

Treating Two Adjacent Missing Teeth in the Esthetic Zone

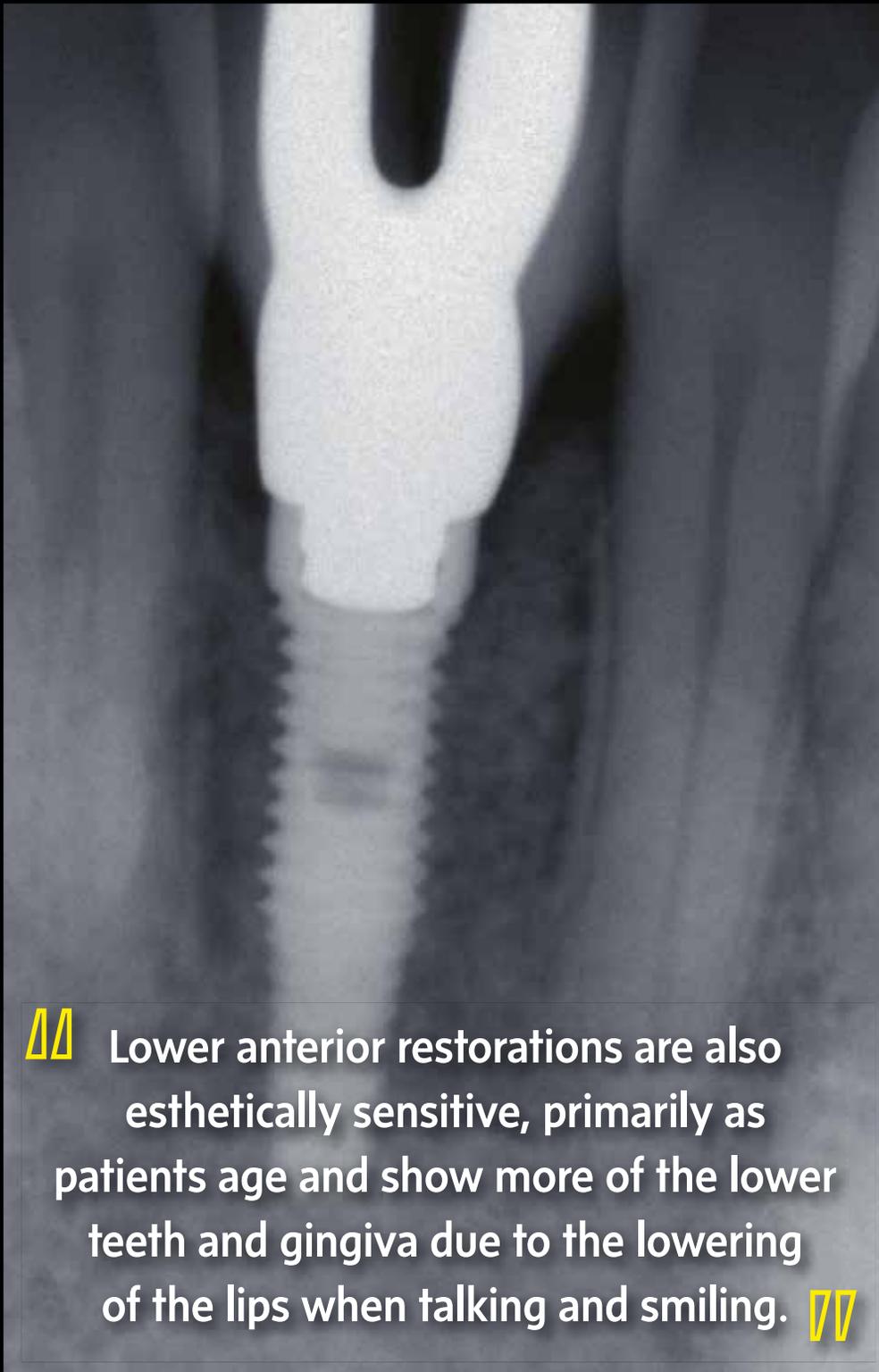
Part 2: The Pink Hybrid Restoration and the “In-Between” Implant Concept for the Anterior Mandible

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Abstract

This article, the second in a three-part series, outlines the issues, considerations, and advantages of utilizing an “in-between” single implant placement approach for cases involving the replacement of two missing adjacent teeth in the anterior mandibular esthetic zone when combined with a pink defect. This is an area in which lack of space and gingival issues are common challenges and can present esthetic and biological complications. Particularly when used in combination with pink ceramics or pink hybrid restorations, placement of a single implant between two teeth presents a viable treatment option for addressing space problems, bone loss, and gingival issues in a simple, economical, and highly esthetic manner.

