Masterclass in Clinical Practice

Dental Implants

with

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Developing the emergence profile: Part 2 Fixed provisional implant-supported restoration/ prosthesis.

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Introduction

Part 1 of this Masterclass focused on the use of healing abutments to develop the emergence profile of the soft tissue surrounding a dental implant. Part 2 aims to clarify and provide clinical tips and steps to develop the emergence profile using a fixed provisional implant-supported restoration/prosthesis.

According to The Glossary of Prosthodontic Terms (10th Edition) a provisional prosthesis is a prosthesis designed to "enhance aesthetics, provide stabilization and/or function for a limited period of time, and should be replaced by a definitive prosthesis after a period of time".[1]

Timing of provisionalization

During the treatment planning phase, the clinician may discuss the possibility of immediately restoring dental implants, however the final decision-making is confirmed clinically at time of implant placement, based on several factors, amongst others, the stability of the implant, bone quality and the aesthetic demand of the specific site.

When it comes to the restoration, the clinician has two broad treatment approaches. The restoration can either be fabricated and delivered at time of implant placement (immediate restoration), or if there is need to delay this step, due to instability or other healing factors, the restoration can be fabricated once the implant has sufficiently osseointegrated and the site is healed.

1. Immediate provisionalization of the dental implant

Immediate provisionalization may contribute to a more promising and predictable outcome, due to the guidance and support that is offered to the soft tissue, specifically the facial gingival margin and the interdental papillae. This predictability is particularly seen when using a customized provisional restoration, which is either fabricated chairside, or in a dental laboratory, and delivered within 48hours of the implant placement.

Immediate provisionalization is associated with shorter treatment times and fewer dental appointments, protection of the soft and hard tissue after implant placement, and improved aesthetic outcomes. The only comparable result will be if the implant is placed in a 2-stage protocol and exposed after integration. This also provides for the opportunity to take an impression/index of the implant at placement and to have the provisional crown manufactured while integration is taking place. The index method using composite for the implant impression is done during surgery and does not touch the gingiva or bone so it is safe from a surgical standpoint (see video for demonstration of index impression). During the exposure, the provisional crown can then be placed to guide the soft tissue without the risk of implant failure due to immediate loading.

2. Provisionalization of an osseointegrated dental implant

In the case of an osseointegrated implant, the implant will either have a cover screw (requiring a second stage surgery to first expose the implant), or a healing abutment will be in place. A healed implant can be restored with a provisional restoration once the osseointegration has been confirmed. This is usually anytime from two to six months following implant placement. Replacing the healing abutment with a provisional restoration/crown will not be

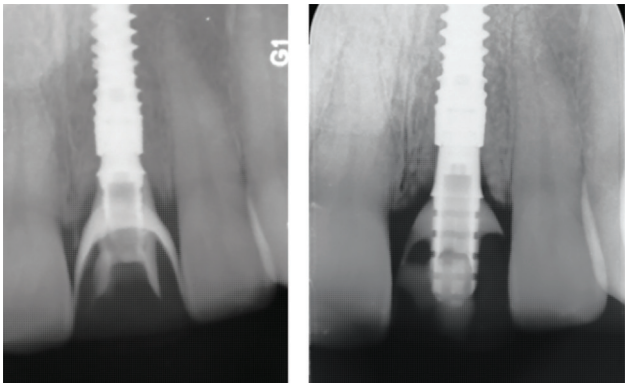

Figure 1: Short cuff height abutment applying pressure on surrounding bone (left); Correct longer cuff height abutment on right not touching bone.

able to influence, or shape, the soft tissue contours as much as the immediate restoration, as the gingiva will have been shaped by the healing abutment and the tissue will already be mature.

Clinical protocols available:

The clinician has the option to either fabricate a provisional restoration chairside, or to take an impression (analogue or digital) and have the laboratory fabricate the restoration. There are several critical aspects to be considered, regardless of the option chosen. The clinician should be aware of their role with regards to choosing both the correct provisional abutment and the correct material with which to fabricate the provisional restoration.

