

Single Tooth Implant Restoration

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In clinical cases where a single tooth is missing, several treatment options may be available:

1. No treatment and follow-up;
2. Removable denture;
3. Orthodontic treatment;
4. Three-unit bridge;
5. Resin-bonded bridge;
6. Orthodontic treatment, or
7. Implant-supported crown.

The restoration of a single missing tooth with an implant-supported crown is comprised of two treatment phases: the surgical implant placement phase and the restorative phase. The present video focuses on the restorative phase and describes the clinical steps involved in the fabrication and placement of the implant-supported crown.

The surgical phase of implant placement involves either a **two-stage surgery** or a **one-stage surgery** approach. The two-stage procedure involves two surgical appointments (i.e., stages). During the **stage-one surgery** appointment, an implant is placed in the jaw-bone and the implant platform is covered with a **cover-screw**. The head of the cover-screw is very thin and just covers the implant platform and prevents bone in-growth. The implant and cover-screw are then covered with the gingival tissue (i.e., **submerged implant**). The surgical site is allowed to heal for about 3-6 months; surgical sites with better bone quality

(i.e., denser bone) and quantity (i.e., more bone to circumference the implant) require shorter healing time. During this time, bone is formed in close contact with the implant in a process called osseointegration. During **stage-two surgery** appointment, the gingiva over the cover-screw is either punched-out or reflected with a flap, and the cover-screw is removed and is replaced with a narrow or wide **healing abutment** which protrudes through the gingival tissue. The gingival soft tissue is then allowed to heal around the abutment and establish an aesthetic contour. If stage-two surgery involves a soft tissue punch to expose the implant platform with no suturing then at least 2 weeks of healing are required but, if the surgery involves flap elevation and/or when restoring a tooth in the aesthetic zone, 4-6 weeks are required.

In the **one-stage surgery** approach, there is only one surgical appointment. The implant is placed into the bone, followed by an immediate placement of the healing abutment which protrudes about 2mm above the gingival level. The restorative phase can begin immediately following the 3-6 months period of bone and soft tissue healing.

The advantages of the two-stage submerged approach is that it protects the implant from the oral environment and forces and thereby reduces the risk of infection and implant micro-movement which can interfere with the bone healing process and lead to early implant failure. The two-stage surgery approach is particularly indicated when the implant has not obtained an optimal primary stability during surgery or when the surgery involves bone grafting procedures. The advantages of the one-stage surgery approach are that it avoids one surgical intervention and shortens treatment times.

Once the tissues are healed the restorative phase can start. While many restorative options are available, this video focuses only on 2 restorative options for a titanium screw-type implant with an internal tri-channel connection. Similar restorative principles apply to other implant systems.

One restorative option is an implant-level screw-retained crown that is directly attached to the implant head. This crown is fabricated on an **engaging UCLA-type abutment**. The abutment has **tri-lobes** that engage the implant's **tri-channels** and thereby provides an **anti-rotation** feature that is crucial in single tooth implants since it decreases the risk of screw loosening. The abutment has a gold base and a pre-attached waxing sleeve. The height of the sleeve can be reduced as desired and the crown's framework is waxed-up around the abutment, cast, and then finished with porcelain. An all-metal crown may also be fabricated. The final crown has a screw-access hole that provides retrievability and easy removal of the prosthesis, making this type of crown the preferred treatment option.

Another restorative option is a cement-retained crown, where a custom-abutment is fabricated on a UCLA-type abutment and then a conventional porcelain-fused to metal crown is fabricated to fit the custom-made abutment. In a patient with very high aesthetic demands

a custom-ceramic abutment and an all-ceramic cement-retained crown may also be prescribed.

A screw-retained crown is a preferred option because it allows for retrievability. It is also indicated when the mesiodistal and interocclusal spaces are limited since it requires less mesiodistal spaces than a cement-retained crown. However, for aesthetic reasons, a screw-retained crown requires a favourable implant angulation whereby the access hole is not visible and is located within the cingulum of an anterior crown or within the occlusal surface of a posterior crown. When implant angulation is unfavourable, a cement-retained crown is indicated.

