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Oro-facial Implant Axis in the Anterior Maxilla: a Pilot Study

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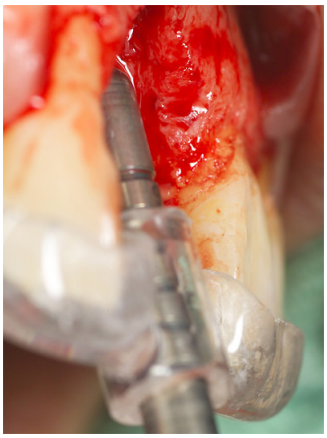
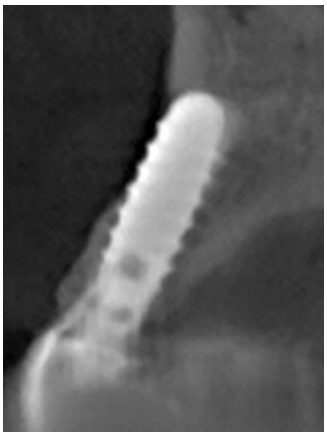
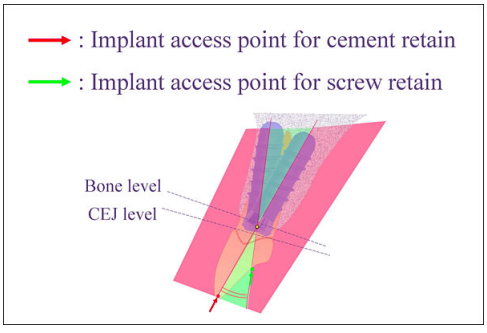
Introduction

Screw retention is recommended for implant supported and retained prostheses in the anterior maxilla. This is because machined components have improved fit charactersitics and excess cement removal is difficult when restorative margins are located greater than 2mm subgingivally.
Recently, in order to increase predictability of an aesthetic result, restorative options have increased. The use of screw-retained customized abutments in conjunction with cement retained crowns is one of these options. This procedure is associated with several advantages. Machined components can be utilized deep in the ginigival sulcus and the cement line is moved coronally where it is readily accessible. The use of customized abutments also increases the degree of flexibility for the oro-facial implant axis, as restorative inclination can be modified in the abutment.
It is common for the oro-facial implant axis to change between screw and cement retention. In other words, the oro-facial implant axis needs to be set up toward the palatal side of the incisal edge for a screw retained implant prosthesis. On the other hand, the oro-facial implant axis of cement retained implant prostheses requires an implant axis that passes through the incisal edge. This gives a more ideal emergence profile and improves cement line location. The difference between these axes influences traditional contour (particularly emergence) of the prosthesis. Therefore, it is possible that differences in the oro-facial implant axis (and the use of this inclination as a measureable parameter) may help in obtaining and predicting aesthetic treatment results.





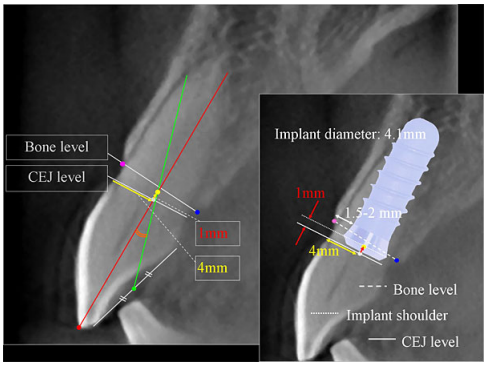


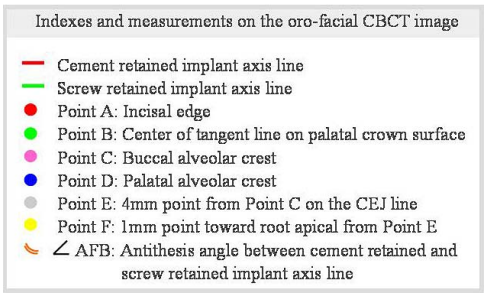
Oro-facial comfort & danger zones in implant axis

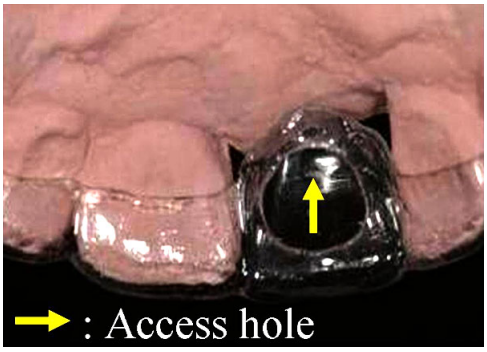
Objectives

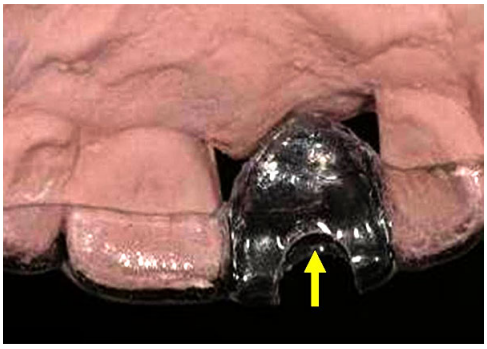
For this pilot study, oro-facial axis was measured using Cone-Beam CT (CBCT) images of normal teeth to consider the angle between planned implant axis for screw and cement retention.

