Chapter 6 – Aesthetical improvement – Use of one-piece type implants

1. Improving esthetics with one-piece implant

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Aesthetics of two-piece two-stage type implant system

The implant fixture is generally much narrower than the natural tooth root therefore resulting in a larger difference in the junction between the crown and the root of the tooth, thus resulting in over-contouring of the superstructures. This acts as a handicap with respect to both estheticism and oral hygiene. Meanwhile, the junction of the fixture and abutment in two-piece type are positioned deep in the subgingival margin directly above the plane of the alveolar bone allowing the crown margin to also be placed deep inside. The superstructure can therefore erupt from the gum with a similar diameter to those of the natural teeth, therefore providing with the means to construct an esthetic emergence profile.

Estheticism with AQB one-piece implant

Basis of estheticism can be said to be the bone structure. Bone resorption typically results from the loss of tooth which makes it difficult to regain estheticism later on. With two-piece two-stage type, bone augmentation procedure with GBR membrane can be conducted simultaneously with the fixture implantation, but with one-piece type, bone graft must be conducted prior to implantation (Refer to 'A case where the fixed prosthesis was set after implantation with GBR' for further details on bone augmentation procedure).

As the implant diameter is much narrower than the junction between the crown and the root of a natural tooth, it is evident that the crown emerging from right below the margin would not be able to achieve estheticism (Image-1). Theoretically, by preparing the abutment so that the crown margin can be placed in the subgingival margin, similarly to the restorative crown of the natural teeth, allows the crown to be erupted from this position. A vast improvement in estheticism can be expected with this. The only issue that has to be made aware of with this is that due its comparatively narrow nature, the margin must be set deeper into the gingival margin, and erupted with a larger expansion than those of the natural teeth. In achieving this, and by gaining an emergence profile that has no comparative differences to the adjacent natural teeth, issues of one-piece implant with estheticism can be overcome (Image-2).

It is important to note that the position "deeper inside the gingival margin" does not indicate as far as where the junction of the two-piece type is located, but a depth where a sufficient level of hygiene can be maintained by the patient being able to reach the peri-implant pocket with dental brush or dental floss with their hands.

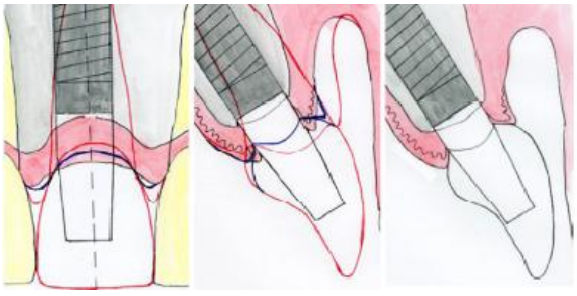
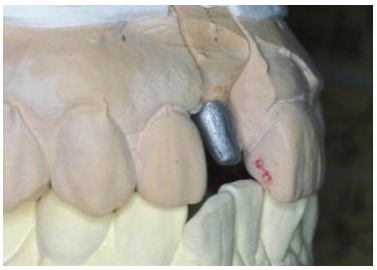


Image-1: An esthetic crown is one that can get as close to the original dental profile (outlined in red)as much as possible. In other words, to get close to the shape drawn out with red lines in the exterior, the crown margin must be placed in the subgingival margin so that it can emerge out from that position.

a  b 

c  d 

Image-2a: Even though the implant is 4 mm in diameter, it is much narrower in comparison to natural teeth cervix, thus it is usual to find them palatally inclined.
b: Set the crown so that it bulges directly above the gingival margin on both mesiodistal and labial sides.
c,d: Images taken during trial placement of the crown and after its placement.

Unforced setting of the gingival margin

The margins of the dental veneers fabricated to cover the natural teeth are generally long, in labial and the palatal directions, but short mesiodistally, in a similar way to straddling over the ridge. This is the natural three-dimensional curve that has been set consistently on the subgingival margin without pressure exerted on any one point of the margin (Image-3).

