group, 15 ± 2.5 vs. 12.1 ± 3.1 ($p=0.012$).
- The frequency of sites exhibiting $PES \geq 6$ following implant treatment was 94% in the CTG group and 73% in the no-CTG group while the corresponding frequencies of $WES \geq 6$ were 94% in the CTG group and 64% in the no-CTG group.

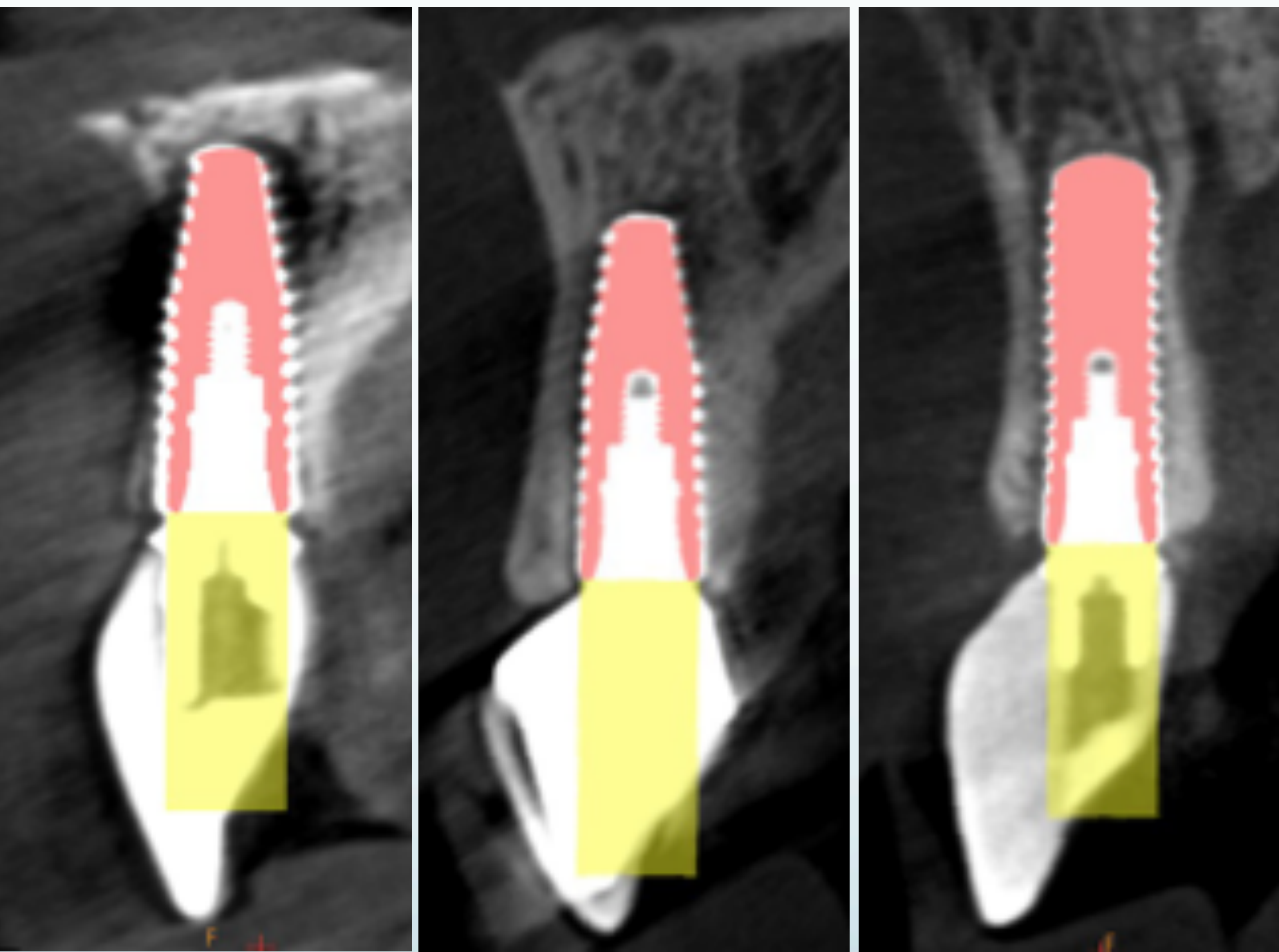
Part 2: The Buccal Bone Dimensions

CBCT analysis: Thickness of the buccal bone wall at four different levels from the implant shoulder.

