



The Chairside Fabrication of a Provisional Crown for a Single-Tooth Implant (2nd Edition)

A Peer-Reviewed Publication

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PUBLICATION DATE: OCTOBER 2014

REVIEW DATE: MAY 2018

EXPIRATION DATE: APRIL 2021

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The Chairside Fabrication of a Provisional Crown for a Single-Tooth Implant (2nd Edition)

EDUCATIONAL OBJECTIVES

At the conclusion of this educational activity, participants will be able to:

1. Discuss the importance of a well-fabricated provisional implant crown.
2. Describe the materials and steps needed to create a temporary prosthesis.
3. Restore a dental implant with a provisional restoration using the materials and methods discussed in this course.

ABSTRACT

Whether the intent is a delayed or immediate implant restoration, a dental implant may require a provisional crown. This can be accomplished in the laboratory or chairside. When creating a chairside provisional crown, the practitioner has control over the planned soft tissue growth and therefore the health of the implant and periodontium. This course describes and illustrates the steps needed to fabricate a chairside provisional crown for single-tooth implants.



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INTRODUCTION

When presented with an implant requiring a provisional crown, it is vital to create an emergence profile that appears natural and in harmony within and with the surrounding tissue. By fabricating a provisional crown chairside, the architecture of the gingiva can be manipulated by creating natural contours, especially where the provisional crown is subgingival. In addition, bone health responds in kind with gingival health; therefore, in part, the bone supporting the implant will continue to be supportive and maintain its height.

THE CONCEPT

There are numerous case reports and studies on the subject of implant provisional restorations, especially those in the esthetic zone. A study by Slagter et al. described the benefits of immediate implant with provisional placement. It was determined that “immediate placement with immediate provisionalization of dental implants in the esthetic zone results in excellent short-term treatment outcome in terms of implant survival and minimal change of peri-implant soft and hard tissue dimensions.”¹

Regardless of whether the implant is in the esthetic zone or not, the challenge is the preservation and health of the surrounding hard and soft tissues. In a clinical description by Chu et al., an immediate postextraction socket implant to replace a nonrestorable tooth in the esthetic zone was reported.²

To support their procedure, they described studies that “documented the biologic and esthetic benefits of bone graft containment with either a custom healing abutment or provisional restoration.”² Here, the use of a prefabricated provisional shell was used. The shell replicated the extracted tooth at the cervical area. This is the critical part of any procedure that attempts to reproduce the contours of the original tooth, especially at the subgingival level and the emergence profile. In essence, their method demonstrated that the procedure aided in guided tissue preservation and the “esthetic outcome in an easy, simple, consistent, and less time consuming way.”²

PROVISIONAL FABRICATION: CHAIRSIDE VS. LABORATORY

An excellent clarification of this subject was written by Azer in an article entitled “A simplified technique for creating a customized gingival emergence profile for implant-supported crowns.”³ He states that the “successful implant restoration is one that will allow adequate function and esthetics. Soft-tissue management around implant-supported restorations continues to present a considerable challenge for the restoring dentist as well as the laboratory technician while fabricating the final prosthesis.”³ The objective was to create a simple provisional restoration that directs tissue healing and has a gingival architecture that could be reproduced in the laboratory for the final restoration.

Additionally, whenever chairside treatment can be done, it should be employed, as this gives the practitioner full control over the clinical outcome of the immediate and long-term care of the site in question. Azer makes a compelling case for the dentist dictating the final laboratory outcome vs. the reverse.

This can be further understood when one realizes that the shape of an implant platform is circular. Therefore, when sculpted and shaped properly, the provisional restoration can serve as a mode for the architectural manipulation of the peri-implant soft tissue, thus transmitting information to the lab in the fabrication of the desired emergence profile.