The design of subgingival margin is usually done with the following dimensions: 0.8 to 1.0 mm in the mesiodistal, 0.6 to 0.8 mm in the labial, and 0.3 to 0.4 mm in the palatal side. Since the abutment is already narrow, its preparation is conducted in such a way as to prepare the peri-implant mucosa with the use of light chamfer or a diamond bur with an arrowhead, instead of reducing the abutment diameter. Stop the bleeding with gingival pack, then take impression with silicon rubber impression agent and fabricate the crown that bulges out directly above the finish line, both on the mesiodistal and labial sides, to achieve an emergence profile that is as natural in appearance as possible (Image-1).

In cases where the continuous reproduction of the gingival scallop structure is not possible with the preparation just to the gingival margin, soft tissue management such as gingivectomy may be necessary. However, by using this method, an aesthetic outcome similar to that with the two-piece type can be accomplished. In performing implant treatment with the aim to obtain esthetic outcome, the majority of the cases have not only accomplished esthetic outcome at the time of crown placement, but this has been retained throughout the observation period (Image-4,-5).

It has been 20 years since I started installing AQB one-piece type. In the first ten years, the emphasis had been placed on oral cleaning therefore the crown margin was placed right on the gingival margin. The level of estheticism was low with this method since the titanium cervix had become exposed when the surrounding mucosa started to constrict. Alongside the remarkable improvement with the implant clinical trials, estheticism on top of their excellence in their functions began to be required. I have also started to consider the importance of esthetic finish with implant prosthesis in the last ten years, and have devised methods implemented into my practice as described here. The progress of one-piece type implants has only been observed for ten years since implementing esthetic finish, therefore, it is hardly sufficient to be able to draw a conclusion, but would like to observe the progress for the next five, ten years from now.

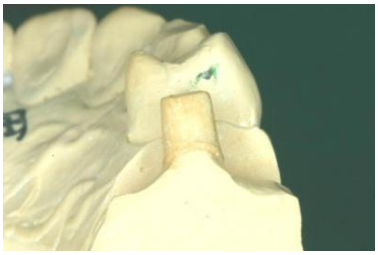
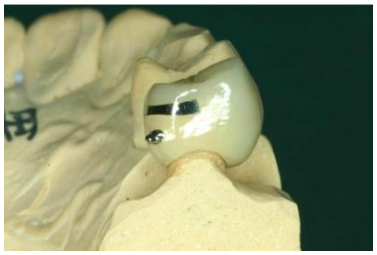
3-a  3-b  3-c 

Image-3-a,b,c: The three-dimensional structures of composite resin margins for one-piece AQB implants have long lengths in the labial and palatal sides, but are short mesiodistally, like straddling on the alveolar ridge. This design is similar to the preparation of the abutment tooth for a natural tooth, with the structures of the jaw bones and the alveolar ridge taken into consideration to derive at a setting of the subgingival margin deriving at a structure with no strain exerted on any one part of the margin (artificial tooth fitted to position No. 4 is shown).

4  5-a  5-b 

5-c  5-d 

5-e  5-f 

Image-4: Till agreement can be met with the craftsmen at the workshop, it may be necessary to grind to adjust the contour on the chair side of the artifact by using carborundum point (artificial teeth to positions No. 8 and 9 are shown).

Image-5a: The reproducibility of the gingival scallop is an important factor that can affect the esthetics of the outcome. If a case presents with significant indentation on the alveolar ridge, and where it can be anticipated that the crown lengthening is needed, bone augmentation therapy should be performed to prepare a suitable environment for the placement of the crown. Alternatively, there are cases where esthetic outcome could be expected with the absence of indents in the jaw bone structure. But on the contrary, upon the placement of prosthesis, the crown length is found to have shortened, therefore the reproduction of the scallop structure can become more complicated. In such cases, soft tissue management should be conducted at the placement of the temporal

crown as shown in b,c,d and e.

