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How to Make Impressions for Different Implant Systems??

Dr. Tarun Nanda[1], Dr. Sonia Madaan Nanda[2], Dr. Richa Mehta[3], Dr. Swapnil Pande[4]
[1]Demonstrator, Department of Periodontics, Post Graduate Institute of Dental Sciences, Rohtak
[2, 3]Demonstrator, Department of Prosthodontics and Crown & Bridge, Post Graduate Institute of Dental Sciences, Rohtak
[4]Department of Prosthodontics, Baba Banarsi Das University, Lucknow

Abstract: Fabrication of implant supported prosthesis requires precise transfer of the intraoral structures and the implant components to the plaster model. With the increase in the number of implant systems, impression making procedures also increased depending on each system. This article summarizes and describes the procedures and factors that affect adequate impression making for several implant systems.

Keywords: Dentistry, implant, implant systems, impression materials.

INTRODUCTION

Prosthetic dentistry has entered a new era with the successful use of implants. Particularly in implant prosthodontics, the precise impression methodology would decrease the failures experienced related to the suprastructure fabrication. This article describes the procedures and factors that affect adequate impression making for several implant systems.

Prosthetic treatment with the implants

In implant prosthodontics, since support is obtained from the implants to avoid alveolar bone resorption, mastication effectiveness, adaptation of the prostheses and patient satisfaction are also increased. Passive fit of the suprastructures onto the abutments and implants are of great importance. Any faults occurred during impression making procedures in the clinic may lead to false analogue positioning and prosthesis fabrication in the laboratory that may result in prosthetic complications like uneven force distribution, prosthesis and abutment screw loosening and occlusal discrepancies. For this reason, intraoral position of the implant and its relation to the abutment connection must be recorded and transferred to the impression accurately so that precise cast models could be made.[1]

While making impressions, elastomeric materials such as additional silicone and polyether should be of choice.[2] Carr et al [2] showed that a rigid elastomeric impression material, like polyether, would secure the impression copings accurately, has dimensional stability, high resistance to permanent deformation, high primary shear resistance with little creep under compressive forces that makes it an optimal material to be used for making impressions of the implants. While making impressions from implants, two types of trays can be used.

Indirect method (Closed tray method)

Following placing the impression copings onto the implants, impression is taken with standard trays. After the material is set, it is removed from the patient's mouth. Impression transfer coping is then removed from the mouth, attached to its analogue and placed into the impression again. When this method is employed, impression material surrounding the impression copings will be thick, thereby more resistant to the displacing forces that often occur when impression is being removed from the mouth (Figure 1-3). When compared with the direct method, clinical procedures are considerably simpler and any rotations that could occur in direct method while loosening the copings and eventually the resultant distortion are avoided.

Direct method (Opened tray method)

In this method, impression copings are placed onto the abutments and access holes are prepared on the fabricated custom impression tray in order to gain access for the copings. Using an accurate impression material and square or screw type of

impression copings, the impression is made. First, impression copings are screwed tightly onto the implants and then access holes are prepared on the tray for implant copings to extrude from the custom tray during the impression procedure. After the impression material is set, impression coping screws are loosened and the impression is removed from the patient's mouth (Figure 4,5).

The advantage of using a custom tray is that adequate space is created for the impression material. Thus, material will be evenly distributed and shaped, owing to the desired thickness. When resilience of soft tissues is considered, tissue stops would help the tray to be stabilized and pressed on the soft tissues. However, opened tray method has also some limitations; during the impression procedure, screw loosening could be experienced that exhibits a challenge for the clinician. When splinting is not performed, copings may rotate while unscrewing before the removal of the impression from the mouth. Preparing large-diameter access holes on the custom tray would decrease the pressure and result in uneven distribution of the impression material around the implants and on the soft tissues.