Restorative Appointment #1 – Patient Evaluation at Commencement of Restorative Phase

The objective of the first restorative appointment is to update the patient's medical and dental records, evaluate the healing of the hard and soft tissues at the surgical site, re-evaluate patient's functional and aesthetic expectations, and estimate the crown's design

ARMAMENTARIUM:

- Prosthodontic kit
- Plastic periodontal probe
- Straight handpiece and acrylic burs
- Hand-held mirror for the patient
- Dental floss
- Gauze squares
- Hydrogen peroxide in a dappen dish
- Vita shade guide
- Study casts
- Implant **screwdriver kit**
- - This kit includes the screwdriver components that you will need for the prosthetic procedures including: a **Machine Unigrip Screwdriver Handle** and **screwdriver shafts** of various lengths (e.g., 20, 25, 30 or 35mm) that can be inserted into the handle. The screwdriver can be used to manually **engage** or disengage the screws that attach the different implant components.
 - When mouth-opening is limited use the shortest 20 mm screwdriver shaft.
- The handle and attached shaft can also be inserted into the **Manual Torque Wrench** in order to tighten the screw of the final restoration to the desired load or torque.

- **Precaution Measures** in using screwdrivers and implant components intraorally:

- - The screwdriver must be secured with a length of dental floss that is inserted into the hole located at the top of the screwdriver handle. This will aid in screwdriver retrieval in the event it accidentally drops intraorally and ingested or aspirated by the patient.
 - At all times, place a piece of gauze at the back of the mouth to act as a throat guard to decrease the risk of ingestion or aspiration of a screwdriver or an implant prosthetic component in the event it accidentally drops intraorally.
- To avoid soft tissue collapse on the implant, once the healing abutment is removed immediately replace it with a prosthetic component and vice versa.

CLINICAL PROCEDURE:

1. Update the patient's medical and dental records and any conditions such as parafunctional habits that may affect your choice of prosthetic treatment.
2. Discuss with the patient any post-surgical side effects such as altered sensation.
3. Evaluate the patient's functional and aesthetic expectations.
4. The beginning of this appointment is the best time to select the crown shade since tooth desiccation may lighten the tooth (higher value). Evaluate the implant site and adjacent and opposing teeth clinically and radiographically. Check for any bone or tooth pathology. Further treatment may be necessary if, for example, there is a cavity, faulty restoration or worn occlusal surface.
5. Radiographically note the marginal bone levels around the implant and adjacent teeth. This bone level will serve as a baseline for subsequent annual measures of bone loss around the implant and adjacent teeth (see Restorative Appointment #4).

6. Examine the soft tissue health and oral hygiene around the healing abutment. Evaluate the proximity and angulation of the implant and adjacent teeth and measure the mesiodistal dimensions of the edentulous space.
 1. If the soft tissue is inflamed and oral hygiene is inadequate then treatment should be halted. Reinforce oral hygiene practices to the patient and prescribe **Chlorhexidine** mouth-rinse. Then re-evaluate soft tissue health within 1-2 weeks.
 2. Sometimes, the **healing abutment** is too short and the soft tissue grows over the abutment. Sometimes the abutment is too narrow to allow for an optimal **emergence profile** that is similar to that of the pre-existing natural tooth. Since healing abutments come in different lengths and widths, the short and/or narrow abutment can be replaced with a longer and/or wider abutment. If the soft tissue looks healthy, remove the healing abutment and put it in a dampen dish containing hydrogen peroxide. It is normal for the soft tissue to bleed slightly when the healing abutment is removed since healthy soft tissue can adhere to the sides of the abutment. However, if bleeding is due to soft tissue inflammation, reinforce oral hygiene and prescribe chlorhexidine. Remember to return the healing abutment as soon as possible to avoid the soft tissue from collapsing.
 1. Apply local anesthetics.
 2. Place gauze at the back of the mouth.
 3. Cut the excess soft tissue with a '**soft tissue punch**'.
 4. Use the screwdriver to remove the healing abutment and place it in a dampen dish with hydrogen peroxide solution which will remove any blood or debris.
 5. Use a plastic periodontal probe to measure the **soft tissue thickness** from the **implant platform** to the gingival margins.
 6. Immediately place and tighten the longer and/or wider abutment that should extend more than 2 mm above the gingival margin.
 7. The healing period following soft tissue punch is 2 to 6 weeks. Aesthetic regions require longer healing time than non-aesthetic regions.
 3. If the soft tissue looks healthy, remove the healing abutment and put it in a dampen dish containing hydrogen peroxide. It is normal for the soft tissue to bleed slightly when the healing abutment is removed since healthy soft tissue can adhere to the sides of the abutment. However, if bleeding is due to soft tissue inflammation, reinforce oral hygiene and prescribe chlorhexidine. Remember to return the healing abutment as soon as possible to avoid the soft tissue from collapsing.