Image-5b,c,d,e: The reproduction of scallop form became difficult during the trial placement of the metal bonded crown structure to No. 8 position, therefore Gingivectomy was conducted as soft tissue management, in preparation for the placement of final crown structure to achieve aesthetic outcome. This step should usually be conducted during the placement of temporary crown.

Imge-5f: The prosthetic outcome without taking estheticism into consideration (No. 9) and with esthetic consideration (No. 8). The image features the state, 8 years after the placement to No. 9 position, and 6 years and 10 months after the fitting to No. 8 position.

The placement of the temporary crown and the tooth brushing after

The implant installation to the anterior or premolar region with a high demand for estheticism would require temporary cover with artificial teeth till placed with the final superstructure. In the case of two-piece type, the temporary cover would be placed after the fitting with the healing cap or healing abutment, but with the one-piece type, since the abutment and fixtures are the same, the impression taking can be performed straight after the installation, and therefore the temporary cover can be placed after the washing on the day after in the majority of cases. Thus the priority after the implant installation should lie in achieving primary stability. If adjustments are required in the orientation of the AQB abutment after it is fitted onto the implant, a working model should be constructed to aid the fabrication of temporary crown with color markings. Prepare the abutment tooth in the oral cavity in accordance with colored markings before mounting with the temporary crown.

Inform the patient that the aim of the provisional crown is solely for the sake of esthetic appearance before adjusting the occlusion in a way that there is no occlusal contact with the opposing teeth both at the time of mastication and gliding motion to the anterior region. An EZ type temporary cement should be used so that it can easily fallout upon exertion of strong occlusal pressure, thus preventing any damage caused to the implant itself. It is usual to remove the stitches 5 to 7 days after the implant installation, and start the brushing few days later using super-soft brush, but it can be delayed depending on the conditions of the wound. In the first and second month, accelerate the constriction of the peri-implant mucosa with thorough brushing, and take impression imaging two months or so later before fabricating the prosthesis. Constriction of the mucosa surrounding the temporary crown exposing the titanium is a common occurrence. If sufficient mucosal constriction is not achieved during this period and has to constrict after the superstructure placement, the area of titanium abutment exposure increases with the subsequent gingival constriction, therefore estheticism is lost with aging of the prosthetics.

a  b  c 

Image-6a,b: The day after the implant installation, during the placement of the provisional crown after disinfectant cleansing. Prepare the abutment tooth before its placement in the oral cavity in accordance with the color markings. Inform the patient that the temporal crown is placed solely for the sake of achieving minimal amount of estheticism, and designed to prevent any form of

occlusal contact made between the opposing tooth at the time of occlusion as well as preventing the sliding motion towards the anterior teeth.

Image-6c: Image of the oral cavity a week after the suture removal.

d 

e 
f 

Image-6d: A few days after the stitch removal, start brushing with super-soft brushes designed specifically for postoperative use. Use of normal brushes can be initiated 3 to 4 weeks after surgery.

Image-6e,f: In the first and second month post surgery, constrict the gingivae with thorough brushing for a month, followed by impression taking after 2 months for fabrication of prosthetics.

g 
h 
i 

Image-6g,h,i: Take impression imaging 2 months later, after the removal of the temporal crown, and after the preparation of the abutment tooth.

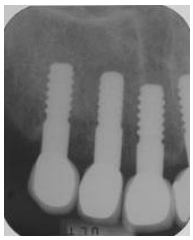
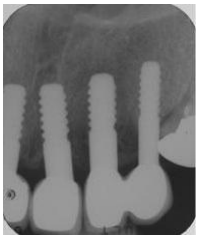
j 
k 
l 

Image-6j,k,l: Dental radiograph of the oral cavity straight after the placement of the metal bonded single crown.

m 
n 
o 

Image-6m,n,o: Ten months after the installation to the positions No. 9, 10, 11, a year after the installation to the positions No. 6, 7, 8, and 7 months since the crown placement to all of these implants installed.

Estheticism with one-piece type and other measures for improvement

The same natural esthetics can be obtained with the one-piece implant as with natural teeth, thus it is

likely that estheticism can last for a longer duration of time. The answer to this speculation should be given in due course with given time.