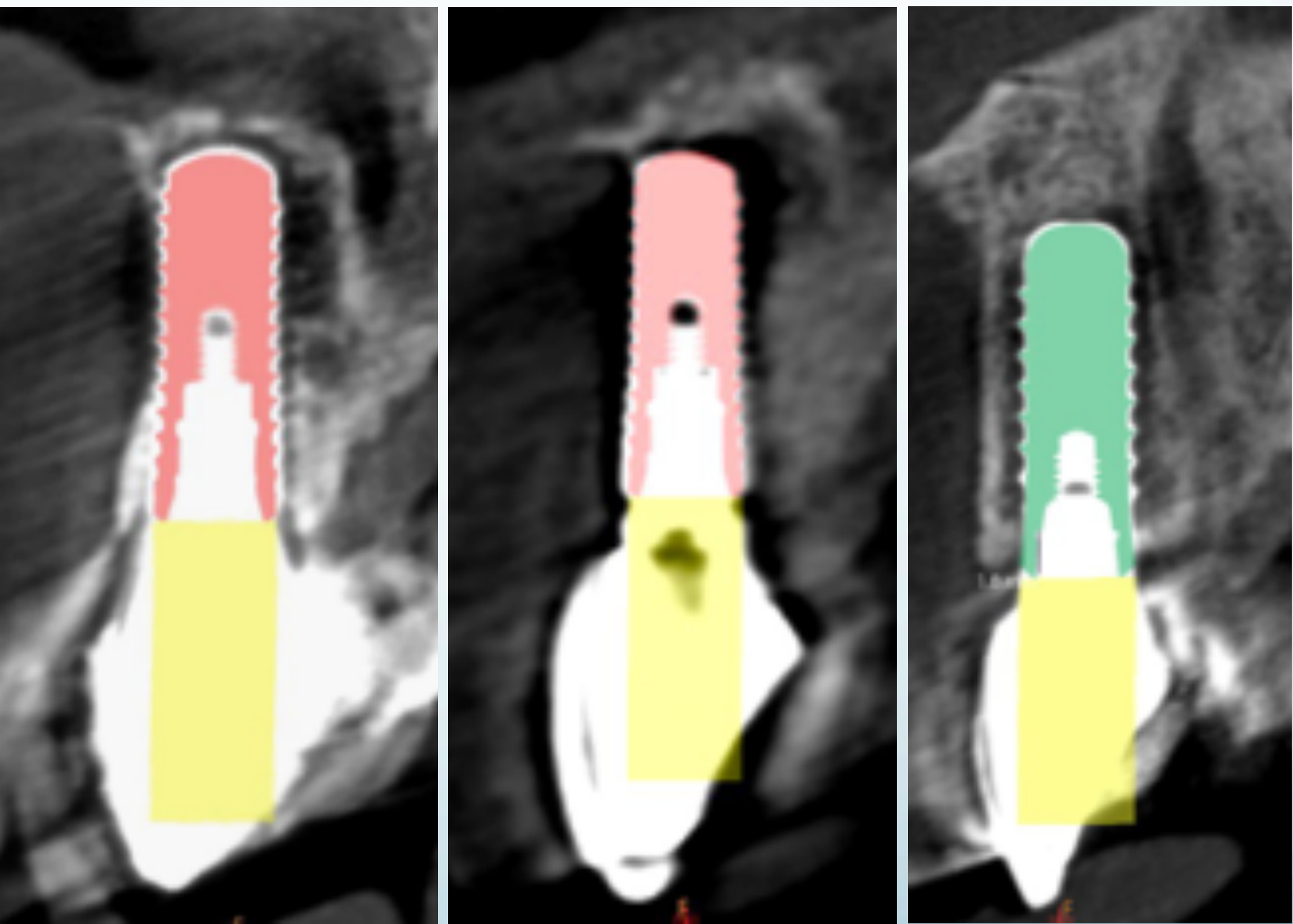
		CTG	No CTG
Buccal bone	0	1.5 ± 1	1.2 ± 1.1
	2	1.5 ± 1	1.2 ± 1.2
	4	1.3 ± 1	1.2 ± 1.1
	6	1.3 ± 1.3	1 ± 1



CTG group



No-CTG group



- No significant differences of buccal bone thickness were observed between the two groups. ($p>0.05$)
- The CTG and no-CTG groups presented similar results at the implant shoulder(0), 2, 4 and 6 mm below.

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RESULTS:

Part 3: Mid-buccal mucosal level

		Crown height (mm)	MBML (mm)	<i>p-value</i>
CTG n = 17	Tooth	10.6 ± 1.2	0.1 ± 0.6	0.43
	Implant	10.5 ± 1		
No CTG n = 11	Tooth	11.1 ± 1.6	-0.4 ± 1	
	Implant	11.4 ± 1.7		

- When compared to the contralateral natural tooth, no significant differences of the mid-buccal mucosal level btw the CTG and no-CTG groups.
- When comparing mucosal level alterations over time, i.e., failing tooth at T0 and implant site at T1, the CTG group lost 0.15 mm (SD 0.8) while the no-CTG group lost 0.8 mm (SD 0.8), with statistically significant differences between the groups (p = 0.04).