ACCESS: FLAP VS. FLAPLESS

The ultimate goal of a restored implant is the health of the peri-implant tissue. To achieve this goal, there are some who advocate a flapless technique for ultimate tissue preservation.⁴ Llamas-Monteagudo et al. reported that additional research is required to determine the ideal outcome; however, implant placement via a flapless approach has proven effective.⁵ Whether by cone-beam computed tomography,⁶ bone mapping,⁷ or other means, this technique is fine so long as there is an understanding and pre-planning of the bony anatomy into which the implant will be placed. With this appreciation, many have reported great success with this technique.

In one such report by Turkyilmaz et al.,⁸ a flapless implant insertion into a fresh extraction socket of a poorly restored peg lateral was accomplished. An immediate provisional crown was fabricated and placed onto the implant. This is a highly desirable procedure, especially when the case involves a site in the maxillary anterior region “where esthetics are a high priority. The strategy preserves optimum gingival contours and papillary height may be a viable option compared to fixed partial dentures.”⁸ In addition, this report cited that this procedure is beneficial “due to some advantages including less bleeding, swelling, and the preservation of existing soft tissue contours.”⁸

This procedure is recommended, even when there is bone needed at the time of immediate implant placement.⁹ In a study by Tarnow et al., it was recommended that bone grafting should be placed into the gap between the implant and the space at either the facial, palatal, or both in “combination with a contoured healing abutment or a provisional restoration...”⁹

Of course, the question of flapping is most pertinent in the maxillary anterior region due to loss of interdental papilla and the facial aspect of tissue. However, when it comes to the posterior areas, this is not as critical. Therefore, it is often advantageous to flap a posterior site that will be receiving a dental implant.

PROVISIONAL PLACEMENT: IMMEDIATE VS. DELAYED

It is often desirable to use an implant provisional at the time of implant placement. This was the conclusion of an article entitled “Customized abutments to shape and trans-

fer peri-implant soft-tissue contours” by Stumpel et al.¹⁰ In it, he states that “with the functional successes of implant therapy being realized, the emphasis is shifting to the creation of tooth-like esthetics with implant therapy. Dental implants are placed after careful planning and site preparation, which may include bone and soft tissue grafting. The final soft tissue appearance is enhanced through the early use of provisional restorations.”¹⁰

This concept was also realized by Chee and Donovan, who stated that the earlier a provisional is placed on the implant, the more likely there will be ideal esthetics.¹¹ “The objective of restoring missing teeth with implant-supported restorations should not merely be achieving osseointegration with an implant and a biomechanically sound restoration.”¹¹ However, there is concern over the effect that an early provisional restoration can have on bone levels surrounding the implant. This concern has been put to rest by numerous studies. One study by Block et al.¹² demonstrated that “crestal bone response to immediate or delayed placement of an implant into an extraction site in the maxillary anterior region with immediate provisionalization is similar regarding hard tissue changes. Support of the gingival margin with a provisional at the time of tooth extraction and implant placement preserved 1 mm more facial gingival margin position compared with the delayed group.”¹² This, of course, is an area to be monitored following provisional implant crown placement. The healing of the peri-implant tissue using screw vs. cement-retained prostheses will now be investigated.

PROVISIONAL RETENTION: SCREW VS. CEMENT

There are two types of fixed prostheses for the restoration of a single tooth implant: cement retained and screw retained. The decision to use one or the other is based on multiple factors, and when treatment planning for a single-tooth implant-borne restoration, there are advantages and disadvantages of the two methods of retention.^{13,14}

“These include ease of fabrication, cost, esthetics, access, occlusion, retention, retrievability, clinical prosthesis fit, restriction of implant position, effect on peri-implant tissue health, provisionalization, immediate loading, impression procedures, delivery, porcelain fracture and clinical performance.”¹⁴ Since each method of retention has certain advantages and disadvantages, there are some clinical situations in which it is better to select one method of retention rather than the other.