4. If the soft tissue looks healthy after healing abutment removal, measure the soft tissue thickness. In aesthetic areas, the implant platform should be ~3mm below the gingival margins to allow for an optimal emergence profile and to hide the crown's **metal margin** subgingivally. If the soft tissue is too thin, in a patient with high aesthetic demands, an all ceramic crown may be indicated. Then, measure the interocclusal clearance in maximum intercuspation (MI) and excursions and take into consideration the soft tissue thickness.
7. Evaluate the proximity and angulation of the implant and adjacent teeth and measure the mesiodistal dimensions of the edentulous space.
8. A wider implant requires more mesiodistal space than a narrower implant. A screw-retained crown requires less interocclusal and less mesiodistal space than a cement-retained crown. These measures also depend on the implant system and the type of material used for the crown fabrication. For example, a crown with metal contacts requires less space than a crown with porcelain fused to metal contacts.
9. Enameloplasty of adjacent teeth can eliminate interferences in the path of crown placement and create more space for the crown. Enameloplasty may be best performed against a diagnostic tooth set-up which may require at least one more appointment.
10. Make alginate impressions of both maxillary and mandibular arches to serve as working casts. Rinse and disinfect the alginate impressions, wrap them with wet paper towels, place in a plastic bag and make sure they are poured up with type IV gypsum within 15 minutes. Make another set of alginate impressions to serve as study casts, and pour in type III gypsum.
11. If the MI position is unstable also take interocclusal record.
12. If the patient has an acrylic interim denture that has been relined with a soft liner, check the condition of the material and consider replacing it with new material as indicated.

PLAN THE PATIENT'S NEXT APPOINTMENT:

1. Mount the study casts and prepare a diagnostic tooth wax-up for proper design of the prosthetic crown including embrasures size, emergence profile and crown form in maximum intercuspation and excursions. Decide if and how much of enameloplasty of an opposing over-erupted tooth or tipped adjacent tooth is necessary.
2. For crowns in the aesthetic zone, particularly when the implant collar is deep subgingivally, try to evaluate the anticipated emergence profile of the final crown and consider fabrication of a temporary crown fabricated on an **engaging** temporary abutment (which needs to be ordered) that can be created either chair-side or in the laboratory after making an impression of the implant.

3. Decide what type of impression technique you will use: **Open-tray** or **Closed-tray technique**. In most cases either technique can be used at the discretion of the operator, but the open-tray technique appears to be more accurate since the impression along with the impression coping are removed from the mouth in one piece. However, if the mouth-opening is limited, particularly for a posterior implant crown, a closed-tray impression technique may be indicated.