Key Words: “in-between” implant, adjacent missing teeth, single implant, anterior mandible, pink hybrid restoration (PHR)



△△ Lower anterior restorations are also esthetically sensitive, primarily as patients age and show more of the lower teeth and gingiva due to the lowering of the lips when talking and smiling. ▽▽

Introduction

When dealing with cases that involve two missing teeth in the anterior mandibular region, clinicians and technicians often find themselves confronting a “tight” situation, literally and figuratively. The reasons for this include the following:

- The diameter of anterior lower incisors is minimal and sometimes approximates a reduced diameter implant.¹
- In other cases, although the diameter of the implant and tooth might be similar, the space between the teeth is insufficient to ensure adequate interproximal bone and soft tissue formation between two implants and the neighboring teeth.²
- Lower incisors often are crowded,³ further minimizing the space for two implants after two teeth are extracted.
- When two lower incisors are missing, the adjacent teeth tend to shift to close the gap.
- Even if the teeth did not shift, crowding may already have existed before tooth loss, meaning that the space available after extraction is less than what corresponds to two perfectly aligned lower central incisors. In many such cases, even when the patient is missing two teeth, it is difficult to place two implants, and when placement is attempted, esthetic and biological complications can occur in the short and/or long term.

Considering these factors, it is not difficult to understand why the prospect of restoring two adjacent missing teeth by placing a single implant was first proposed to resolve issues in the anterior mandibular area, a highly esthetic zone prone to spacing, bone loss, and gingival challenges. It was suggested in particular for older patients, whose lower teeth and gums show more due to the drooping of the lower lip with age. Particularly when used in combination with pink ceramics or pink hybrid restorations (PHR), single implant placement in between two teeth represents a viable treatment option to address spacing, bone loss, and gingival deficiencies in a simple, economical, and highly esthetic manner.

Advantages of “In-Between” Implant Placement When Using Artificial Gingiva Between the Ideal Positions of the Crowns

As previously stated, lower anterior restorations are also esthetically sensitive, primarily as patients age and show more of the lower teeth and gingiva due to the lowering of the lips when talking and smiling.⁴ When using artificial gingiva, placing implants in between the ideal position of the crowns offers numerous advantages. These include the following:

- Better primary osseous integration (placement over the bone crest provides immediate loading).
- Easier hygiene (there is only a single abutment instead of two, and two half cantilevers on each side instead of a full cantilever on one side, so there is no need to use a threader in between the implants).

- Better occlusal load distribution (the implant axis will be positioned in the middle of the mesiodistal gap, thus generating more centric occlusal forces).
- Better lingual morphology (the implant screw access will exit on the interproximal area, allowing ideal lingual anatomy development, less lingual volume, and more comfort for the tongue).
- Better interproximal, cervical, and gingival margin esthetics (the “in-between” implant position affords clinicians more freedom and space to work with the emergence profile and connector positions and to create more natural-looking color and translucency in restorations).

Two-Unit Implant Bridge: Esthetic Framework Challenges

Hiding a ceramic bridge framework, however, is always difficult. When a two-unit implant bridge is fabricated, the main esthetic challenges regarding the framework include the following:

- Hiding the areas that have a thinner ceramic layer, where the framework can show through.
- Hiding the connector in between the two crowns. This is probably the biggest challenge because a natural-looking interproximal area—one that creates the illusion of two separated crowns—must be created without revealing the connector. On a conventional bridge, the connector is placed on the contact area in between the two crowns. In addition to the previously cited esthetic challenges, this requisite connector placement also blocks light transmission around this area, an important consideration because it is close to the incisal edge, a region with high light transmission. A very common problem when trying to make a bridge look like individual teeth is hitting and exposing the framework when using a disc to esthetically develop the interproximal morphology. Consequently, single crown restorations are esthetically easier to create than bridge restorations.
- Hiding the screw channel. The implant position must accommodate development of a framework design that incorporates the diameter of the screw channel, thickness of the framework material for proper resistance, and esthetic layering material to hide all of the above.