However, neither technique is perfect, and both show areas of failure as demonstrated in the literature. A data search since 2012 showed that “screw-retained crowns demonstrated more failures such as porcelain cracks and

fractures or screw loosening, while cement-retained crowns caused more severe biological complications such as peri-implant soft tissue inflammation or pathological bone resorption.”¹⁵ In a research study of implant treatment and complications by Wang et al., a five-year retrospective assay was performed.¹⁶ Of the 5,491 implant-supported fixed prostheses, “499 mechanical complications were recorded. During the (five-year) period, screw loosening, lateral screw loosening, decementation, esthetic complication, veneer chipping or fracture, and food packing/contact point issues were recorded at different rates for different types of prostheses in the private practices included in this study. Clusters of several complications within the first year were observed. For single-implant crowns, screw-loosening complications were less frequent in the more experienced group. Operator-reported attrition was related to higher rate of veneering material fracture. More contact point complications were found in the posterior regions of the oral cavity.”¹⁶

When fabricating a chairside provisional implant restoration, it is this author’s opinion that the screw-retained method is easier. This is true for a number of reasons such as ease of handling, the ability to use preformed tooth shells, and the lack of concern over unremoved cement with peri-implant inflammation since no cement is used with the screw retained technique. Korsch et al. stated: “consequences of excess cement may be increased bleeding on probing, suppuration, and possibly peri-implant attachment loss.”¹⁷

In addition, Wittneben et al. reported, “excess cement left behind cemented restorations is a major problem and can result in soft tissue damage, bone loss, and/or chronic inflammation.”¹⁸ The literature shows that the soft tissue surrounding screw-retained crowns is healthier than the peri-implant mucosa surrounding cemented restorations.^{19,20} However, by removing cement thoroughly, the risk of leaving cement subgingivally that could cause peri-implantitis is reduced significantly.¹⁸

There are other factors that make the screw retained provisional crown desirable. One of these factors includes retrievability. Should the implant screw loosen, it is simply a matter of accessing the screw and tightening or replacing it entirely. Screw loosening has been reported to occur between 5% and 65% of the time.^{21,22,23}

“Screw loosening or fracture is more common with prosthetic screws compared to abutment screws. Screw complications are also more common in single-implant restorations compared with multiple units.”²⁴

In addition, “The most common implant restorations affected by screw loosening seem to be single-unit, mandibular molar implant-crowns.”²⁵

Also, there is only one prosthetic component used, thus making it the de facto unit for shaping soft tissue growth. In a study by Tortamano et al.,²⁶ the dimensional stability of peri-implant soft tissues around immediately placed and restored implants in the maxillary esthetic zone was evaluated. They found that “immediate implants with immediate restorations can be a predictable option for the replacement of teeth in the esthetic zone, providing stability to the peri-implant soft tissue.”²⁶

FABRICATION: STEPS TO ENSURE SUCCESSFUL CHAIRSIDE IMPLANT PROVISIONALS

The chairside creation of a provisional or temporary restoration for a dental implant requires several steps. The initial planning requires the selection of a provisional hard shell crown form (e.g., polycarbonate) or a soft, malleable, uncured composite crown (e.g., Protemp, 3M). The use of these crown forms is one of the quickest methods for this technique. Once selected, a plastic, temporary implant abutment is seated and fastened to the implant using a screw typically used for open-tray impressions. The provisional crown form is then perforated to allow full seating so that the temporary form is at the correct incisal length for anterior teeth and at the correct occlusal height for posterior teeth. For hard shells, the access opening can be created using a carbide lab or high-speed bur. For soft forms, a rubber dam punch is used. In either case, the final hole should be large enough to allow a passive fit over the screw/abutment assembly.

The intaglio aspect of the polycarbonate crown should be abraded with a bur or sandblasted to create a rough surface. This roughened surface will allow for improved adhesion to resin and should be rinsed, thoroughly dried, and an unfilled liquid resin applied and cured. This step is not required for the uncured composite crown form. A small amount of wax is placed over the screw head to prevent clogging. A flowable composite, selected for the appropriate shade, is then injected into the provisional shell and the shell seated to the preestablished incisal or occlusal height. The composite is well cured, being careful to ensure that the flowable is cured at the most apical areas. This is a critical step and ensures that the provisional crown, flowable composite, and temporary implant abutment are now one piece. Once removed, the one-piece provisional can then be completed. This requires the careful addition of flowable composite along any areas of exposed plastic abutment as well as any voids or irregularities that need attention. During this process, the screw-retained provisional should be tried back on the implant to assure complete seating.