Material and Methods









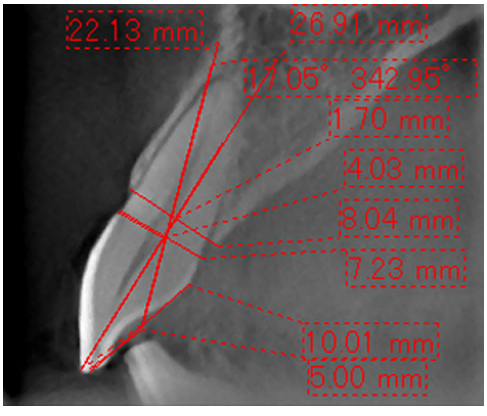
Screw retained Cement retained

10 CBCT (3DX: J.Morita Co. Japan) images of normal central incisor area without periodontal disease or prosthesis as the minimum requirements of bone volume were selected.
Center point of 4.1mm diameter implant was established 4mm point toward palataly from facial CEJ point to leave facial bone wall 1-2mm. (Point E) And implant shoulder depth was established 1mm point toward apicaly from CEJ line. (Point F)
The red line (Point A-F) was established as the cement retained implant axis and the green line (Point B-F) as the screw retained implant axis. Angle AFB, Point C to D and oro-facial distance of CEJ were measured using the software bundled CBCT.

Results

Measured results on maxillary central incisal area [mm]

Average age of 10 sample images was 33 years old. (25 - 41 years old).
Subject images were 4 males and 6 females.
In 10 CBCT images, Average of angle AFB was 17.687°. (15.39°- 19.96°)
Distance of CEJ was 6.886mm, Distance of Point C to D was 7.842mm.



One of the measured CBCT images (Case#2)

case #	CEJ [mm]	CD [mm]	AFB [°]
1	7.09	7.52	18.16
2	7.23	8.04	17.05
3	6.18	6.73	15.39
4	6.38	8.17	17.54
5	7.22	8.11	18.73
6	6.96	8.59	19.96
7	7.1	8.22	17.03
8	6.63	7.59	15.87
9	7.06	7.74	19.69
10	7.01	7.71	17.45
avg.	**6.886**	**7.842**	**17.687**

Conclusions

Proceedings of the third ITI Consensus Conference1) identified the optimal three-dimensional implant position. Accordingly, when the implant axis for screw retention inclines unfavorably in comparison to the implant axis for cement retention, the prosthesis tends to become a ridge-lap design with aesthetic compromise. The tolerance level of this angle made between implant axes planned for screw and cement retention is one of the important factors for ensuring a satisfactory emergence profile and optimal aesthetic result.
Oro-facial implant axis are 15 to 20 degrees different on Screw retain and Cement retain from the point of view of incisal anatomy on maxilla. Implant axis for acquisition of ideal emergence profile is concerned so much with the emergence profile involved and the natural teeth axis. The superstructure of cement retain with custom abutment tend to be an ideal emergence profile.
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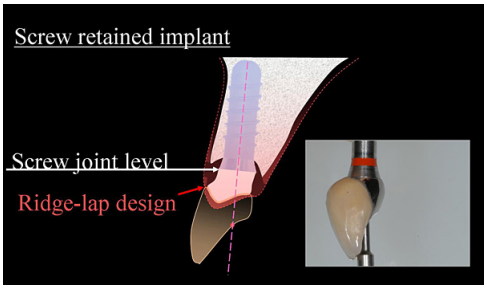

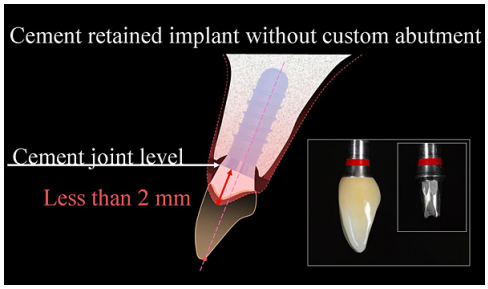

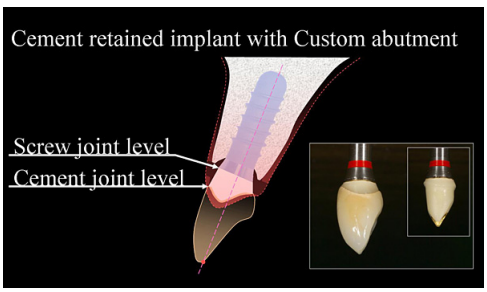

The angle between screw and cement retained implant axis is 15 to 20 degrees. It seems that this angle can be set to one of the reference values in order to predict aesthetic treatment results.

Literature

Daniel Buser, William C Martin, Urs C. Belser. Proceedings of the third ITI consensus conference. Int J Maxillofac Implants 2004; 19(Suppl): 43-61

This Poster was submitted by Dr. Arne F. Boeckler.

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Poster Faksimile:

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*2 Center of Implant Dentistry Japan (CID)

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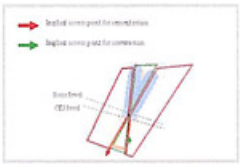

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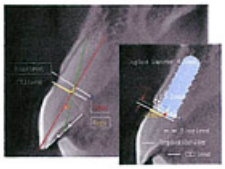
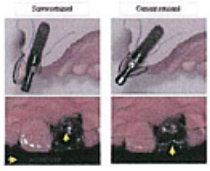


Indexes and measurements on the oro-facial CBCT image

- Cement retained implant axis line
- Screw retained implant axis line
- Point A: Incisal edge
- Point B: Center of tangent line on palatal crown surface
- Point C: Buccal alveolar crest
- Point D: Palatal alveolar crest
- Point E: 4mm point from Point C on the CEJ line
- Point F: 1mm point toward root apical from Point E
- AFB: Antithesis angle between cement retained and screw retained implant axis line



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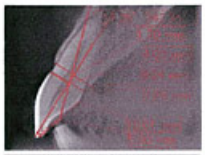

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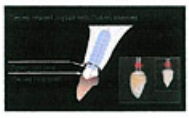

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