Abutment choice

The selection of the provisional abutment to be used is important as it has a direct relationship with the hard and soft tissue healing and morphology around an implant. When the healing abutment has been removed, a clearly marked periodontal probe should be used to measure the distance between the shoulder of the implant and the free gingival margin. This measurement should ideally be recorded on the buccal aspect of the implant and the shortest measurement should be noted, giving you the soft tissue height around the implant. Subtraction of at least 1mm from this measurement will give you the recommended "cuff height" of the provisional abutment. This cuff height measurement should be provided to the technician to facilitate abutment selection.

If the cuff height of the abutment chosen is too short, then pressure may be applied to the bone and prevent complete seating of the restoration (Fig. 1).

In part 1 of this Masterclass the importance of the healing abutment was emphasized. Many companies standardize the shapes of their healing abutments, and provisional and final abutments, ensuring that the emergence profile created by the healing abutment can be followed through to the provisional and final restoration. Your abutment choice can therefore be aided by supplying the specifications of the healing abutment used to your technician. It is good practice the provide the technician with a radiograph of the healing abutment, and if possible, an old used healing abutment of the exact dimensions. This will ensure the emergence profile is followed through from healing abutment to provisional crown.

Material choice

There are several material options available:

1. PMMA (Polymethyl methacrylate)
2. Composite resin
3. Auto-polymerizing acrylic resin (ColdPacTM)

When choosing the material for the implant-supported restoration, there are several aspects which need to be considered:

- Strength and durability – The material should not be prone to breakage or wear during the period of use.
- Modifiable – The provisional restoration may need to be modified/recontoured either by adding material or by polishing away material. The material of choice needs to support these modifications. Composite resin is easily modified with materials readily available in the dental clinic. Acrylic resin on the other hand proves to be more challenging and time-consuming as the acrylic needs additional time to cure prior to finishing/polishing.
- Highly polishable – The restoration needs to be highly polished to avoid irritation of the peri-implant soft tissue and to prevent plaque accumulation. Ideally, the clinician should have the necessary polishing burs/wheels available in their practice to re-polish the restoration after any modifications have been made. Most clinicians have the instrumentation to polish composite resin to a high degree.
- Aesthetically-pleasing – The restoration needs to satisfy the aesthetic needs of the patient. Anterior restorations can be stained etc. to improve on the natural appearance thereof.

Chairside provisional restoration fabrication

The clinician has several options available to assist with the chairside fabrication of the provisional restoration:

- Diagnostic wax-up and vacuform template (Fig. 2)

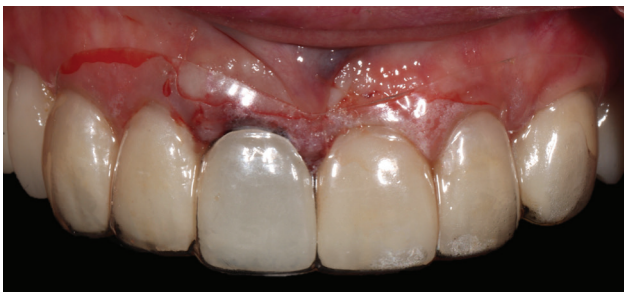

Figure 2: Diagnostic wax-up and vacuform template

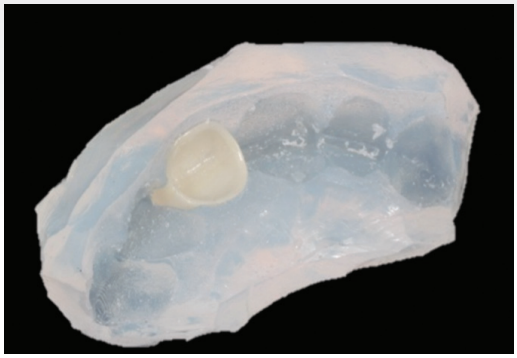

Figure 3: Digitally designed restoration with silicone template.