Once satisfied, any excess material is trimmed and the crown polished. After polishing, the screw retained provisional crown is seated and screwed to place on the implant. The occlusion should be adjusted depending on the amount of occlusal load one wishes to impart. A final polish should be applied to the adjusted occlusion. If any surgical flaps were made to gain access to the implant prior to provisional fabrication, the soft tissue can be sutured, using the contours of the provisional screw retained crown to ultimately form the final soft tissue architecture.

CASE HISTORY: PROVISIONAL FOR ANTERIOR IMPLANT

A 45-year-old male presented with a nonrestorable maxillary lateral incisor due to extensive decay. It was decided to extract the tooth and place an immediate implant. Once an implant is placed in the esthetic zone, the patient must not go without a tooth. Provided the implant has excellent stability, a provisional crown should be placed.

For this patient, a Legacy[™] implant was placed, and a plastic temporary abutment was seated and screwed on the implant (Figure 1). A provisional

acrylic shell crown was adjusted to fit over the adjusted plastic abutment, and a long retention screw was placed (Figure 2). A cotton pellet was inserted into the screw access hole, and the crown filled with flowable composite (Figure 3). After curing, the entire assembly was removed from the implant. Flowable composite resin was added where necessary (Figure 4), trimmed and polished (Figures 5 and 6), and the occlusion adjusted. After three months, the site was evaluated and the tissue appeared healthy and the papillae intact (Figure 7).

Figure 1.



Figure 2.



Figure 3.



Figure 4.



Figure 5.



Figure 6.



Figure 7.

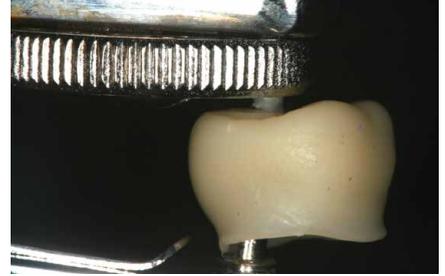
Figure 8.



Figure 9.



Figure 10.



CASE HISTORY: PROVISIONAL FOR POSTERIOR IMPLANT

After allowing for osseointegration of a lower left implant in the first molar area, the patient presented for a provisional crown (Figure 8). Due to lack of sufficient attached tissue on the facial aspect, a sliding full thickness flap was made. The patient received local anesthesia and papillae-sparing vertical incisions were made. The tissue was released and slid in a facial-apical direction. Prior to suturing, a temporary plastic abutment was seated and screwed to the implant (Figure 9). Then a provisional composite crown was selected and a hole created with a rubber dam punch in the uncured crown (Figure 10). The crown was placed over the abutment (Figure 11), cured, and the entire assembly was removed from the implant (Figure 12). The voids were filled with a flowable composite resin (Figure 13), trimmed (Figure 14), and the occlusion adjusted. After polishing, the screw retained provisional crown was seated and screwed to place on the implant (Figure 15). The flap was secured with interrupted sutures using chromic gut. Periodontal packing was placed over the surgical site, and the patient was dismissed with home-care instructions. After a one-week postoperative check, and a total healing period of three weeks, the site was ready for a final impression (Figure 16), and the occlusion on the provisional crown was modified to provide for increased loading (Figure 17).

Figure 11.

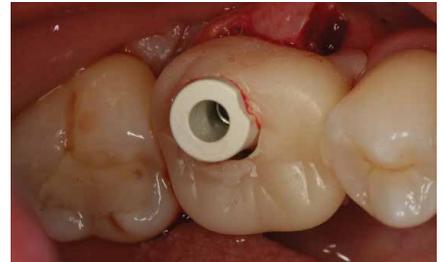


Figure 12.