The means to improve the esthetic outcome have been discussed up till now, but I shall mention of the reoccurring condition that arises under the various oral cavity environments, referred to as mesial inclination of the implant towards the mesially adjacent tooth. With such state, the gap between the implant and the mesially positioned natural tooth can become enlarged, often resulting in a vacancy between the crowns. If forced to form a contact between the two crowns by over-contouring, it can result in a top-heavy structure that is morphologically unfavorable, with too much load to be exerted on the implant body, and the maintenance of hygiene in the over-contoured region would be difficult. If such cases arise, the best solution would be to adopt mesial or distal pontic.

In the region where esthetic outcome is not the top priority, there are situations where it is best not to form a contact between the crowns, and where it is actually better to separate them. Thus the best solutions for each of the cases should be considered individually.

Challenges with one-piece AQB implant

The crown margins of one-piece type tend to be less in depth than with the two-piece types. This does make the cleaning much easier, and the shallowness can prevent the issues encountered with the difficulty in the complete removal of temporary cement with those with deep pockets. The temporary cement remnant can cause chronic peri-implantitis, causing bone resorption therefore this factor must be handled cautiously (Image-7). As a preventative measure, the confirmation of the absence of cement remaining with dental radiograph after the coronal placement, with dental X-ray radiography and peri-implnt pocket examination should be conducted six months later. With the presentation of progressive bone resorption and lengthening of the pocket depth from the radiograph, and can also be suspected from probing, the dental practitioner should have the courage to verify this by more invasive means such as opening the flap for cement curettage. It should be noted that the changes with regards to any modification to the bone on the mesiodistal sides of the implants can be evident on the dental radiograph, but the initial bone resorption on the labiopalatal sides are not clear.

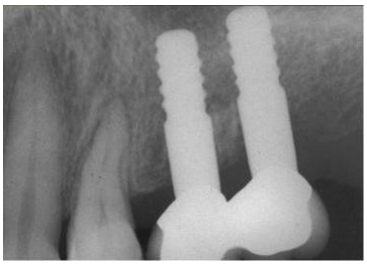
7-a  7-b 

Image-7a,b: Image taken at the time of connected crown placement to No. 3 and 4 positions (09.01.2000).

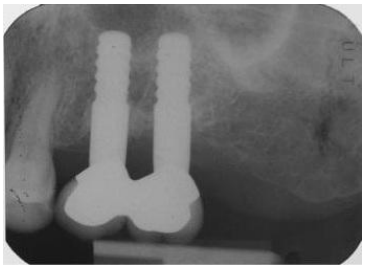
7-c  7-d 

Image-7c,d: The temporal cement remnant causing decubital ulcer with perforation in the mucosa. Bone resorption was not observed in the dental radiograph. A perforation window remained for a period after the cement was removed with the probe.

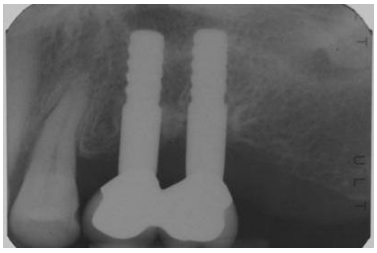
7-e  7-f 

Image-7e,f: Fortunately, the patient had high resistance to periodontal disease, therefore it had not progressed to a chronic case. A gingival constriction could be observed with through brushing, but without any bone resorption (05.18.2005).

Case example 1: The case where the esthetic outcome could be obtained with one-piece type.