“In-Between” Implant Bridge: Advantages

The advantages of opting for the “in-between” bridge include the following:

1. It creates an esthetic situation in which the two crowns will behave as a single unit, even though they are connected, since the connector will be moved cervically behind the artificial papillae. This makes it easier to address the challenges of hiding the connector and screw channel.
2. When a two-unit bridge with artificial papilla in between is present, the area with the greatest volume of esthetic material (i.e., ceramic and/or composite) is the papilla region,

making it the best location for placing the connector and screw channel. The “in-between” implant placement specifically allows this consideration.

3. It requires less critical implant positioning (e.g., away from adjacent teeth and interproximal bone and away from the apex of adjacent teeth, especially when the apex is converging apically and decreasing space for the implant in this area). Additionally, bone resorption after tooth extraction causes a shorter ridge and small perimeter arch,⁵ situations that force implant placement to another nonideal position unless the surgeon compensates for it by performing a bone graft.
4. It makes it easier to handle the soft tissue because only some compression is needed. It also eliminates concerns about an unsatisfactorily built papilla or gingival esthetics in between the two artificial crowns, situations that occur frequently.⁶
5. It is less costly due to the need for fewer implants and less complex reconstructive surgeries.
6. The surgeries required are less critical in nature. Typically, in these cases, the most unpredictable procedures are ridge augmentation surgeries, since there are many prosthetic implications resulting from tooth loss.⁷ The “in-between” implant bridge technique eliminates those steps.
7. It enables a shorter treatment period. In most cases, the duration is less than four months. Treatment typically involves an initial appointment for simple and fast implant placement (e.g., one that does not attempt vertical ridge augmentation); a second appointment after three months of healing for try-in and placement of the ceramic bridge; and—only if required for the particular case—a third appointment one week later for intraoral application of pink composite.

Case Presentations

Two clinical cases are described below. They have the same objective (replacing two lower incisors in the esthetic zone with implant-supported restorations). However, they employ two different approaches (two-implant placement versus single-implant placement) to examine the respective challenges and possible outcomes of each in order to determine which offers the best esthetic, osseous integration, load distribution, lingual morphology, and hygiene results.

Case 1

Two implants were placed to restore the patient’s missing mandibular central incisors (#24 and #25) in a very tight space (**Fig 1**). The restoration design attempted to overcome space deficiencies (**Fig 2**), but the final outcome demonstrated an inappropriate biological and esthetic result (**Fig 3**).

When anterior mandibular teeth are missing, it is common to find severe bone defects with complete papillae loss. Consequently, the papilla between the two missing teeth likely will

require artificial restoration since it is difficult to reestablish natural papilla form, even in cases where the ridge height has been recovered.³ If the papilla between two missing teeth needs to be restored with artificial pink, the “in-between” implant position represents the best option.



Figure 1: Two implants placed to restore both missing lower incisors in a very tight space.



Figure 2: The restoration design attempted to overcome the space problem.



Figure 3: The final outcome demonstrated an inappropriate biological and esthetic result.

Case 2

This patient's mandibular central incisors (#24 and #25) exhibited major soft and hard tissue loss. The treatment approach sought to provide a solution that not only was more likely to achieve better esthetics but also would decrease the possibility of technical and biological complications and minimize treatment cost and effort. The teeth required extraction due to a lack of bone support, which was visible radiographically (Fig 4). The restoration's design required particular attention, since it would have a significant impact on smile esthetics because when the patient smiled the exact area of intervention was revealed (Fig 5).

Two diagnostic wax-ups were made to evaluate the esthetics of two alternative treatment approaches. In the first restorative option, one large central was placed in the position of the two missing teeth (Fig 6). However, the one implant/one central solution created an excessively wide and unattractive tooth (Fig 7). In addition, the computerized tomography (CT) scanning used for three-dimensional (3D) planning of the implant position revealed insufficient space for normal centrals and two implants (Fig 8).

In the second restorative option, the adjacent laterals were minimally stripped in the cast model, and two centrals were placed—minimally overlapping them toward the laterals—to recreate a natural, slightly crooked position (Fig 9). From an esthetic perspective, the second option appeared to be the best alternative. Therefore, digital planning was performed to place an implant at the "in-between" position to support two centrals and reshape the mesial aspect of both laterals (Figs 10 & 11).