Figure 13.



Figure 14.



SUMMARY

The ability to replace a missing tooth with a dental implant is a necessary function in daily clinical dentistry. The use of a provisional crown on the implant is especially important in areas of esthetics, and where soft tissue requires time for optimal healing. When fabricated chairside, these crowns offer the practitioner complete control over soft tissue growth, occlusion, and overall function and form. Thus, the ability to fabricate a provisional crown chairside offers a generous amount of positive attributes to the success of these cases.

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Figure 15.



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Figure 16.



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Figure 17.



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AUTHOR PROFILE

Dr. Ian Shuman maintains a full time general, reconstructive and aesthetic dental practice in Pasadena, Maryland. An educator and author, Dr. Shuman is a pioneer in developing advanced, minimally invasive techniques. Dr. Shuman is the Editorial Director of Continuing Education for PennWell Publishing. He is a Master in the Academy of General Dentistry, an Associate Fellow of the American Academy of Implant Dentistry, and a Fellow of the Pierre Fauchard Academy. Dr. Shuman was named one of the Top Clinicians in Continuing Education since 2005 by Dentistry Today. Dr. Shuman's mission is to teach dental professionals current methods for creating beautiful, long lasting restorations that preserve the maximum amount of tooth structure.

AUTHOR DISCLOSURE

Dr. Ian Shuman has no commercial ties with the sponsors or the providers of the unrestricted educational grant for this course.

The author of this course receives an honorarium.

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QUESTIONS

1. When creating a chairside provisional crown, which of the following does the practitioner not have control over?
 - a. Planned soft tissue growth
 - b. Bone growth of opposing tooth
 - c. Periodontal health
 - d. Health of the implant
2. When presented with an implant requiring a provisional crown that appears natural and in harmony within and with the surrounding tissue, it is vital to create:
 - a. Osseointegration
 - b. VDO
 - c. An emergence profile
 - d. Architecture of adjacent teeth
3. Which of the following statements is true?
 - a. Regardless of whether the implant is in the esthetic zone or not, the challenge is the preservation of the surrounding hard and soft tissues.
 - b. The implant must be in the esthetic zone for the challenge of preservation of the surrounding hard and soft tissues.
 - c. Regardless of whether the implant is in the esthetic zone or not, the challenge is not actually the preservation of the surrounding hard and soft tissues.
 - d. Regardless of whether the implant is in the esthetic zone or not, the challenge is the preservation of the surrounding soft tissue.
4. For ultimate tissue preservation, there are many who advocate which of the following techniques?
 - a. Transgingival
 - b. Flap
 - c. Z-plasty
 - d. Flapless
5. It is often advantageous to flap a posterior site that will be receiving a:
 - a. Dental implant
 - b. Fixed bridge
 - c. Partial denture
 - d. LANAP procedure
6. The final soft tissue appearance is enhanced through the early use of a:
 - a. 3 mm healing cap
 - b. Provisional restoration
 - c. 5 mm healing cap
 - d. Final restoration
7. Chee and Donovan stated that the earlier a provisional is placed on an implant, the more likely there will be:
 - a. Bone loss
 - b. Osseointegration
 - c. Ideal esthetics
 - d. Lingual recession
8. Azer mentions that successful implant restoration is one that will provide adequate:
 - a. Esthetics
 - b. Function
 - c. Occlusion
 - d. Both a and b
9. Which of the following authors stated: "Immediate implants with immediate restorations can be a predictable option for the replacement of teeth in the esthetic zone, providing stability to the peri-implant soft tissue"?
 - a. Chu
 - b. Tortamano
 - c. Block
 - d. Tarnow
10. By fabricating a provisional crown chairside, the architecture of the gingiva can be manipulated by creating:
 - a. Unnatural contours
 - b. Natural contours
 - c. Subgingival contours
 - d. Both b and c
11. In a report by Turkeyilmaz, a flapless, immediate implant was placed due to a poorly restored:
 - a. Supernumerary tooth
 - b. Cusp of Carabelli
 - c. Peg lateral
 - d. Central incisor
12. The ultimate end goal of a restored implant is the health of the:
 - a. Root
 - b. Gingiva
 - c. Peri-implant tissue
 - d. Crown
13. Provided an implant in the esthetic zone has excellent stability, which of the following should be placed?
 - a. Maryland bridge
 - b. Flipper
 - c. Provisional crown
 - d. None of the above
14. In the case history of the posterior implant, what type of flap was made?
 - a. Pedicle flap
 - b. Sliding full thickness flap
 - c. Mucosal
 - d. All of the above
15. It was reported that a flapless implant insertion into a fresh extraction socket has which of the following advantages?
 - a. Less swelling
 - b. More bleeding
 - c. Less hemostasis
 - d. Elimination of existing soft tissue contours
16. In a clinical description by Chu, the shell replicated the extracted tooth at the:
 - a. Incisal
 - b. Cervical
 - c. Middle third
 - d. Cingulum
17. A screw-retained provisional is preferred due to all of the following except:
 - a. Ease of handling
 - b. Ability to use preformed tooth shells
 - c. Lack of concern over unremoved cement
 - d. Ease of coping fabrication
18. The study by Block demonstrated that support of the gingival margin with a provisional at the time of tooth extraction and implant placement preserved:
 - a. 2 mm lingual gingival margin
 - b. 1 mm facial gingival margin
 - c. 1.5 mm lingual gingival margin
 - d. 0.5 mm facial gingival margin
19. Advantages and disadvantages of screw retained and cement retained prostheses include:
 - a. Esthetics
 - b. Retention
 - c. Retrievability
 - d. All of the above
20. The shape of an implant platform is:
 - a. Oblong
 - b. Square
 - c. Circular
 - d. Semicircular