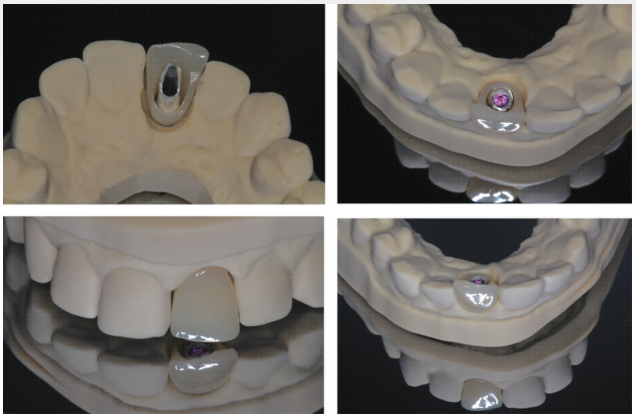

Figure 4: Shell temporary restoration, hollowed out to fit passively over the abutment.

- Digitally designed provisional restoration with silicone template (Fig. 3)
- Shell temporary restoration or denture tooth, with or without positioning jig (Fig. 4)
- Hollowed out natural tooth crown or denture tooth.

1. A suitable provisional abutment is positioned and tightened (Fig. 5), and the accurate seating thereof is confirmed via intra-oral radiograph. The provisional abutment is adjusted (Fig. 6) to ensure sufficient space for the provisional restorative material within the template, or the accurate seating of the shell temporary crown, hollowed-out natural tooth crown or denture tooth.
2. If a metal abutment is being used, then a flowable light-cured opaquer should be used to mask the grey colour of the metal (Fig. 7).
3. To prevent the material from entering the screw access chamber of the provisional abutment, polytetrafluoroethylene (PTFE)/Teflon tape should be inserted firmly into the access chamber.
4. Isolation of the adjacent teeth by means of PTFE tape will also be helpful. Blocking out of undercuts can be done with PTFE tape or a block-out resin material (Fig. 8)
5. If using a vacuform/silicone template, the template is then filled with provisional crown and bridge material, seated and light cured. Once light cured, the template is removed from the mouth. If using a shell temp or the hollowed out natural crown/denture tooth, the fitting surface of the crown/tooth should first be prepared by

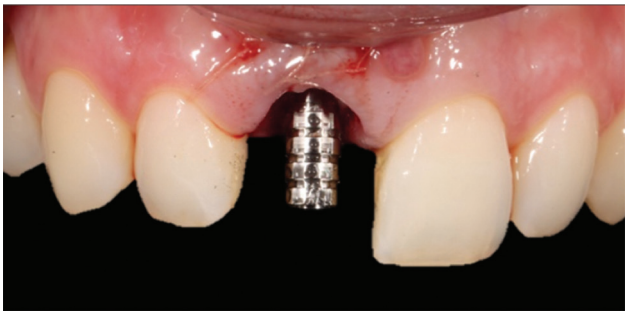

Figure 5: Provisional abutment positioned and tightened.

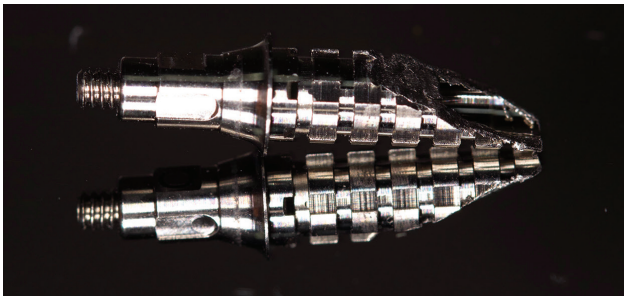

Figure 6: Trim and adjust provisional abutment as needed.

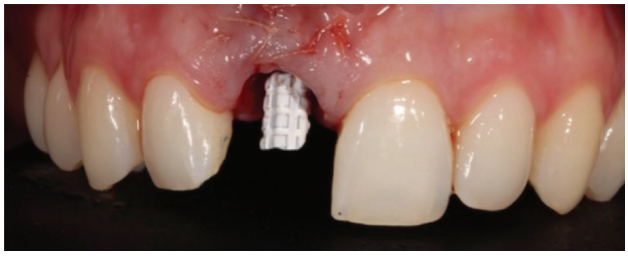

Figure 7: Light-cured opaquer applied to the provisional abutment to mask the grey metal. Without this it is not possible to obtain an aesthetic provisional crown colour.