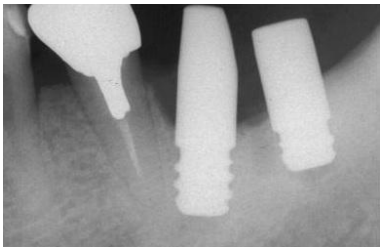
This case was a referral from a friend, who is also an AQB system user, whereby the depth of implantation at the positions No. 30 and 31 were insufficient therefore resulted in their failure as a result of peri-implantitis. One-piece implant type 5SM to No. 30 position, and 566 to No. 31 positions were installed, to which, the single metal bonded crown structures were mounted, respectively. Next the teeth, No. 10 and 19, significantly affected by a chronic case of peri-implantitis were extracted.
No. 10 tooth position was placed with a pontic of the temporary crown supported by the two adjacent teeth and fixed with superbond. Position No. 19 was left untreated for 6 months before implants were installed simultaneously to No. 10 and 19. Once osseointegration was achieved, No. 19 implant was fitted with a metal-bonded crown, whilst No. 10 implant was mounted with connected metal-bonded crown with three other natural anterior teeth. No. 10 artificial tooth has still retained its esthetic appearance since.

Patient: 53 year-old male
First medical examination: July 1999
Main complaint: Requested implant to No. 31 position (referral from another clinic)
Primary treatment plan: Implant to No. 2 and 3 positions, to establish occlusal support on the left molar region

Current condition and treatment progress:

Implant type 5LM was planted to No. 30 (10.04.1999), and a 566 implant to replace No. 31 that had fallen out naturally a month later (01.26.2000). After establishing osseointegration, single metal bonded crowns were mounted onto the two implant abutments as well as to No. 4 natural tooth. Having treated the other areas with standard dental treatments, following the request to extract the periodontal disease affected teeth and their replacements with implants, No. 10 tooth was extracted first, to be replaced with a pontic of the temporary crown that was supported by the two adjacent teeth and fixed with superbond (01.12.2001). No.19 position was left vacant (01.29.2001) till the alveolar bone had been set before placing 4LM implant to No. 10, and 5MM to No.19, 6 months after the tooth extractions (07.11.2001). Once osseointegration was achieved, the implant at No. 19 position was mounted with metal bonded crown,

while the implant at the No. 10 position was fitted with a metal bonded crown along with three other natural teeth (10.31.2001). The progress of this case has been monitored for 8 years since the placement of the superstructures, alongside conducting standard dental treatments, and estheticism has been retained up till now.

1 

2 

Image-1,2: 5SM to No. 30 position, and 566 to No. 31 were planted (01.26.2000)

3 

4 

Image-3,4: Placement of the metal bonded composite resin (08.18.2000).

5 

6 

Image-5,6: No. 10 extraction, and placement of temporary bridge with the pontic on top of No. 10. Superbond was used to fix the two adjacent natural teeth (02.12.2001).

7 

8 

Image-7,8: 4LM implant installed in No. 10 position (07.11.2000). Image features the state just before the impression taking, and is placed with a temporary crown (09.12.2001).

9 

10 

Image-9,10: Right before the placement of the metal bonded crown. Only one out of the four anterior teeth is the AQB implant (10.31.2001).

11  12 

Image-11: Occlusal adjustment a week after the superstructure placement to No. 10 position

Image-12: The state of the prosthetics placed 5 years and 1 month after the implant installation. The prosthesis to the No. 10 position shows no significant differences with the other natural teeth, No. 2-9 (08.23.2006).

13  14 

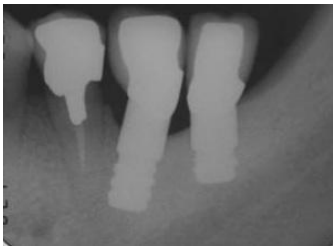
15  16  17 

Image-13 to 17: The states of the implant prosthesis eight years after the placement to No. 10 and 19 positions, and 9 years and 7 months for 30 and 31. It is difficult to differentiate that only No. 10 position is an implant (05.13.2009).

Case example 2: A case where aesthetic outcome has been retained with a bridge supported by two one-piece implants to a area with four missing teeth

A bridge that was placed on top of No. 7, 9 and 10 teeth were extracted, as the three dental roots were deemed not suitable to be preserved, it was temporarily placed with immediate denture for prosthesis treatment with AQB at a later date. A consolidation period of 6 months had been given before conducting implant surgery. The area of treatment was supposed to correspond to the lack of four teeth, however it had been narrowed thus 2 implants were inserted with a bridge placement instead. Where insufficient amount of space is present, placement of 4 mm diameter AQB implant should an esthetically pleasing dental arch can be derived at with a slight adjustment of the crown widths, rather than crowding with the placement of the same number of implants as that of the missing teeth.