Part 4: Patient-centered subjective outcome

Variable	CTG (n = 17)	No CTG (n = 11)
How do you feel about the shape of the new implant tooth?	9.8 ± 0.6	9.6 ± 0.7
How do you feel about the colour of the new implant tooth?	9.6 ± 0.9	9.6 ± 0.7
How do you feel about the shape of the gum that is around the new implant tooth?	9.8 ± 0.5	9.8 ± 0.4
How do you feel about the colour of the gum that is around the new implant tooth?	9.7 ± 0.6	9.7 ± 0.5
What is your overall satisfaction with the new implant tooth?	9.9 ± 0.2	9.5 ± 1.5
MEAN	9.8 ± 0.4	9.7 ± 0.7

- Both groups reported high levels of satisfaction, with an overall mean score in the CTG group of 9.8 (SD 0.4) and 9.7 (SD 0.7) in the no-CTG group.
- There were no statistically significant differences between the 2 groups.

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CONCLUSION:

Within the limitations of this study, this retrospective cohort study indicated that placing a CTG following immediate implant installation promoted better esthetic outcomes (PES/WES) at the maxillary central incisor sites compared to the no-CTG group. However, CTG did not improve the buccal bone dimensions or the mid-buccal mucosal level. Patient satisfaction showed high overall scores, regardless of study group, topic and PES/WES outcomes.