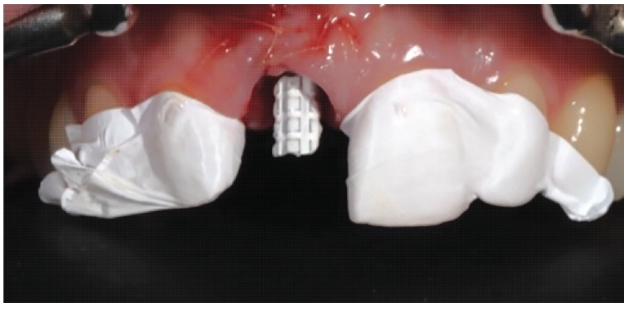

Figure 8: Isolation of adjacent teeth using PTFE (Teflon) tape

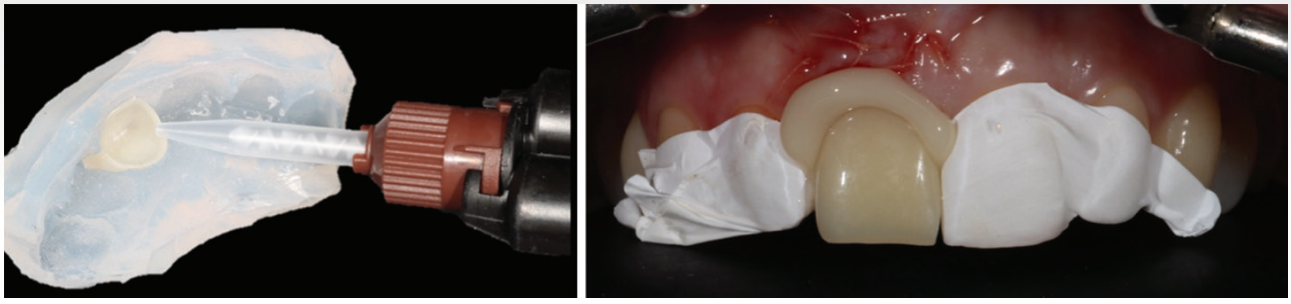

Figure 9: Shell temporary restoration being relined using a flowable temporary crown and bridge material.

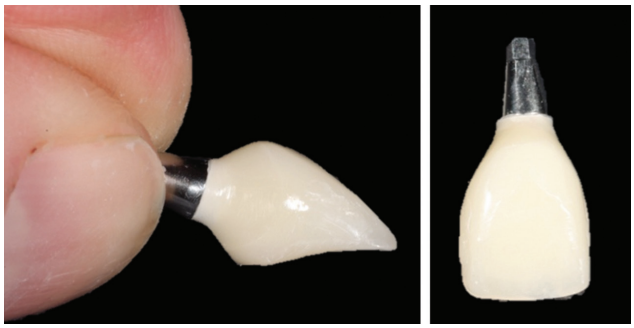

Figure 10: Concave subgingival shape to allow soft tissue fill on all aspects around the restoration.

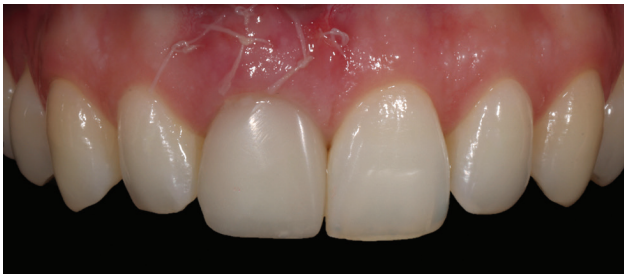

FIgure 11: Seating of provisional restoration immediately after implant placement

sandblasting/etching. A flowable light-cure composite resin or provisional crown and bridge material can be used to reline the crown over the provisional abutment (Fig. 9).