Recently, manufacturers developed a method where newly designed copings are used in a so-called **'snap-on'** method. In this method, impression copings are placed on the transmucosal neck of the implants through positioning cylinders and left in the impression without using the screwing system. The advantages of both direct and indirect methods are combined in one simple system.[3]
Stabilization of positioning cylinders and impression copings cannot be achieved during impression removal. In implant prosthodontics, therefore impression procedures can be followed at two stages after the surgery namely, at the abutment and the implant level:

Abutment level

At the abutment level, a direct impression method is used. After the healing caps are removed and abutment is placed on the neck of the implant, abutment is prepared according to the tooth preparation principles. Impression is then made from the prepared abutment in the mouth following the conventional impression procedure and sent to the laboratory where suprastructure is cast in the model (Figure 6, 7). By this way, impression procedure becomes very simple. In single implant restorations, relation between the abutment and the teeth could be established by the clinician instead of the technician. In order to obtain precision during the laboratory steps, making impression at the abutment-level is not recommended.[4]

Implant level

In single tooth implant cases, either direct or indirect technique is recommended at the implant level as described above.[4] For impression copings, screw type or plastic copings are used. Implant level impressions provide simplicity during provisional restoration fabrication, allows selecting the proper abutment in the laboratory and it is possible to prepare adjustable or custom-made abutments. These are the great advantages of implant level impressions when compared with abutment level impressions (Figure 1, 5).

Splinting procedure

Before making the impression of multi-unit implant restorations, in order to decrease the amount of distortion and to improve impression accuracy and implant stability, splinting procedure is recommended either using direct or indirect impression methods.[5] Splinting of the abutments or transfer copings stabilizes the impression copings under the applied torque force during analog screw tightening (Figure 8). Rotational movement of impression copings in the impression material is also avoided. Apart from these advantages, splinting has an important role in the accuracy of the model fabrication.[3] Brånemark et al.[6] compared the accuracy of impression materials and found that splinting the transfer coping delivers better results than not splinting.

Impression making in different implant systems[7, 8]

In each implant system, different impression methods are recommended:

1. Straumann implant system

Straumann implant system (Institut Straumann AG, Waldenburg,Switzerland) recommends 'snap-on' impression method and consists different abutment types both for screwed or cemented restorations. With the Straumann System, according to preference, impression could be made at the abutment or the implant level.

Abutments and transfer copings

SynOcta Abutment: "Regular Neck" and "Wide Neck" options are available that can be used for both screwed or cemented systems. In situations where angled implant axes are restored with screw type of systems, angled "Regular Neck" abutment is used.

Solid Abutment: "Regular Neck" and "Wide Neck" abutment types could be used for impression making of cemented suprastructures and also for impression making at the abutment level.

SynOcta Gold Abutment: This abutment is designed for establishing precision in the regions where esthetic is concerned and it allows for casting of suprastructures.

Snap-on Impression Coping and Impression Cylinder: They supply space for impression cylinders for 'snap-on' impression method.

Esthetic CeraOne Abutment: It is used in the anterior regions since it is preferred for its translucency especially when they are used in combination with full ceramic restorations.

Impression making in Straumann system

Gingival former is removed from the mouth to have access to the neck of the implant. 'Pick-up' coping is placed onto the transmucosal neck of the implant and positioning cylinders are stabilized until a 'click' sound is received. Impression is made using the closed tray technique. Impression cylinders and 'pick-up' impression copings are left in the impression (Figure 1, 7).

2. FRIALIT-2 implant system

In FRIALIT-2 implant system (Friatec AG, Mannheim,Germany), implant-level impression making is recommended instead of abutment-level impression and for this reason screw type of transfer copings are designed. In this system, using different abutment types, direct impression method is advised. Six types of abutment types are available:

Abutment Types

Esthetic Base: It is designed for single and multiple-unit restorations. They are available in 1-3mm gingival profile heights and could be either cemented or screwed from the lingual side.

Auro Base: This abutment type can be customized according to gingival profile height in both suprastructure fabrication and in angled/inclined situations.

Cera Base: This abutment is designed for the restoration in the anterior region where high esthetics is of importance.

MP Classic: They are fabricated for occlusal screw type or full mouth restorations and have 1 to 5mm gingival profile height. Occlusal screw tightens both the suprastructure and the abutment together.

