Peri-implant Soft Tissue Conditioning with Provisional Restorations in the Esthetic Zone: The Dynamic Compression Technique

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An optimal esthetic implant restoration is a combination of a visually pleasing prosthesis and surrounding peri-implant soft tissue architecture. This article introduces a clinical method, the dynamic compression technique, of conditioning soft tissues around bone-level implants with provisional restorations in the esthetic zone. The technique has several goals: to establish an adequate emergence profile; to recreate a balanced mucosa course and level in harmony with the gingiva of the adjacent teeth, including papilla height/width, localization of the mucosal zenith and the tissue profile's triangular shape; as well as to establish an accurate proximal contact area with the adjacent tooth/implant crown. (Int J Periodontics Restorative Dent 2013;33:447–455. doi: 10.11607/prd.1268)

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fully mimic the anatomical and esthetic characteristics of the tooth or teeth that will be replaced. Implants featuring the abutment connection at the crestal bone level are preferably indicated in the esthetic zone. With the bone-level design, the clinician has more freedom to determine the location of the crown margin, the final mucosal zenith position, the emergence profile, and the soft tissue architecture. After a successful surgical approach with bone-level implants, it is important to provisionalize to develop the desired soft tissue architecture and emergence profile. Dental implants differ from natural teeth in size and shape at the crestal bone level and at the mucosa level. After removal of healing caps, the geometry of the tissue profile is circular and does not match that around teeth. Especially with incisors, teeth have a more triangular tissue profile created by the emergence profile and form of the teeth. Therefore, the peri-implant soft tissue profile has to be converted into a tissue profile that is in harmony with the neighboring dentition. The aim of this study was to introduce a novel clinical method, the dynamic compression technique, to create an esthetically pleasing peri-implant soft tissue architecture and emergence profile for single and adjacent implant restorations in the esthetic zone.

### The Dynamic Compression Technique

Two clinical cases, one requiring a single implant restoration (case 1) (Figs 1 to 8) and the other a replacement of two teeth with adjacent implants (case 2) (Figs 9 to 14), were chosen to present the step-by-step procedures of the dynamic compression technique.

Prior to implant placement, it is important to perform detailed treatment planning, evaluate all possible risk factors, and determine the complexity of the treatment. The SAC (straight forward, advanced, complex) classification is a useful tool to assess the difficulty of treatment and deter-
mine whether an interdisciplinary approach is necessary. For both cases, a multidisciplinary team approach was chosen. To minimize the risk for complications, evidence-based surgical and loading protocols were used. In the esthetic zone, bone-level type implants are recommended and inserted following an early placement concept, ie, 6 to 8 weeks postextraction, and...
loaded with a fixed provisional after 6 to 8 weeks (early loading).\textsuperscript{8} Frequently in the esthetic zone, contour augmentation using guided bone regeneration (GBR) is performed concomitantly to increase and maintain the thickness of the buccal bone wall, and by this token the soft tissue contour, leading to a stable long-term result. GBR was performed in both cases for maintenance of the buccal bone and subsequent soft tissue support. Implants must be positioned to create a defined threedimensional tissue-to-implant relationship\textsuperscript{9} to achieve an ideal prosthetic position of the implant platform in mesiodistal, orofacial, and coronal directions and angulations. The accurate prosthetic position can be determined with a wax-up, which is intraorally verified using a mock-up try-in and/or the use of the provisional. This information is subsequently transferred to a radiographic stent with radio-opaque teeth in the ideal prosthetic position. Subsequently, with the use of cone beam computed tomography, the available bone relating to the proposed prosthetic implant position can be verified. The radiographic stent can be transitioned into the surgical stent.

Prior to loading the implant, a provisional must be chosen that preserves the existing soft tissue. Therefore, a nontransmucosally loading provisional should be the interim restoration of choice.\textsuperscript{10} In both cases, an Essix retainer was chosen.

