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Impressions In Dental Implants -A Review

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Abstract:
A passive and precise fit between the implant supra-structure and the implant abutment is crucial for long-term success and durability, significantly reducing prosthetic complications. Accuracy and technique in implant dentistry play a vital role in achieving this goal.
To fabricate precise implant-supported prostheses, it is essential to understand implant materials and different types of copings. The choice of implant impression technique depends on the type of prosthesis and implant placement level.
This article primarily discusses modifications of impression techniques for cases such as All-on-4, multiple implants, and deeply placed implants. In the modern era of digital advancements, digital impressions have emerged as a highly effective method, enhancing accuracy and ensuring optimal prosthetic outcomes.
Key Word*: Dental Implants, Techniques, Steps, Modifications, Jig methods, Digital impressions.*

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I. Introduction

Impression - Definition by G.P.T-8 [1]

A negative likeness or copy in reverse of the surface of an object; an Imprint of the teeth and adjacent structures for use in dentistry.

Goals of impression making [2] :

- Capturing the position of Osseo-integrated implant fixture accurately.
- Associate it to surrounding structure for fabrication of a superstructure.
- With optimal aesthetic emergence profile.
- Soft tissue management surrounding the implant fixture & an accurate impression is vital.

II. Materials In Impression Making [3,4]

Alginate –

- Poor dimensional stability
- Poor dimensional accuracy
- Poor tear strength
- Poor stiffness
- Interferes with setting of gypsum

Agar –

- Interferes with setting of gypsum
- Dimensional instability
- Elaborate equipment needed
- Low tear resistance

Poly sulphide –

- High tear strength

- Messy
- Unpleasant odour
- Long setting time
- Poor dimensional stability
- Hydrophobic

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Condensation silicone –
- Cheaper
- Good tear strength, accuracy & elastic properties
- Dimensional instability, due to loss of ethyl alcohol

Addition silicone –
- Shorter setting time
- Easy to mix- automatic mixing devices
- Adequate tear strength
- Extremely high accuracy
- Dimensional stability even after 1 week
- Least distortion on removal
- Hydrophilic , Good compatibility with gypsum

Polyether-
- Good dimensional stability & accuracy
- Short setting time
- Material very rigid
- Not available in all consistencies
- Most expensive

Dispensed as Manual mixing and Auto mixing system polysulfide, silicones and polyether are used in implant dentistry

III. Classification

The techniques for implant impressions are largely classified on the basis of:
1. The type of tray used or Impression coping:
a. Open-tray (Pick-up) Impression
b. Closed-tray (Transfer) Impression

2. The objective of making an Impression:
a. Primary Impressions
b. Secondary Impressions

3. By Impression level:
a. Implant level Implant Impression
b. Abutment level Implant Impression

Open tray/ direct/ pick-up impressions:

The open tray impression technique, also known as the pick-up or direct implant impression technique, is one of the most commonly used methods for implant impressions. It allows the impression coping to remain connected to the implant fixture within the oral cavity during impression making.

Once the impression material has set, the screw securing the impression coping is loosened through an opening in the tray. The impression is then removed from the mouth along with the coping, which remains embedded in the impression material. (Fig 1)

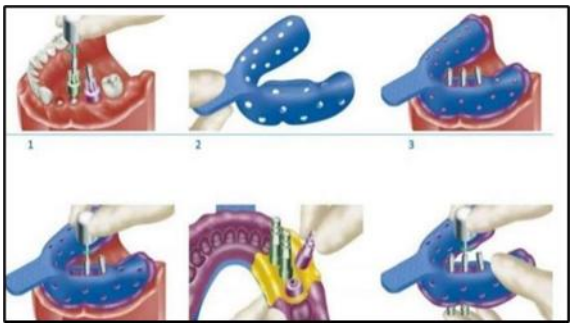

Fig.1 - Open tray/Pick-up/Direct Implant Impressions

This technique minimizes the impact of implant angulation, reduces distortion of the impression material upon removal, and eliminates the need to reposition copings into the impression . It is referred to as a "pick-up" impression because the coping is picked up along with the impression body once the material has hardened [5,6].

The open tray technique can be further classified into splinted and non-splinted variations:

In the splinted technique, all impression copings are rigidly connected using a splinting material. This prevents individual movement of copings during the impression-making process.

Splinting also reduces rotational movement of the copings within the impression material during analog fastening, improving the accuracy of the final cast

Materials Used for Splinting Impression Copings:

Different materials can be used to connect (or splint) impression copings and keep them stable during the impression process. These include: (Fig.2)

- Light-curing impression plaster
- Thermoforming material
- Acrylic resin
- Auto-polymerizing acrylic resin (often used with dental floss as a scaffold)

Fig.2 - Open tray/Pick-up/Direct Implant Impressions

Recently, a new method has been introduced using titanium bars. In this technique, the bars are welded to the abutments or impression analogs directly in the mouth, offering a more advanced way to splint implants.

Closed Tray / Indirect / Transfer Impressions:

The closed tray technique, also known as the indirect or transfer technique, is commonly used for making preliminary impressions for fixed complete dentures. A stock tray or a custom tray can be used for this method. (Fig. 3)

Fig. 3 - Closed tray/Transfer/ In-direct Implant Impressions

In this technique:

- Impression copings are placed on the implants or multi-unit abutments.
- The impression is made and allowed to set.
- The tray is removed, but the impression copings stay in the mouth.
- The copings are then removed separately and connected to implant or abutment analogs.
- This coping-analog assembly is then transferred back into the impression, fitting into the exact position where the coping was originally located.