Patient: 44 year-old female

First medical examination: November 2003

Main complaint: Requested implants to No. 7 to 10 (referred from another clinic)

Primary treatment plan: Root extraction of No. 8, 9 and 10.

Secondary treatment plan: Implants to No. 7 to 10, and placed with a bridge.

Current condition and the treatment progress:

The bridge that had been placed 22 years ago to No. 7, 9 and 10 positions first fell out 4 years ago and has continuously been replaced since. At the time of primary clinical evaluation in November 25th 2003 (Image-1,2), the dental radiograph showed softened interior of the root canals of these teeth, therefore were deemed unsuitable for preservation, therefore was decided to be placed with immediate denture. No. 7, 9 and 10 teeth were extracted, and were placed with immediate dentures with No. 7 to 10 implants as the anchors (12.05.2003). Since this region is usually limited in the space available, it is usually installed with four 3 mm diameter AQB implants to for a narrow ridge. However, as the ridge width in this case was shown to be sufficient for 4 mm implants, 2 implants were installed to this space, for subsequent placement of the bridge prosthesis.

The implant installation was conducted after a 6-month healing period (05.24.2004) (Image-3,4,5,6). Upon opening up the flap, the presence of thick nerve and vessel bundle were found, and even the installation with 3 mm diameter implants were deemed unsuitable to either No. 8 or 9 positions, so 4 mm AQB implants were inserted to No. 7 and 10 positions in preparation for placement with a bridge prosthesis. Fortunately, 4LM type implants could be installed. The suture was removed a week later (Image-7), and impression was taken 2 months and 1 week later, for a final placement of the metal bonded bridge (08.30.2008) (Image-9,10,11,12). Regular follow-up has shown the estheticism to have been maintained up to now (Image-13,14,15).

1  2 

Image-1: Image of the oral cavity at the time of initial medical examination.

Image-2: The dental radiograph 5 months after the root extractions.

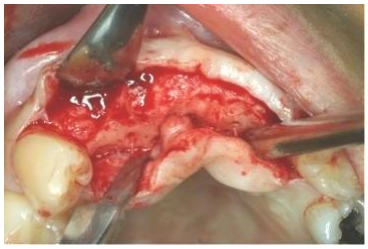
3  4  5 

Image-3: The state of the oral cavity right before the implant installation (05.24.2004)

Image-4: Showing the thick nerve and the vessel bundle from the incisor pore that was presented upon the flap opening.

Image-5: Completion of installation of two 4LM implants, and suture.

6  7  8 

Image-6: Dental radiograph straight after the implant installation.

Image-7: The placement of the temporal bridge, a week after the stitch removal.

Image-8: The temporal crown margin was stretched in preparation to the gingival constriction after the brushing.

9  10  11  12 

Image-9,10,11,12: At the time of bridge placement.

A sufficient pressure has been applied to the peri-implant mucosa due to the fitted margin of the temporal crown. The crown contour is positioned such that the crown emerges from the pressurized subgingival margin, giving rise to an esthetic emergence profile from underneath the gingivae (08.30.2004).

13  14  15 

Image-13,14: Image and dental radiograph featuring the state 3 years after the implant installation. The esthetic outcome has been retained since the initial installation (05.09.2007).

Image-15: Image of the oral cavity 4 years after the implantation (06.03.2008).

2. A case of esthetic prosthesis placement with two-piece type

Chief Director of Niwa Dental Office
Ken Niwa

Patient: 25 year-old male
First medical examination: November 2006
Main complaint: Request for esthetically pleasing anterior teeth.
Treatment period: 6 months
Treatment plan: Two-piece type implant installation in conjunction with GBR for expansion of the

No. 9 tooth was dislodged as a result of sports accident in August 2006. Bridge prosthesis was offered as a treatment option, but the patient was not satisfied with the treatment that required grinding of the abutment teeth, therefore chose to replace the loss with an artificial tooth. The result was not esthetically pleasing therefore came to this clinic to request implant treatment.