At stage-two surgery, management of the soft tissue architecture begins with the insertion of a longer healing cap. Starting from the round diameter of the implant, a tissue profile according to the planned reconstruction matching...
and mimicking a natural tooth with gingiva and the adjacent dentition has to be generated. It is helpful to enlarge at least two different healing caps or mucosa former sizes to add initial pressure on the planned soft tissue conditioning site.

Fixed implant-supported provisionals can be fabricated either in the laboratory or chairside. Laboratory-fabricated provisionals have the advantage of reducing chair time and offer the possibility of creating the ideal emergence profile directly on the cast, adapting to the adjacent dentition and situation. Chairside provisionals can be fabricated immediately in one visit. In general, all provisionals must be highly polished to have a high surface quality that reduces the growth/development of plaque bacteria. For proper soft tissue conditioning, a screw-retained provisional is preferred because of its easy removability. After delivery of the implant-supported provisional, the patient should be instructed in oral hygiene and daily use of dental floss or interdental brushes.

Soft tissue management with the dynamic compression technique is performed by first inducing pressure to guide the soft tissue and “squeeze” it in the right position. Next, the provisional is periodically reduced to create space for soft tissue fill.

**Technique details**

A screw-retained implant provisional, slightly overcontoured in the mesial and distal regions, is inserted, applying pressure to form the mucosa (Fig 1). By customizing the shape and the contour, the peri-implant frame is improved and the emergence profile formed (Figs 1 and 2). The presence of an
interproximal contact area to the adjacent tooth/implant crown is important. The initial reaction to the applied pressure on the mucosa at insertion is of the ischemic type, causing so-called blanching of the peri-implant soft tissue that should only be moderate and should disappear within 15 minutes (Figs 1, 4b, and 10). It is essential to control this reaction and limit its extent to halfway to the neighboring teeth. This blanching phenomenon should be moderate to avoid tissue damage and, ultimately, necrosis. It is recommended to wait during the visit until this ischemic reaction disappears, confirming that the peripheral blood perfusion has been reestablished at the specific site.

During the first 2 weeks, selective pressure is applied by adding volume using flowable composite resin or light-cured acrylic resin on selected sites. Material is added extraorally by first marking the site with a pencil. After each additive, the provisional is polished. In cases requiring large volume changes, the initial shape of the provisional crown may demonstrate a ridge lap design and/or concave surfaces. Since such niches will induce plaque accumulation, this design should be avoided.

Two weeks later, the shape is modified by removing volume in the interproximal and cervical areas (Figs 1, 5, and 11). This creates

**Fig 13** (a) Final all-ceramic screw-retained single crowns. (b) Final periapical radiograph.

**Fig 14** One-year follow-up shows stable soft tissue contours.
space for the soft tissue and allows the papillae to mature into the prepared space. The goals are to recreate a balanced mucosa/gingival level matching the adjacent dentition, to establish an accurate emergence profile, to relocate precisely the gingival zenith, to achieve balanced papilla height/width, and to create a proximal contact area with the adjacent tooth/implant crown. In both cases, the material was intraorally removed using a yellow-coded fine sharp-pointed diamond bur (Komet) while simultaneously retracting the mucosa with a spatula. Subsequently, the area was polished with a sharp-pointed Arkansas stone (Shofu Dental). As a consequence, the respective provisional crown outline was now undercontoured. It is important that this procedure is done under optimal plaque control with homecare maintenance by the patient.

The following techniques have been proposed to transfer the created soft tissue profile and architecture to the final master cast: (1) using an individualized impression coping that has the same tissue profile as the clinically approved provisional, (2) using the provisional itself as an impression coping, (3) injecting impression material around a provisional restoration seated on the master cast, and (4) fabricating an emergence profile cast. In both cases, a customized impression coping was fabricated, reproducing the created emergence and tissue profile from the provisional crown that was attached to an implant analog. A silicone impression (Silikon Optosil, M+W Dental) was taken, capturing the emergence profile. The provisional was then removed from the analog and replaced with an impression coping that had previously been sandblasted in its cervical portion. The space between the copied emergence profile and the impression coping was then filled in with composite resin material (Pattern Resin, GC Europe).