Telescope Abutment: This is a basic suprastructure for single unit restorations with occlusal screw type of abutments and for maxillary edentulous cases restored with four implants. Telescope abutments are prepared in the dental surveyor and mounted in the denture.

Ball and Socket Attachment: They are simple attachments, can be easily cleaned and could be considered as alternatives for fixation of mandibular dentures. They are also available for 1 to 5mm gingival profile height.

Impression making in FRIALIT-2 system

First, the gingival former is removed, proper impression coping for the implant diameter is chosen and fixed on the implant using a screw. Transfer copings are then placed onto the copings in order to improve the impression precision. Impression is made using the direct method. Through the access holes created in the custom tray, transfer copings are unscrewed and kept in the impression. Implant analogues are then fixed onto the transfer copings (Figure 2).

3. CAMLOG implant system[7, 8]

In CAMLOG implant system (Camlog Biotechnologies AG, Basel, Switzerland), transfer copings are fabricated for direct and indirect impression methods. Copings are designed to be used either at the implant or the abutment level. Plastic transfer copings do not exist in this system. All transfer copings and abutments are screw type of copings or abutments.

Abutments and transfer copings

Laboratory and Impression Copings: Screw type of copings are developed both for open and closed tray techniques. According to preference, either direct or indirect impression methods could be used.

Provisional Abutment: These abutments are used with screw system for provisional restorations. They are available in 3.8, 4.3, 5 and 6mm diameters.

Ball Abutment: It is used for over denture prostheses with gingival profile heights of 1.5, 3 and 4.5mm.

Bar Abutment: It is designed for over denture prostheses with gingival profile heights of 0.5, 2 and 4 mm.

Universal Abutment: It is developed for abutment level impressions in all cases for all regions. Height of profile is established in the dental laboratory.

Standard Abutment: Two types of standard abutments are available in gingival profile heights of 1.5 and 4mm.

15º Angle Standard Abutment: They are available in 1.5 and 4mm gingival profile heights, specified for implants that are angled properly for suprastructures.

Esthetic Abutment: It is used in anterior regions where esthetics is of importance. They have 1.5 and 4 mm of gingival profile heights.

Impression making in CAMLOG system

Abutment level: Abutment is shortened with a hand piece and screwed onto the implant. Margins are prepared intraorally like in FPD preparation and conventional impression procedures are followed.

Indirect method at implant level: Implant abutment is screwed to the neck of the implant. Impression is made with a standard tray. Unscrewed abutment is repositioned in the impression.

Direct technique at implant level: Transfer copings are developed for direct impression technique. They are screwed onto the implant and impression is made with a custom tray. Through the access holes, transfer copings are loosened and kept in the impression (Figure 3).

4. SWISSPLUS implant system

In SWISSPLUS implant system (Zimmer Dental, Carlsbad,USA) by using indirect technique, impression making either at the abutment or the implant level is recommended. For direct impression method, screwed restorations, appropriate abutments and replicas are all included in the impression. All impression copings and abutments in this system are in screw type design. The abutment types in this system are as follows:

Abutments and transfer copings

Transfer Copings: They are available in 4.6, 5.2 and 6mm gingival profile height. Screw type of transfer copings are fabricated for indirect impression method.

Straight Abutment: After the intraoral preparation, this type of abutment is used in indirect impression making at the abutment level or after being fixed to the implant that serves as an impression coping. They are available in 3.5, 5.2 and 6mm gingival profile height.

20º Angled Abutment (Zimmer's): This abutment type is specified for anterior regions where esthetics is considered. It recommends use it after the intraoral preparation with abutment-level impression method or after being fixed to the implant as an impression coping with indirect impression method. They are available in 4.6 and 5.2mm gingival profile height.

'Cast-to' Gold Abutment: These screw type of gold abutments come in 4.5 and 5mm gingival profile heights with plastic copings for cast suprastructures.

ACT Transfer Caps: These caps are developed for multi-unit screw type implant restorations. Either direct or indirect impression technique could be applied. They have also alternatives for suprastructures, like plastic and gold copings.

Ball Abutment and Attachment: This special abutment and its analogue are used for overdentures.