The labial side of the alveolar bone in this patient had significantly been indented (Image-1,2), and estheticism was not likely to be achieved even with implant treatment. Consequently, bone augmentation by means of GBR method was necessary to facilitate the implant procedure. The idea of utilizing one-piece type implant had to be abandoned. Fortunately, with the presence of remaining bone on the palatal side confirmed with dental radiography, the applicability of GBR to this case was verified (Image-3).

A significant loss of the bone on the labial side was presented upon incisional detachment of the implanting region (Image-4). After the construction of the implant cavity with the standard protocol, the bone was decorticated to induce blood supply to the area (Image-5a,b). After the installation of two-piece type implant, 4122, (Image-6), demineralized freeze-dried bone allograft (DFDBA) and hydroxyapatite (HA) were added. This area was then covered with titanium mesh, 0.1 mm thickness, to retain its structure (Image-7), before preventing the connective tissue invasion with the application of resorbable membrane. A release incision was applied to the periosteum once confirming its stability, ready for the subsequent suturing (Image-8). The postoperative dental radiograph showed the implants to have been placed at ideal locations with favorable equilibrated distances with the adjacent tooth roots (Image-9).

The space created by the GBR membrane was confirmed to have been filled with osteoid tissues 17 weeks after the surgery (Image-10) therefore the secondary surgery was conducted after this to extract and remove the titanium mesh and membrane (Image-11). Impression was taken via the open-tray method, 3 weeks later, and completed the surgery with the placement of the ceramo-metal crown (Image-12). The indentation on the labial side that presented on the primary clinical evaluation was filled, thus fulfilling the patient's request for estheticism.

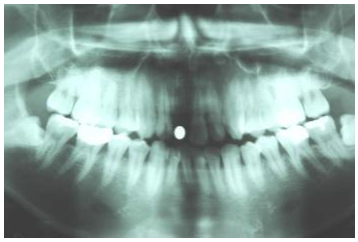
1  2  3 

Image-1,2: Maxilla with a deep indentation on the labial side of position No. 9.

Image-3: Panoramic radiography, where a sufficient alveolar height can be seen, with the presence of cortical bone on the palatal side that is equivalent of the level of margin.

4  5-a  5-b 

Image-4: Image featuring the state upon detachment of periosteal mucosa. A significant bone deficiency can be observed.

Image-5a,b: Showing decortication of the jaw bone. The bone regeneration requires blood supply from the surrounding bone, and not just those of the implant cavity.

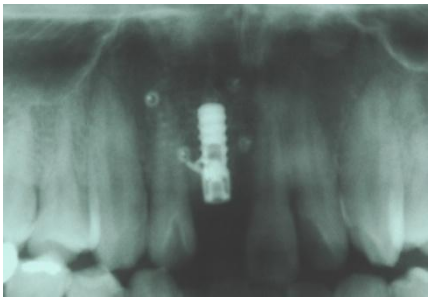
6  7  8  9 

Image-6: Implant installation. The HA coating layer on the labial side of the fixture is largely exposed.

Image-7: Cover the treatment area with titanium mesh and then with membranes after applying DFDBA and HA.

Image-8: Apply release incision to the periosteum on the labial side in preparation for subsequent suture so that excessive pressure was not exerted on the gingivae.

Image-9: Radiograph taken after the installation confirmed that the implant body was inserted as was planned.

10  11  12 

Image-10: 17 weeks post-surgery. The GBR subjected area displays the osteoid tissues to have filled out over the titanium mesh.

Image-11: The state at the end of the secondary surgery. An incision was applied to preserve the dental papillae – an important step that should not be neglected to retain the estheticism of the gingiva.

Image-12: The state after prosthesis placement – estheticism was achieved.