During implant placement surgery, the open flap revealed the defect. The lack of buccal and interproximal bone support clearly emphasized how challenging it would be to develop papilla in between the two prosthetic crowns (Fig 12), already indicating that a small artificial pink papilla might be needed to avoid the problem presented in Case 1 (Fig 3). A surgical guide fabricated based on the "in-between" digital planning (Fig 13) was used, and the "in-between" implant (i.e., a 3.3 x 13-mm implant) was placed (Fig 14). Bone grafting was performed (Fig 15) and the graft was covered with a membrane (Fig 16).

After healing, an ideal soft tissue condition was achieved with ample keratinized tissue around the implant. This resulted from the guided bone regeneration and connective tissue graft performed during implant placement, as well as the implant's adequate positioning (i.e., correct distance to the neighboring teeth) (Fig 17).

To open space for the two centrals, the mesial side of the laterals was trimmed according to the design created on the wax-up (Fig 18). The final metal-ceramic bridge featured screw access on the lingual and pink porcelain on the buccal sides. The "in-between" implant placement created two half cantilevers on each side of the bridge; this facilitated much better load distribution (Fig 19) and also enabled easier and better access for hygiene (i.e., floss goes around the two half cantilevers on each side for cleaning) (Fig 20).

The patient's smile, which revealed the treated area and definitive metal-ceramic restoration, emphasized the increased importance of achieving ideal esthetics in this area (Figs 21 & 22).



Figure 4: The lack of bone support, necessitating extraction of both lower central incisors, was visible radiographically.



Figure 5: Preoperative view of #24 and #25. Restorative esthetics was an important concern because the exact area of intervention was revealed when the patient smiled.



Figure 6: A diagnostic wax-up of the first restorative option consisted of one large central in the position of the two missing teeth.



Figure 7: A two-dimensional (2D) digital sketch illustrates that the one implant/one central solution created an excessively wide and unattractive tooth.



Figure 8: A 2D digital sketch illustrates that the space was too tight for normal centrals and two implants.



Figure 9: The diagnostic wax-up of the second restorative option involved minimal stripping of the adjacent laterals in the cast model and placing two centrals—minimally overlapping toward the laterals—to recreate a natural-looking small, crooked position.



Figure 10: A 2D digital sketch demonstrates that the ideal restorative solution combines an "in-between" implant supporting two centrals and reshaping the mesial of both laterals.

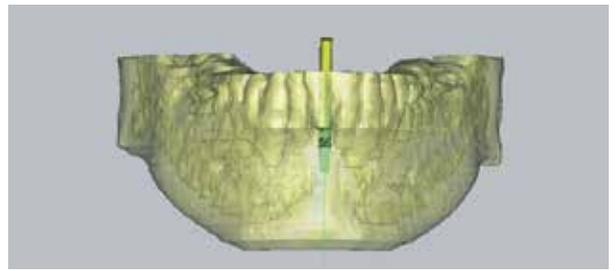


Figure 11: 3D digital planning was performed to place the implant at the "in-between" position.

▮▮ If the papilla between two missing teeth needs to be restored with artificial pink, the 'in-between' implant position offers the best option. ▮▮





Figure 12: The open flap revealed a lack of buccal and interproximal bone support, which would make it challenging to develop papilla between the two prosthetic crowns.

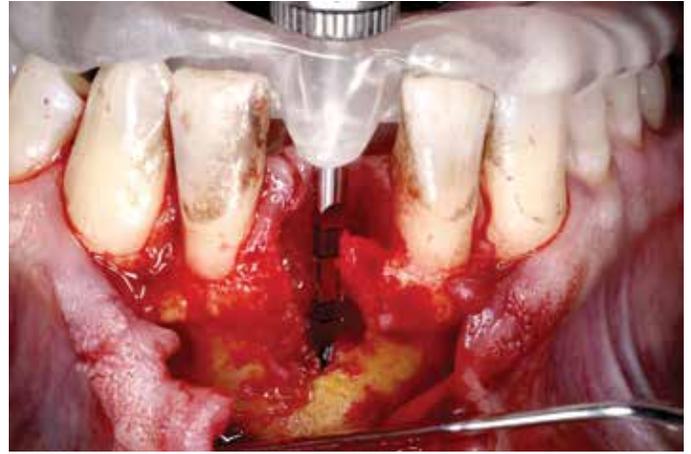


Figure 13: A surgical guide fabricated based on the “in-between” digital planning was used during implant placement.