ZAAG Abutment and Attachment: It is specific for the fabrication of suprastructure in the overdenture prostheses in 1.5 and 2.5mm height.

Impression making in SWISSPLUS system

Abutment level: Abutment is shortened with the hand piece and screwed to the implant. Margins are prepared intraorally similar to a preparation for an FPD and then conventional impression procedures are followed.

Indirect method at implant level: Implant abutment is screwed to the neck of the implant. Indirect impression is made with a standard impression tray. Unscrewed abutment is then repositioned in the impression.

Direct method at implant level: Transfer copings, developed for direct impression method, are screwed onto the implant. Impression is made with a custom tray. Through the access holes, transfer copings are loosened and kept in the impression (Figure 5).

5. ASTRATECH implant system[7]

In ASTRATECH implant system (Astra Tech AB, Mölndal, Sweden) 'snap-on' type of impression making is recommended. However, the system also consists copings to be used for the impression at the abutment level.

Abutments and transfer copings

Direct Abutment: Direct abutments, designed for 'snap-on' impression method are available in 0.5, 1, 2.5 and 4mm gingival profile heights. They also allow for intraoral preparation before impression making at the abutment level.

Profile Abutment: These abutments are available in 0.5, 1, 2.5 and 4mm gingival profile heights that are suitable for situations where high esthetic outcome is considered.

Cast-to Abutment: They are in gingival profile heights of 0.5, 1, 2.5 and 4mm generally being used for multi-unit implant restorations.

Pick-up Cap: After they are stabilized on the abutment, 'snap-on' impression method is applied.

Healing Cap/Burn-out Cylinder Cap: They are designed for fabrication of provisional restoration and also used during the healing period.

Impression making in ASTRATECH system

Depending on the gingival height profile, proper abutment is selected and fixed on the abutment. Impression is made with open or closed tray technique (Figura 4). Closed tray technique is advised and pick-up impression coping is kept in the impression.

Indirect method at implant level: Implant abutment is screwed to the neck of the implant. Indirect impression is made with a standard impression tray. Unscrewed abutment is then repositioned in the impression.

Direct method at implant level: Transfer copings, developed for direct impression method, are screwed 30 onto the implant. Impression is made with a custom tray. Through the access holes, transfer copings are loosened and kept in the impression

DISCUSSION

Research findings on the impression making procedures for implant supported fixed or removable fixed-partial-dentures are based on the impression material, impression method, splinting and the type of modified impression copings. The effects of these factors have resulted in different research outcome:

Impression material

In one study, impression making with a stock tray using polyvinyl siloxane was found to be an efficient and cost-effective method.[3] Also, in the same study, using polyether and polyvinyl siloxane did not show significant differences. In another study, Daoudi et al.15 did not find significant differences between polyvinyl siloxane (light and heavy body) and polyether impression materials for the accuracy.[4] When the double-mix technique was used, polyether and additional silicone were found equally good with regard to precision. Furthermore, polyether and additional silicone impression materials demonstrated no significant difference between two methods where transfer caps were used.[9,10] On the basis of an analysis by Wee, implant casts made from polyether (medium) or additional silicone (high) impression materials presented significantly less casting error than those made from polysulphide impression material[11]. The findings of this study suggest the use of polyether for making impression from completely edentulous cases where multiple implants are indicated. Herbst et al[12]. stated that two-stage addition-reaction silicone-based impression material has properties that ideally suits for coping transfer, capable of providing sufficient rigidity, preventing rotation of square impression copings during analog tightening and forming the casts.[12] Thus, when such materials are used, splinting may not be necessary.