Open-tray impression technique:

- Requires preparation of a window in the tray prior to making the impression. The window should be centered directly over the implant site, and it should allow for protrusion of the guide-pin beyond the height of the tray. This will ensure easy access to the guide-pin head to allow its removal prior to the removal of the custom-tray and the set impression material from the mouth.
 - Is indicated when the mesio-distal space between two adjacent teeth is limited since the open-tray impression copings in some implant systems are narrower and can be further trimmed as appropriate.
 - Note that when restoring a molar tooth, if mouth-opening is limited, you may be required to use the shortest (20 mm) screwdriver shaft and the shortest guide-pin.
 - Can lead to a more accurate impression than the closed-tray technique because it does not involve removal of the impression coping and then re-insertion back into the impression once the impression has been removed from the mouth.
- Closed-tray impression technique:
 - Is indicated in patients with a limited mouth-opening.
 - May need to have a custom tray with an area that is taller at the implant site in order to fit over the height of the impression coping and guide-pin.
 - Requires a rigid impression material such as polyether.

Prepare a custom-tray with or without a window. Remember that a window in a closed-tray can be opened chairside; and a window in an open-tray can be easily closed with a wax.

Order the final-impression prosthetic components that include an **engaging impression coping, guide-pin** and **implant analogue/replica**. Note that impression copings may come in different diameters and different heights. Choose the components that match the implant diameter, crown diameter and emergence profile, and the final impression technique to be used.

Restorative Appointment #2– Final Impression (Implant level)

The objective of this appointment is to make a final impression that transfers the position and angulation of the dental implant and adjacent dentition from the patient's mouth to a master cast. This master cast is used for the design and fabrication of the final implant-supported

crown. This appointment can be scheduled at any time after your first appointment as long as the soft tissue around the healing abutment is healthy and you have the prosthetic components at hand.

ARMAMENTARIUM:

- Engaging impression coping + guide-pin (sterile) for an open or closed-tray impression technique
- Implant replica/analogue
- Open-tray or closed-tray (disinfected)
- Prosthodontic kit
- Implant screwdriver kit
- Dental floss tied to the screwdriver handle
- Straight handpiece and acrylic burs
- Impression material & custom-tray adhesive
- Hand mirror
- Gauze squares, cotton pellets
- Hydrogen peroxide in a dappen dish
- Orophodontic/rope wax

For Open-Tray Technique, You Also Need:

- Baseplate wax
- Hanau torch, Bunsen burner & matches or a cup with hot water
- Wax knife kit

CLINICAL PROCEDURE

1. Paint the inner surface of the custom-tray with the appropriate tray adhesive and allow the adhesive to dry for at least 30 minutes. Insert the appropriate screwdriver shaft into the secured screwdriver handle.
2. Have the impression coping and guide-pin available on the bracket table for immediate placement. Impression copings may be available in different heights and diameters. Chose the coping that is most suitable to your case. For a longer and wider tooth, chose a coping with a higher and wider profile.
3. Place gauze at the back of the mouth.
4. Use the screwdriver to remove the healing abutment and place it in the hydrogen peroxide solution. It is important to immediately connect the impression coping to the implant to prevent soft tissue collapse.

5. The tip of the engaging impression coping has a tri-lobe geometry that fits the internal tri-channel geometry of the implant. Therefore, check that the implant platform is free of soft tissue or bone debris and then gently seat the impression coping into the implant head and with a slight rotational movement find the correct position in which the tri-lobes of the coping engage the tri-channels of the implant head. Then slowly manually tighten the guide-pin with the screwdriver. **NOTE:** Sometimes, the impression coping may have a slightly larger diameter than the healing abutment and may cause soft tissue blanching. This may be uncomfortable or even painful for the patient, particularly when the implant head is positioned deep subgingivally. In such cases, seat the coping and tighten the guide-pin gradually with intermittent stops of few seconds until the impression coping is fully seated in place and the guide-pin is fully tightened. Alternatively, local anaesthesia may be used in the area.
6. Ensure that there is no contact between the impression coping and adjacent teeth. This can be accomplished visually or with a shimstock film. If the coping has a tight contact with an adjacent tooth, replace it with a narrower coping and/or trim the coping (extraorally) or the adjacent tooth to free the contact points to ensure it can be fully seated on the implant and to create a space for the impression material.
7. Take a periapical or a vertical bitewing radiograph to confirm proper connection between the impression coping and the implant platform. Aim the central ray at the connection between the coping and the implant platform, and in a 90 degrees angle to the implant long-axis. In a proper image angulation, the implant threads appear clear and sharp on both sides of the implant and the evaluation of a gap between the impression coping and the implant platform is more reliable. If there is a gap, the impression coping is not fully seated. Disengage the guide-pin, rotate and reposition the impression coping, then by attempting to rotate the coping ensure it has engaged the implant, and then manually tighten the guide-pin. Verify with another radiograph that no gap exists between the implant platform and the impression coping.