CTG Group



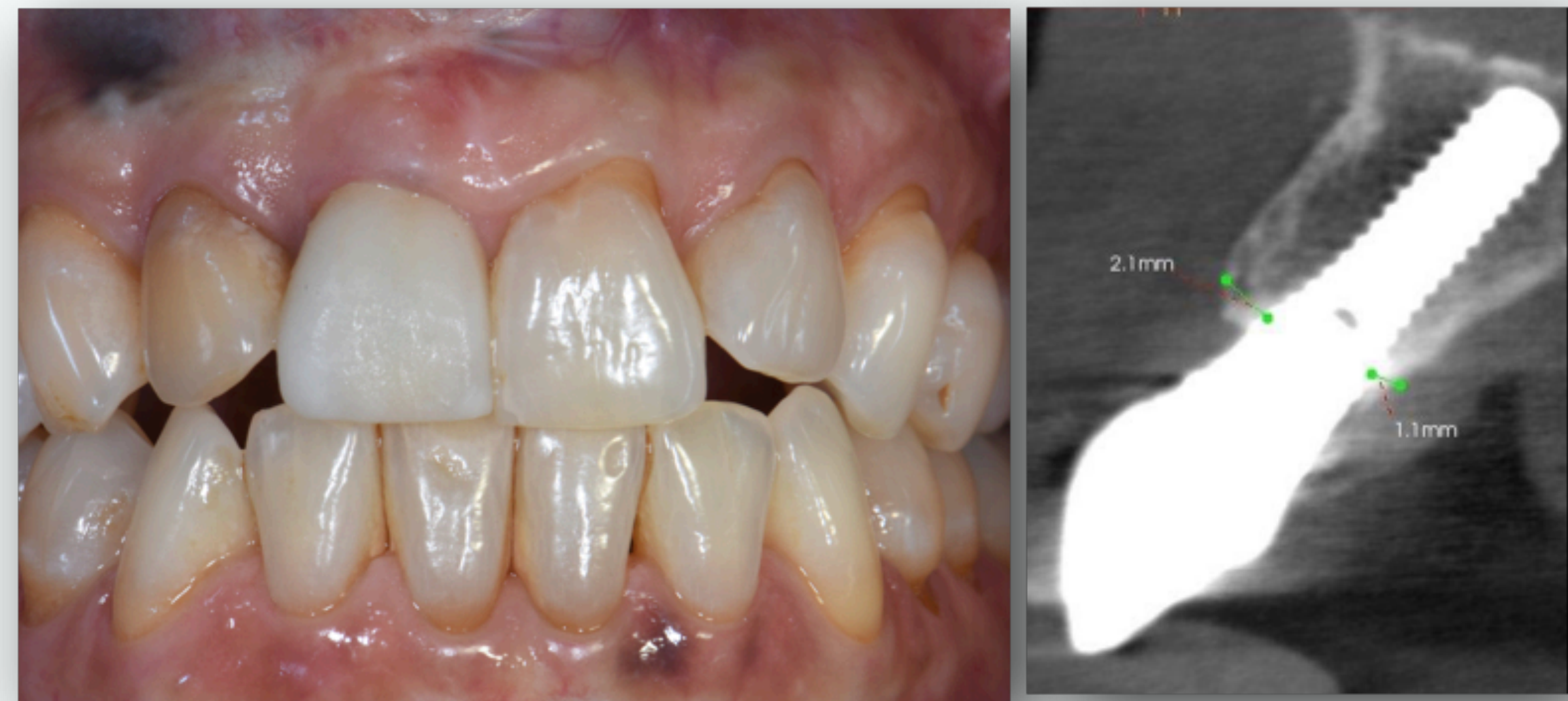
#8: 3 years



#9: 5 years

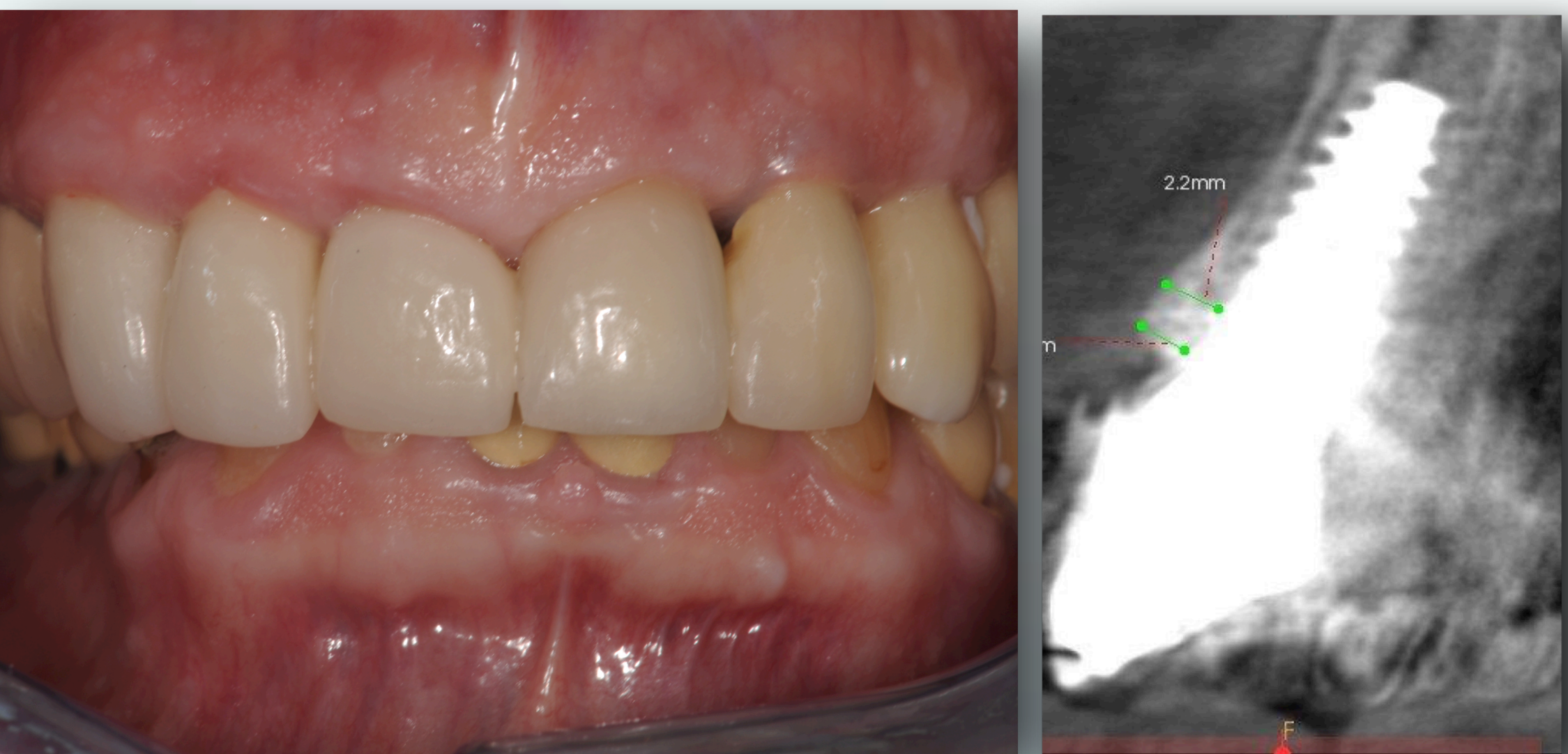


#9: 10 years



#8: 11 years

No-CTG Group



#9: 5 years



#8: 9 years



#8: 11 years



#8: 15 years