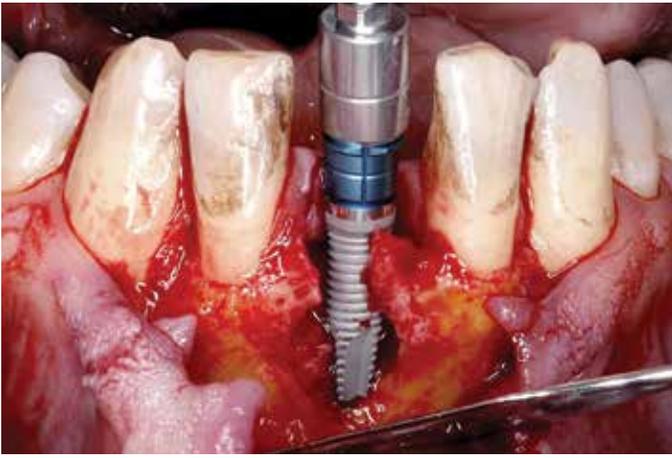


Figure 14: The “in-between” implant was placed.



Figure 15: Bone grafting was performed.



Figure 16: The bone graft was covered with a membrane.

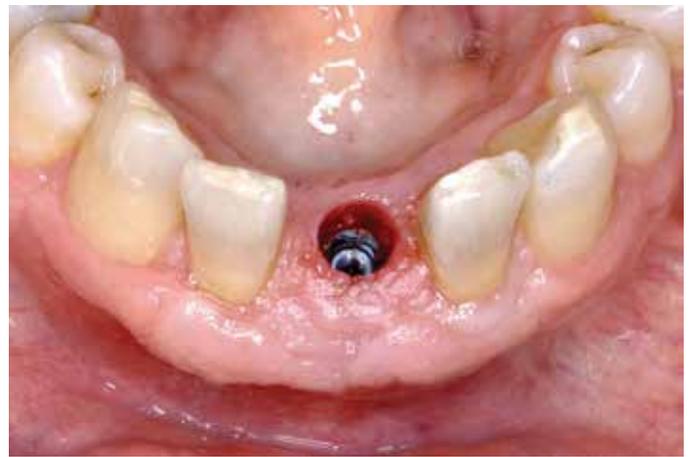


Figure 17: After healing, there was ample cauterized tissue around the implant.



Figure 18: Following the design created on the wax-up, the mesial side of the laterals was trimmed to create space for the two centrals.



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Figure 19: Views of the definitive metal-ceramic bridge with the screw access on the lingual and pink porcelain on the buccal sides.



Figure 20: The “in-between” concept makes hygiene easier; floss goes around the two half cantilevers on each side for fast, efficient, and thorough cleaning.



Figure 21: The final metal-ceramic bridge. The patient's smile reveals the restored area, emphasizing the increased importance of good esthetics. (Clinical work by Maurice Salama, DMD; ceramic work by Christian Coachman, CDT, DDS)



Figure 22: Radiographic image of the "in-between" implant. Note the implant's appropriate distance from the adjacent natural teeth roots.

Summary

Traditional implant placement aims to restore missing teeth. Ideally based on esthetic integration and load distribution, implants should replace teeth on a one-to-one basis. When implant bridges are fabricated, the classic approach has been to place them where a natural tooth was located and replace the other missing tooth with a cantilever or intermediary, and then place the next implant. However, when only two teeth are missing and a cantilever is the replacement choice, the load distribution is less than ideal. Particularly in cases where two lower incisors are missing, the space issue also presents challenges because those teeth often are quite small and likely to be crooked. In addition, if the teeth loss has been of long duration, the adjacent teeth tend to have (at least partially) closed the gap. All of these factors make one-to-one tooth implant placement impossible.

The "in-between" single implant concept represents an interesting solution, especially in the anterior mandibular region, an area particularly prone to spacing, bone, and gingival challenges. This approach provides the implant with more distance between the natural teeth, allowing better bone and papilla formation, and the prosthesis with better load distribution, since two half cantilevers are created. The medial papilla is created with pink ceramics, which blend naturally with the underlying natural gingiva. Whenever two adjacent teeth are missing and, due to a major soft and/or hard tissue defect, artificial pink is required between the two crowns, the "in-between" implant position presents a viable option for clinicians and technicians to achieve simple, hygiene-friendly, and highly esthetic results with less treatment time, lower cost, and fewer complications.

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