OPEN-TRAY IMPRESSION TECHNIQUE:

1. Try-in the custom-tray intraorally and make sure the window provides easy access to the tip of the guide-pin of the impression coping and that it protrudes through the window.
2. Remove the tray from the mouth and cover the window with a softened pink wax. Try-in the tray again to ensure the tip of the guide-pin is visible and protrudes through the wax.
3. Use orthodontic/rope wax to block out any large embrasures, open contacts or undercuts (e.g., bridge pontic/s).

4. The final impression is taken with an elastomeric impression material such as polyether or polyvinyl siloxane. The dental assistant loads the tray with the impression material while you syringe the light body material around the impression coping. Keep the tip of the syringe submerged in the impression material at all times to avoid trapping of air bubbles. Seat the loaded tray in the mouth and ensure that the tip of the guide-pin is visible and protrudes through the wax. You may use a cotton roll or plastic instrument to wipe away excess impression material. If the tip of the guide-pin is not visible, reposition the tray slightly. If it is still not visible, remove the impression immediately before the material sets and clean the patient's mouth. Clean the tray and repeat the impression.
5. Once the tip of the guide-pin is visible through the wax, let the impression material set for 5 minutes from the time of insertion of the impression material into the mouth. During this time, do not let the patient bite down on the tray. Immobilize the tray using a passive pressure.
6. Unscrew the guide-pin and remove it to ensure it is no longer engaged to the implant.
7. Remove the impression from the mouth along with the impression coping that remains within the impression itself.
8. Immediately re-insert the healing abutment to prevent soft tissue collapse.
9. Evaluate the impression and ensure that the impression coping is stable and sits within the impression material, that the impression captured all necessary details and there are no voids or air bubbles.
10. Gently sit the implant replica/analogue into the embedded impression coping and carefully tighten the guide-pin paying attention not to spin the impression coping within the impression material.

CLOSED-TRAY IMPRESSION TECHNIQUE:

1. Try-in the custom-tray intraorally and make sure the tip of the guide pin does not interfere with the seating of the tray.
2. Remove the tray from the mouth.
3. Seal the access hole on top of the guide pin with a small amount of orthodontic wax.
4. Use orthodontic/rope wax to block out any large embrasures, open contacts or undercuts (e.g., bridge pontic/s).
5. The final impression is taken with an elastomeric impression material such as polyether. The dental assistant loads the tray with the impression material while you syringe the light body material around the impression coping. Keep the tip of the syringe submerged in the impression material at all times to avoid trapping of air bubbles. Then seat the loaded tray in the mouth and immobilize the tray with a passive pressure.
6. Let the impression material set for 5 minutes from the time of tray insertion into the mouth.

7. Remove the impression from the mouth. Then, loosen the guide-pin and remove the impression coping from the implant.
8. Immediately re-insert the healing abutment to prevent soft tissue collapse.
9. Evaluate the impression and ensure that the impression captured all necessary details and there are no voids or air bubbles.
10. Gently engage the impression coping and the implant replica, and manually tighten the guide-pin. The coping has flat surfaces or slots that align with the coping's lobes which align with the implant grooves. Gently align the coping with the corresponding indices within the impression and seat the coping into the impression, and make sure that it is correctly aligned and fully seated.

For both techniques:

1. If the MI is not definitive, take an interocclusal record.
2. Disinfect the impression, dry it and place in a plastic bag.
3. The final impression, the cast of opposing arch and the bite registration are sent to the laboratory along with a prescription form.