QUESTIONS

21. In regard to implant placement via a flapless approach, who reported that additional research is required to determine the ideal outcome?

- a. Ricardo-Llamas
- b. Llamas-Montevideo et al.
- c. Mont-Blanc
- d. Llamas-Monteagudo et al.

22. According to Slagter et al., it was determined that immediate placement with immediate provisionalization of dental implants in the esthetic zone results in which of the following

- a. Minimal change of peri-implant soft and tissue dimensions
- b. Minimal change of peri-implant hard tissue dimensions
- c. Excellent short-term treatment outcome in terms of implant survival
- d. All of the above

23. In regard to cementable implant restorations, Korsch et al. stated that the consequences of excess cement might be:

- a. Increased bleeding on probing
- b. Suppuration
- c. Possible peri-implant attachment loss
- d. All of the above

24. Who wrote an article entitled "A simplified technique for creating a customized gingival emergence profile for implant-supported crowns"?

- a. Chase
- b. Azer
- c. Sweeny
- d. None of the above

25. Prior to filling the crown's screw access hole with flowable composite, what should be inserted to protect the screw head?

- a. Acid etch
- b. Glass ionomer
- c. Cotton pellet
- d. Gutta percha

26. A 45-year-old male presented with history of a nonrestorable maxillary lateral incisor due to:

- a. Injury
- b. Root fracture
- c. Extensive decay
- d. Recurrent apical abscess

27. In the case of the lower left implant in the first molar area, the patient presented for a:

- a. Healing cap
- b. Cover screw
- c. Healing abutment
- d. Provisional crown

28. In the first clinical case presented, Figure 1 demonstrates a:

- a. Ceramic abutment
- b. Plastic temporary abutment
- c. Titanium abutment
- d. Final abutment

29. Screw loosening has been reported to occur between:

- a. Disparate metals
- b. Natural and implant crowns
- c. 5% and 65% of the time
- d. All of the above

30. Wittneben et al. reported that excess cement left behind cemented restorations is a major problem and can result in which of the following:

- a. Soft tissue damage
- b. Bone loss
- c. Chronic inflammation
- d. All of the above

NOTES