The definitive restorations were inserted after finalization of the soft tissue contour with the provisionals, ie, 4 months in the single tooth case (Figs 6 and 7a) and after 6 months in the case with adjacent implants (Figs 12 and 13a). The 1-year follow-up showed stable peri-implant soft tissue (Figs 8 and 14) and bone level conditions in both cases.

**Discussion**

Esthetic outcomes of implant restorations can be compromised despite successful osseointegration of dental implants due to inadequate prosthetic management. An esthetic implant restoration depends on prosthetically and biologically driven implant placement, a visually pleasing prosthesis, and surrounding peri-implant soft tissue architecture. Patient perceptions on the presence of interdental papillae are subjective and dependent upon individual interpretation, although a lack of papilla, resulting in an open embrasure, can significantly affect a patient's smile. Kokich et al showed that the threshold for open gingival embrasures, ie, the point at which both clinicians and lay people rated them as unattractive, was 3 mm.

The following factors influence the final outcome of pink esthetics: the three-dimensional position of the implant; the soft tissue emergence profile, which determines papilla height and symmetry and is influenced by adjacent implant positions, balanced gingival levels, and papilla height symmetry; as well as any patient-dependent factors and/or prevailing risk factors.

Another important consideration is the location of the contact point for the presence or absence of the interproximal papilla. Achieving esthetic gingival contours, especially suitable interproximal papilla height, is therefore a complex challenge. The provisional restoration phase is of importance. Priest states that “the provisional phase is the most prolonged and...
arguably the most crucial stage of restorative implant treatment.”

The literature is lacking in techniques presenting soft tissue conditioning with implant-supported provisional, and only a few case reports have been published in this context. The provisional restoration is used to redirect a set volume of mucosa to establish optimal papillary and sulcular profiles. Often, it has been suggested to manipulate and modify the implant-supported provisional without mentioning how exactly the modification should be performed. So far the only technique presented in the literature is shaping the peri-implant tissue by adding composite resin on the provisional during the soft tissue conditioning phase. In the initial phase, it is important to squeeze the tissue in the right direction. Especially in the papillary region, the tissue will not have the space to mature and fill up the papillary space as the provisional will be slightly overcontoured due to the addition of the resin material. Therefore, the dynamic compression method uses the pressure in the initial phase since only the round shape has been formed by the transmucosal healing cap. Pressure is added in several steps to avoid necrosis, anemia, or pain. The pressure squeezes the soft tissue laterally to guide it into the right position, and then it is important to strategically reduce the provisional by undercontouring, especially in the papillary region, to allow the tissue to fill the created space. This can be performed over several appointments. By providing this space in the release phase, the soft tissue tends to fill in as observed in clinical cases.

In the presented technique, modification of the provisional is the crucial aspect—the prosthetic management to finalize the soft tissue architecture and maximize the esthetic result.

Conclusion

Implant-level provisional restorations play an essential role, especially in the esthetic zone, finalizing the peri-implant soft tissue architecture and creating a suitable emergence profile to achieve a pleasing and natural esthetic outcome.

The dynamic compression technique with provisional restorations in the esthetic zone represents a clinical method that relies on initial pressure and subsequent modification of the provisional by creating space in the papillary region.

To confirm the validity of this novel technique, clinical studies are needed to examine the long-term stability of peri-implant soft tissues and in vivo histologic analyses are required to show the exact formation of the tissue.

Acknowledgments

The authors express their gratitude to Master Dental Technician Thomas Furter (Art Dent, Bern, Switzerland) for the dental laboratory work in both presented cases. The authors reported no conflicts of interest related to this study.

References