LABORATORY PRESCRIPTION:

Write the following instructions on the prescription:

1. Place soft **gingival replica/analogue** around the implant replica.
2. Pour impression using a type IV gypsum die stone.
3. Mount casts on a semi-adjustable articulator.
4. Return the mounted casts for re-evaluation.

CLINICAL PROCEDURE – RE-EVALUATION:

1. When the mounted casts return from the laboratory, re-evaluate the available space and the implant position and angulation and make a final decision of the type of abutment and restoration to be used.
2. For a single implant-supported crown, a UCLA-type abutment can be used, and whenever possible, it is preferable to use a screw-retained crown because it allows for retrievability. A screw-retained crown requires a favourable implant angulation whereby the crown's screw access hole is not visible and is located within the cingulum position of an anterior tooth crown, or the central fossae of a bicuspid or a molar tooth crown.
3. Use a probe to measure the soft tissue thickness from the implant platform to the gingival margins. In aesthetic areas, the implant platform should be ~3mm below the cemento-enamel junction of adjacent teeth to allow for an optimal emergence profile and for hiding the abutment's metal margins subgingivally. If the soft tissue is too thin, in a patient with high aesthetic demands, an all ceramic crown may be indicated.

4. If the implant angulation is unfavourable and interferes with the final aesthetic results, a cement-retained crown is indicated. For a cement-retained crown, a custom-made abutment is fabricated on a UCLA-type abutment and a porcelain-fused to metal crown is fabricated to fit the custom-made abutment. In a patient with high aesthetic demands and thin soft tissue an all ceramic abutment or an all ceramic screw-retained crown may be indicated. Measure the interocclusal clearance in MI and excursions taking into consideration the soft tissue thickness. The interocclusal space from implant level to opposing tooth should be greater than or equal to 5 mm to accommodate a screw-retained crown or greater than or equal to 6 mm to accommodate a custom-abutment and a cement-retained crown. These measures may change depending on the implant system used and the type of material used in the fabrication of the implant crown. Also note the implant proximity to the adjacent teeth. A screw-retained crown requires less mesio distal space than a cement-retained crown.
5. Send the mounted casts and the selected abutment to the laboratory with the following prescription.

LABORATORY PRESCRIPTION:

1. Request the lab to fabricate one of the following options: Indicate the prosthetic components being sent to the lab (e.g., abutment, gold screw) with your prescription.
 1. A screw-retained porcelain fused to metal (PFM) crown.
You may request that the crown be returned in the metal coping, bisque-bake or glazed state (as appropriate to the case).
 2. A custom-made abutment and a PFM crown. The crown will be cemented to the abutment after its insertion and connection with the implant.
You may also request a lingual or palatal metal anchor point or pin hole to ease crown removal from the abutment.
 3. An all ceramic abutment and an all ceramic cemented crown.
Indicated in a case with a high aesthetic demands.
2. Indicate the prosthetic components being sent to the lab (e.g., abutment, gold screw) with your prescription.
3. Ask the lab to return the packaging of the abutment since it contains the abutment serial number and the lot number which are important for warranty purposes. In addition, ask the laboratory to indicate the type of metal used for fabricating the crown and abutment.

Restorative Appointment #3– Custom Abutment/Crown Try-In and Placement

The objective of this appointment is to try-in the implant-supported crown, check the adequacy of the implant-supported crown, ensure patient's satisfaction and to insert the crown.

PRE-CLINIC CROWN VERIFICATION OF LABORATORY WORK:

First check the crown on the working cast:

- Remove the screw-retained crown or the custom-abutment of the cement-retained crown from the cast. Then, remove the gingival replica and re-seat the crown or the custom-abutment.
- Ensure that the crown or custom-abutment seats appropriately on the implant replica and that there is no gap between them. Then check that the cement-retained crown seats adequately on the custom-abutment.
- Check interproximal contacts between the crown and adjacent teeth. The contact points should be free to one layer of shim stock film.
- Check the occlusion with 1-7 layers of shim stock film. It is preferable to have the implant crown out of occlusion due to the differential compressibility of natural teeth and implants.
- Check aesthetics (emergence profile, shade, shape, embrasures).