6. A small diamond bur can then be used to open the access around the provisional abutment screw channel. The PTFE tape is removed and the provisional crown removed from the implant and the oral cavity.
7. Outside the mouth, all voids need to be filled in with flowable composite. A concave shape should be created below the gingival margin to allow space for the facial and interproximal gingiva to fill in (Fig.10).
8. The provisional crown should be finished to a high lustre using a combination of polishing burs and wheels. Ideally the crown should also be pumiced to create a very smooth surface in contact with the gingiva.
9. The screw-retained provisional crown is then inserted and torqued according to the manufacturer's instructions (Fig. 11). An intra-oral radiograph should be taken to confirm accurate seating of the restoration.
10. All occlusal contacts with the opposing arch should be removed, both in maximum intercuspation and during lateral excursive movements. This means that the restoration should be in "infra-occlusion".
11. PTFE tape is packed with force over the screw head using an "amalgam packer" and composite resin is used to seal the access opening.

Laboratory-made provisional restorations

Alternatively, the clinician can have the provisional restoration fabricated in the laboratory and delivered within 48hours of implant placement, unless an index was taken at time of implant placement in a 2-stage protocol with provisional crown placed at time of exposure (see video QR code).

Two protocols exist, either a conventional impression or a digital intra-oral scan can be performed.

Regardless of the option chosen, the clinician needs to ensure that they have the correct components and instrumentation for the specific implant type required.

Option 1: Conventional impression

For a conventional impression the clinician will need either an open- or closed-tray impression coping for use with a customized, special tray (ideally) (Fig.12 & 13). The applicable laboratory implant analog will also be required.

1. Confirm fit of the impression tray to be used and if using an open-tray impression coping ensure that an opening within the impression tray corresponds to the location of the implant.
2. Remove the healing abutment from the implant, measure the cuff height and attach the impression coping (Fig. 14). Confirm accurate seating with a peri-apical radiograph.
3. Re-confirm the positioning of the impression tray intra-orally.
4. Extra-orally cover the opening in the open impression tray