Impression method and trays

In one study, similar in outcome was found when direct impression method was used in combination with polyether with direct method and indirect method with polyvinyl siloxane.[3] Moreover, snap-on technique used in the ITI system utilizing a stock tray and polyvinyl siloxane material was found to be an effective method with positional and angular accuracy. Daoudi et al[4]., on the other hand, stated that, "pick-up" impression method at the abutment level was more predictable than the repositioning impression method at the implant level. In other studies, polyether and addition reaction silicone, in combination with the use of acrylic resin transfer caps were advised for transfer procedures when Frialit-2 system was employed.[12,13] The study by De La Cruz et al.[13] observed significantly more distortion with the open tray technique than those of resin-splinted situations or when closed tray technique in vertical plane was used.One study on the trays demonstrated that plastic dual-arch tray produced more accurate working dies in buccolingual dimension than metal dual-arch tray. Besides, it was stated that custom tray was not shown to differ from dual-arch trays in accuracy and all three types of impression trays produced dies having adequate clinical standards to make clinically successful impressions of a single tooth implant abutment.[14] Burns et al.[15] reported that when vertical fit discrepancy was measured, both rigid custom close-fit trays and spaced custom trays produced significantly more accurate impressions than flexible polycarbonate stock trays.

Splinting

Assif et al.[9] compared polyether impressions, splinted with autopolymerizing acrylic resin, dual-cure acrylic resin and impression plaster and reported that dual-cure resin splinting method exhibited the highest distortion.,unsplinted tapered copings demonstrated less distortion than unsplinted square type of copings and copings with unsplinted square type with lateral extension.the direct splinting technique was the most accurate transfer method for multiple abutments compared to direct non-splinted indirect impression making methods.[16] It was further stated that in implant cases with divergent angulations, it might be preferable to use square impression copings that are previously airborne-particle abraded and coated with an adhesive.

Modified Impression Copings- There are also alternative procedures in impression making for implant-supported prostheses. They include modifying impression copings (i.e. air-particle abraded, acid etched), splinting of impression copings, using different impression material, using fabricated custom tray, applying direct, indirect or snap-on impression methods.

CONCLUSION

Implant model accuracy could be dependent on the type of the impression material, transfer coping, splinting of these copings and the impression method applied. Impression methods in implant prosthodontics could be either, indirect, direct or direct- splinted methods. When these methods were compared, the accuracy of the direct method was found to be higher and indirect method has shown the highest average distortion value. In direct method, the impression material to be used should be able to stabilize the direct transfer coping and avoid its displacement at the time of the abutment placement. It should also minimize the potential positional distortion that could occur between the abutment replicas and the intraoral implant abutments. Custom trays with high accuracy should be preferred when making impressions. When light-polymerized and auto-polymerized acrylic resin trays were compared, preparation of light-polymerized acrylic resin trays was considered less time consuming.

Also light-polymerized acrylic resin trays showed higher dimensional stability than custom trays. When acrylic resin custom trays are used, spacer thickness and access hole should be increased. By this way, the applied pressure at the time of impression making was found to be equal. Therefore, when making impressions for implant overdenture prostheses, additional silicone and polyether impression materials should be used. Polyether-based impression materials present flexible property under compressive forces and presents acceptable hardness values. Thus, the use of polyether is advised in multiple-unit implant restorations .Increasing order of applied pressure values according to impression material types is polyvinyl siloxane (medium body), polyether, polyvinyl siloxane (light body) and polysulphide.

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Figures Used

FIGURE.1. A, Pick-up coping and positioning cylinders are stabilized in the Straumann implant system. B, Impression made with the closed tray direct technique. C, Implant analogs placed in the positioning cylinders.

FIGURE.2. A, Impression copings fixed on the Frialit implants. B, Transfer copings placed onto the copings. C, Impression made at the implant level with the closed tray technique.

FIGURE.3. A, Impression copings fixed on the Camlog implants. B, Transfer copings placed onto the copings. C, Impression made at the implant level with the closed tray technique.

FIGURE.4. A, Impression copings fixed on the Astra implants. B, Custom made tray for open tray technique. C, Impression made at the implant level with the opened tray technique.

FIGURE 5. A, Impression copings fixed on the Swissplus implants. B, Impression made with open tray method. C, Implant analogs placed in the impression.

FIGURE 6. A, Impression copings fixed on the Astra abutments. B, Abutments and impression copings. C, Impression made with the opened tray method at abutment level.

FIGURE 7. A, Straumann abutments placed on the implants. B, Impression copings placed on the abutments. C, Impression made with the closed tray method at abutment level.