CLINICAL CROWN TRY-IN:

ARMAMENTARIUM:

- Prosthodontic kit
- Implant screwdriver kit
- Hand mirror
- Dental floss tied to screw driver handle
- Articulating paper (Accufilm)
- Shim stock film
- Hydrogen peroxide in a dappen dish
- Fine diamond burs, white rubber wheel and porcelain polishing kit
- High speed handpiece
- Straight handpiece (nose cone & slow speed handpiece motor)
- Cotton pellets

For Screw-Retained Restorations, you will also need:

Temporary filling/ cement (Cavit)

For Cement-Retained Restorations, you will also need:

Temporary Implant restoration Cement.

CLINICAL PROCEDURE:

1. Place a layer of gauze at the back of the patient's mouth.
2. Remove the healing abutment (or temporary crown) and place in a dappen dish with hydrogen peroxide.

3. The portion of the crown or custom-abutment that is inserted into the implant, has a geometry that fits the internal geometry of the implant. Therefore, gently seat the crown or abutment into the implant head, and with a slight rotational movement find the correct position in which the crown or abutment engages the implant head.

For a screw-retained crown:

1. Check the interproximal contacts between the crown and adjacent teeth. These contact points should be free to one shim stock film and there should be a slight snap when dental floss passes the contact point. If the contact points are too opened, the crown needs to be sent to the lab for correction. If the contacts are too tight they may prevent adequate seating of the crown. In this case, use a thin film of articulating paper to mark the tight contact points. Then remove the crown from the mouth and use a white stone and/or a white rubber to adjust the porcelain. Repeat these steps until the crown is fully seated.
2. Then, slowly tighten the crown-screw manually just until resistance is felt. With a shim stock and a dental floss, ensure that the interproximal contacts are not too tight and not too open. If too open, the crown needs to be sent to the lab for correction. If too tight adjust and then continue to tighten the crown-screw and adjust the crown until the screw is fully tightened but not torqued.
3. Polish with the porcelain polishing set.
4. Sometimes, the diameter of the crown (or abutment) is larger than the diameter of the healing abutment and therefore implant/abutment placement may push the gingiva and result in soft tissue blanching. This may also be uncomfortable or even painful for the patient, particularly when the implant platform is positioned deep subgingivally. In such cases seat the crown and slowly tighten the gold screw. Once the patient feels discomfort, stop the screw tightening for few seconds, and then continue to tighten the screw very slowly until it is completely tightened. Alternatively, local anaesthesia may be used in the area.
5. Once the crown is seated, take a periapical or a vertical bitewing radiograph to confirm proper connection between the crown and the implant platform. Aim the central ray at the connection between the crown and the implant, and in a 90 degree angle to the implant long-axis. In a proper image angulation, the implant threads appear clear and sharp on both sides of the implant and the evaluation of a gap between the crown and the implant is more reliable. If there is a gap, the crown is not fully seated. Check for a possible cause such as tight interproximal contacts or existence of debris or soft tissue impingement between the crown and the implant platform. Eliminate the cause and verify proper seating with another radiograph.

For a cement-retained crown follow the steps of a screw-retained crown except:

1. Once the abutment engages the implant platform, slowly tighten the abutment-screw manually until it is tight but not torqued.

2. Take a radiograph to ensure the abutment is fully seated.
3. Insert the crown, and similar to the screw-retained crown, evaluate and adjust the interproximal contacts.