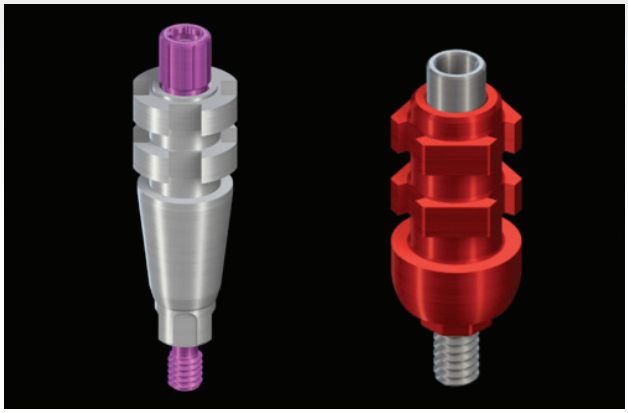

Figure 12: Examples of open-tray impression copings

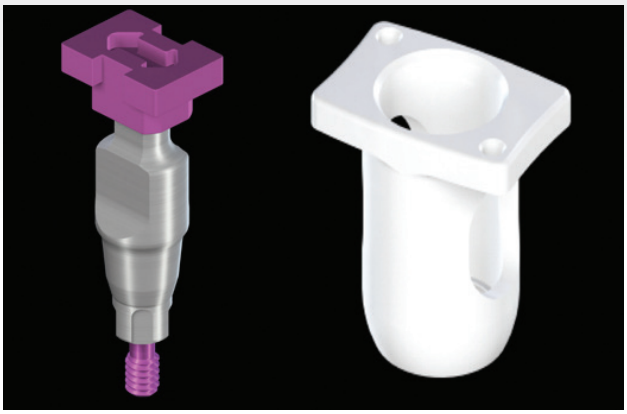

Figure 13: Examples of closed-tray impression copings

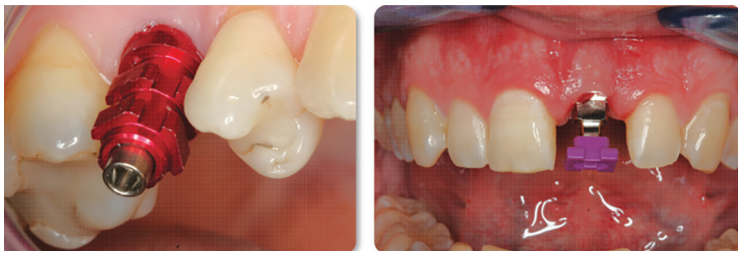

Figure 14: Open-tray (left) and closed-tray (right) impression copings in situ

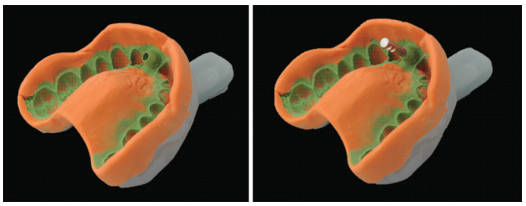

Figure 15: Set closed-tray impression removed from the mouth for inspection (left); laboratory implant analog attached and tightened onto the impression coping within the impression (right).

with pink modelling wax. Apply the applicable adhesive to the impression tray.

5. Fill the impression tray with the impression material. Polyether (Impregum) or several PVS materials can be used as their accuracy is predictable. Ideally a syringe filled with the Impregum or light body (if applicable) is also needed.
6. Dry all the teeth with specific attention to the drying of the adjacent teeth and the impression coping.
7. Syringe the impression material around the impression coping and the adjacent teeth and seat the impression tray containing the remaining material. When seating the tray ensure that the screw of the open-tray impression coping pushes through the wax of the impression tray and can be easily located.
8. Steady the impression tray as the material sets. Once the material is set use an explorer (probe) or any other appropriate instrument, to remove any impression material from the screw of the open-tray impression coping. The screw can then be loosened. Ensure that the screw is completely loose (it should be able to move in a vertical manner).
9. Remove the impression from the mouth and ensure patient comfort. Reposition the healing abutment onto the implant.
10. Inspect impression for any voids/air bubbles. The impression coping should feel sturdy within the impression. The laboratory implant analog can then be attached onto the impression coping and hand tightened using the implant driver (see Fig. 15).
11. Disinfect the impression and package it to be sent with an opposing impression and a bite registration (either wax or a silicone-type of bite registration material) to the laboratory.

Option 2: Digital intra-oral scan

For a digital intra-oral scan, the clinician will need a scan body or scan flag, as well as a digital laboratory implant analog.

1. Remove the healing abutment from the implant, measure the cuff height and dry the soft tissue and remaining teeth sufficiently. Take the initial intra-oral full-arch scan ensuring the adequate capturing of the interproximal surfaces of the adjacent teeth (Fig. 16). If it is a maxillary scan, always include the entire palate.
2. Mark the implant on the completed scan. The software will then remove a portion of the image around the implant.
3. Attach the scan body and hand tighten using the applicable implant driver. Confirm seating with a peri-apical radiograph (metal scan bodies only).
4. Take the next step of the intra-oral impression which involves the rescanning of the implant site and the adjacent teeth. Ensure that you capture all aspects of the scan body, specifically the flat/indexed surfaces (Fig. 17).
5. Once you have completed your scan and are satisfied with the quality thereof, you can remove the scan body and re-

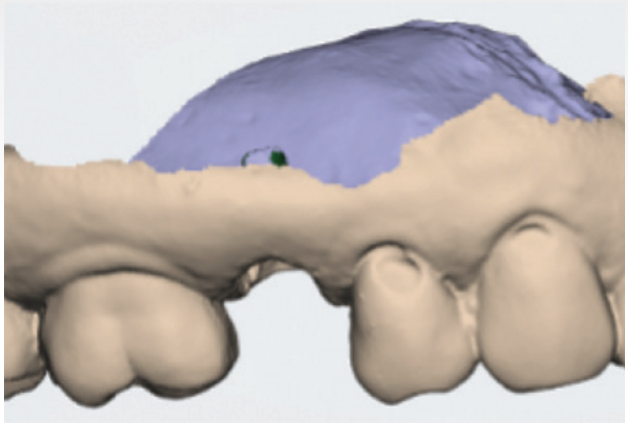

Figure 16: Initial digital scan of the entire arch containing the implant to be restored.

attach the healing abutment.

6. Complete the scan of the opposing arch as well as the buccal bite registration scans.

INSTRUCTIONS TO BE GIVEN TO THE LABORATORY:

1. *Shade selection.*
2. *Material choice (PMMA, acrylic or composite).*
3. *Abutment choice – cuff height based on depth of implant shoulder.*
4. *Send radiograph.*
5. *Restoration to be in infra-occlusion and free of any contact in lateral excursive movements.*
6. *Restoration to be polished smooth and to a high gloss.*

Tissue training via modification of the provisional restoration

The goal of performing tissue training around an implant-supported provisional restoration is not only to achieve natural looking aesthetics, but to also aid restoration design to avoid/minimize food impaction and ensure a healthy, stable soft tissue collar around the implant, with a specific focus on closure of the embrasure spaces with soft tissue and appropriate shaping of the restoration.

If the provisional restoration is delivered immediately after implant placement, you will need to wait until osseointegration is completed before starting soft tissue training. This may take 8 weeks to 3 months in total. Thereafter, one should remove the provisional as few times as needed, to minimize the disruption of the hemidesmosome attachments and not to disturb the bone physiology too much. It is recommended that the restoration not be removed more than 2 times, if possible (see Part I).

When the tissue training process is started, the gingival zeniths should be assessed and marked accordingly. The

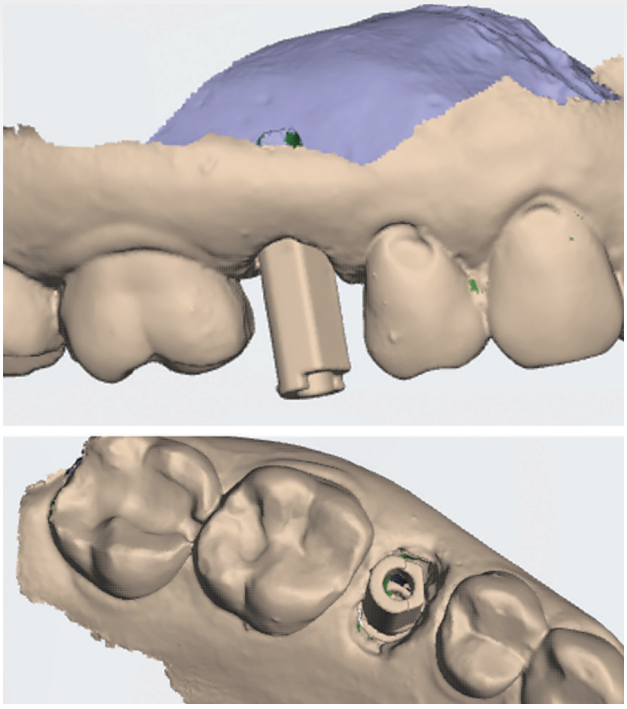

Figure 17: Digital scan of the scan body/flag capturing all surfaces, specifically the flat, indexed surfaces.

initial form of the provisional restoration is under contoured in the trans-gingival sector to allow for tissue fill. The clinician will thereafter modify the provisional restoration to be either concave, straight, or convex, depending on the requirements of the clinical situation.

If the gingival zenith of the provisional restoration is located too far incisally/occlusally then the clinician will need to add material in the region of the gingival margin to create a more convex shape to guide the tissue apically. When repositioned on the implant, the soft tissue will blanch under the new pressure being applied (see Fig. 18). This blanching should disappear within 4-5 minutes. If the pressure is too much and the blanching is not observed to disappear, then one may cause tissue necrosis (Fig. 18).

If the gingival zenith is located too far apically, then the provisional restoration should be hollowed out for a concave contour (under contoured) at the gingival margin. This will allow the soft tissue space to migrate incisally/occlusally.

It is important to re-assess every 2-3 weeks to mark the gingival zeniths and add/remove as necessary. Incremental modification will avoid the chance of necrosis.