For both types of crowns:

1. Once the radiograph confirms the crown is fully seated, check the occlusion. Since an implant acts as an ankylosed tooth and adjacent natural teeth have a flexible periodontal ligament, to prevent implant overloading under functional occlusal loads, it is preferred to keep the crown out of functional occlusal contacts. Therefore, the occlusion is adjusted to allow for a free passage of 1-7 layers of shim stock. Check the occlusion first while the patient is biting in MI and then in excursions. However, in certain circumstances, such as a canine implant crown in a patient with a canine guidance, the implant crown carries the occlusal load in lateral excursions.
2. Check the crown's aesthetics and show the restoration to the patient with a handheld mirror.
3. If you and the patient are satisfied with the appearance and comfort of the crown proceed with the final steps of crown insertion.
4. To better secure the abutment or crown to the implant and decrease risk of screw loosening, the gold-screw of the screw-retained crown or of the custom-abutment is torqued using the torque wrench. First set the direction indicator so that the arrow is pointing toward the lever arm. Then, gently rotate the lever arm clockwise and torque the gold screw to 35 newton centimetres, using the lever arm only. This will secure the abutment or crown to the implant. In the event you need to loosen the screw, set the direction indicator so that the arrow is pointing away from the lever arm and rotate the lever arm counter clockwise. (It is very important to note that the body of the torque driver must never be used to tighten the implant screw since this may transfer excessive torque forces to the screw and or implant-bone interface and may cause bone resorption or screw fracture.)
5. For a screw-retained crown plug the screw access hole with a cotton pellet and a temporary filling, and then check the occlusion again.
6. For a cement-retained crown, plug the abutment access hole with a cotton pellet and then cement the crown with either temporary or resin cement.
7. Provide the patient with regular oral hygiene instructions.

Restorative Appointment #4: Post-Insertion Follow-Up

The objective of this appointment is to ensure oral hygiene practice, patient satisfaction with the crown and in the case of a screw-retained crown, to replace the temporary filling with a permanent one.

ARMAMENTARIUM:

- Prosthodontic kit
- Implant screwdriver kit
- Dental floss tied to screw driver handle
- Articulating paper(Accufilm)
- Shimstock film
- Hand mirror
- Gauze
- Hydrogen peroxide in a dappen dish
- White rubber wheel and porcelain polishing kit

For Screw Retained Restoration, you also need:

- Cotton pellets
- Composite resin

CLINICAL PROCEDURE:

1. Ensure that the patient is satisfied with the aesthetics and function of the implant-supported crown.
2. Check oral hygiene and gingival health.
3. Check occlusion in MI and in lateral, protrusive and retrusive jaw movements.

For screw-retained restorations

1. Remove the temporary filling and cotton pellets.
2. With the aid of the torque wrench confirm that the screw is still tightened to 35 newton centimeters.
 1. If the screw loosened, check for and correct any possible causative factor. For example, check for tight interproximal contact or heavy occlusal contacts. Re-torque the screw to 35 newton centimetres. Plug the screw access hole with cotton pellets and a temporary filling, and then check the occlusion again. You will need to see the patient again prior to the placement of the final restoration.
 2. If the screw did not get loose and remained tight to 35 newton centimeters, then you can place cotton pellets and composite resin to seal the access hole, and check and adjust the occlusion again.

For a cement-retained restoration

1. If the abutment-screw loosened, the crown will need to be removed and separated from the abutment which is not always an easy task.
2. Similar to the screw-retained restoration, identify and correct the cause of the problem.
3. Retighten the abutment, place cotton pellets, re-cement the crown and check and adjust the occlusion.

LONG TERM, FOLLOW-UP APPOINTMENTS:

Follow-up appointments are scheduled for 1 month, 6 months and 1 year after insertion, and then annually or as indicated by other oral conditions.

CLINICAL PROCEDURE FOR ANNUAL APPOINTMENTS:

1. Vertical bitewings, as part of annual dental examinations of the patient, can provide sufficient information regarding the marginal bone loss around implants. If indicated, a periapical radiograph may also be taken.

1. Normal bone loss around implants:

- During 1st year ~ 1mm
- Following 1st year < 0.2 mm

2. Normal bone loss at adjacent teeth:

- During 1st year ~ 1mm
- Following 1st year – remains stable

1. Perform a clinical evaluation ensuring:

- Implant and crown stability.
- Crown integrity.
- Soft tissue health (e.g., colour, swelling).
- Proper oral hygiene practice.
- Patient satisfaction.

Article Reviewed By

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