Conclusion

Fixed, implant-supported provisional restorations can be delivered either immediately (within 48hours) of implant placement, or after osseointegration has been achieved.

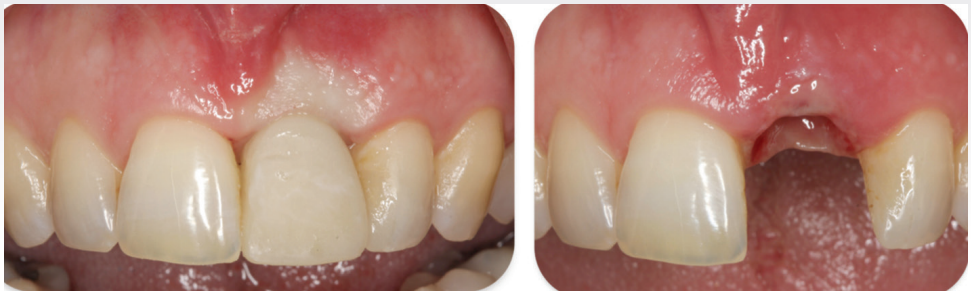

Figure 18: Blanching of soft tissue on re-insertion of modified provisional restoration (left); and resultant tissue necrosis (right)

The clinician has the option to fabricate the provisional restoration chair-side, using an analogue/digital wax-up and a vacuform template/silicone key, a laboratory-fabricated shell-temp or a hollowed out natural/denture tooth that can be relined intra-orally. The other option is to take either a conventional/analogue impression (open- or closed-tray) or a digital impression and have the laboratory fabricate a provisional restoration.

The material of choice should be aesthetically-pleasing, durable, highly polishable and modifiable. Once osseointegration is achieved the provisional restoration can be removed and modified to manipulate the gingival zeniths and achieve a soft tissue morphology that is aesthetically pleasing and stable.

It has been shown that Asian populations show a higher percentage of triangular crown forms, compared to Caucasians. This, as well as the gingival phenotype of each patient, should be noted in the clinical records as it may play an important role in the outcome. Although the periodontal phenotype has been described in the consensus meeting of 2017 as gingival width and thickness combined with alveolar bone thickness[2], peri-implant phenotype has only recently been described.[3] The peri-implant phenotype has a bone and soft tissue component much like natural teeth and it is a combination of the gingival width, thickness and supra-crestal height, as well as the peri-implant bone dimension.[3]

Although more research is needed on the minimum width of peri-implant gingiva required for function, stability and aesthetic outcomes - less than 2mm is regarded as inadequate and more than 2mm as adequate.[3] Similarly the thickness of peri-implant tissue is regarded as thin when below 2mm and thick if over 2mm in thickness.[3] Adequate thickness and width of gingiva around implants are critical in achieving an aesthetic outcome in implant restorations. Supra-crestal tissue height is the combination of the peri-implant sulcus, junctional epithelium against the abutment and supra-crestal connective tissue. Less than 3mm is regarded as short and more than 3mm as tall.[3] The last component in the peri-implant phenotype is the peri-implant bone horizontal dimension, where less than 2mm is regarded as thin and more than 2mm is thick.[3]

It would be wise to consider these 4 components of the peri-implant phenotype when planning implant treatment as it will have a direct impact on the successful functional and aesthetic outcome using the techniques described in this Masterclass.

Part 3 of this Masterclass series will describe, in detail, how you can predictably capture the created emergence profile in your final impression (analogue and digital), ensuring that the form of the final implant-supported restoration will replicate the tissue training done during the provisional phase.

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Scan QR Code to view video

Footnote on video

The index impression provides an accurate position for the implant. To build the provisional crown, the adjacent tooth/teeth are used for creating the contact points and the shape should be as discussed in the text above. One does not need the soft tissue impression for this purpose, as the soft tissue has not healed at all when the crown is placed. The shape of the crown will form the ideal morphology if the emergence profile of the crown is created as described. The depth of implant will determine what the cuff height should be (as a general rule 2-3mm should be a safe bet) and as there is no cement joint in the crown, it does not matter where the composite-metal joint is placed- as long as it is highly polished.