It's called the closed tray technique because the impression is taken through a tray without any openings, unlike the open tray method [7].

This method is often used for preliminary or less complex cases

Implant Level Impressions:

In this technique, the impression coping is attached directly to the top of the implant (called the implant fixture) [8].

Once the impression is taken, the abutment (the part that connects the implant to the crown or denture) can be chosen and placed on the model—not in the mouth. This makes it easier to design and build the final restoration, or superstructure, in the lab.

This method is especially useful for screw-retained abutments, which can be placed on the model before creating the superstructure.

Abutment Level Impressions:

In the abutment-level impression technique, abutments are first attached to the top of the implant (fixture) inside the mouth. Then, impression copings are connected to these abutments, and the impression is taken [9].

Unlike the fixture-level method, the abutments are not removed during the impression process. To protect the abutments and avoid gum overgrowth, a healing cap or gingival former should be placed on the abutment until the final structure (superstructure) is ready . (Table - 01)

TYPE OF IMPRESSION	INDICATIONS	ADVANTAGES	DISADVANTAGES
OPEN TRAY/ PICK-UP/ DIRECT IMPLANT IMPRESSION	- Screw retained restoration - Multi unit prosthesis - FMR - Non parallel implants placed condition	- Effect of implant angulations reduced - Minimize distortion - Prevent rotational movements of copings	- Movement of Impression Copings - Rotational Movement During Analog Connection - Blind Attachment Can Cause Misfit
CLOSED TRAY/ TRANSFER/ IN-DIRECT IMPLANT IMPRESSION	- Single unit cement retained prosthesis - Provisional restorations - Non hexed components - Gagging & limited mouth opening patients	- Easy - No need of custom tray - Coping prevent blind attachment	- Reinserting of coping can cause distortion - Material deformation in non parallel implants

Table: 1 Indications & advantages / disadvantages of impression type

Digital Impressions

Digital impressions are becoming more popular and are often used instead of traditional impression materials. Implant systems now offer scan bodies that help capture the position of the implant and nearby teeth more accurately using digital sensors.

To take a digital impression, three main tools are needed:
- Digital scanner – Scans the teeth and implants, turning them into computer data.
- Software – Converts the scan data into a 3D model.
- CAM system – Uses the model to create the final dental part (like a crown or bridge).

To scan an implant, you first attach a scan body to it. Scan bodies are like digital versions of impression copings and are designed for each specific implant brand. They help guide the scanner during the digital impression [10].

Intraoral scanners use advanced optical technology—similar to a camera, but much more precise. Instead of just capturing light and color, these scanners measure how light reflects off the surfaces inside the mouth to create a 3D image.

The scanner sends this data to special 3D software. The software uses alignment algorithms to "stitch" all the scanned images together and build a complete virtual model of the teeth, gums, and implants.

The most common scanning technologies used in dental scanners include:
- Triangulation
- Active wave-front sampling
- Parallel confocal laser scanning

These methods help collect detailed surface information of the teeth and surrounding gum tissue.

Advantages:
- Less distortion compared to traditional materials
- No unpleasant taste or gagging from impression materials
- Impressions can be viewed in 3D before sending to the lab
- Virtual analysis of prosthetic space
- Better assessment of the emergence profile (especially in front teeth)
- Shorter chair time and fewer impression retakes
- Labs can check for spacing, implant position, and contacts directly on the 3D model

Disadvantages:
- Harder to detect exact abutment positions with multiple implants
- Difficult to scan soft tissue when implants are very close together

Modification if impression technique based on clinical case:

Snap fit technique

This technique uses press-fit impression copings [11], which are pushed onto the implant rather than being screwed or cemented. These plastic copings are picked up in the impression, but the method is not considered a pick-up impression because it uses a closed tray. It's also not a transfer impression, since the coping is picked up during the impression—unlike traditional transfer methods.

Advantages:
- Prevents movement of the coping during the impression
- Reduces chair time for both dentist and patient
- Combines the benefits of open and closed tray techniques
- Simple and comfortable for both dentist and patient

Tissue contouring after 2nd stage surgery [12] :

To make the gums around an implant look natural and attractive, soft tissue procedures are done before the implant is fully uncovered (Stage II surgery). These procedures can be:
- Subtractive – removing excess tissue
- Additive – adding tissue (like grafts)
- Combination – using both methods together

Subtractive Technique:

This technique is used when there is enough healthy gum tissue along the toothless ridge (edentulous crest). The goal is to reshape the soft tissue to create a natural-looking gum contour around the future crown.

It helps form:
A proper emergence profile (how the crown comes out of the gum)
Natural labial contours (front-facing gum shape)
Healthy-looking interdental papillae (the gum between teeth)

Additive Technique -

When there is not enough soft tissue in terms of height or thickness, an additive technique is used to increase tissue volume around the implant.

Steps:
- A small incision is made along the palatal side of each tooth.
- The tissue is lifted until the crest of the ridge is exposed and the cover screw is located.
- A healing cap (gingival former) is placed onto the implant.
- A removable denture is adjusted to fit over the healing cap.
- Over the next few weeks, this setup encourages the tissue to mature and grow in volume around the implant.
- The final crown is placed 6–8 weeks after tissue maturation.

Other Additive Methods-
Roll Technique:

Originally used in fixed partial dentures (bridges), this involves using de-epithelialized connective tissue grafts to bulk up soft tissue around pontics or implants.

Split-Finger Technique (Dr. Carl Misch):

Used when the papilla height is less than 2 mm. This method helps recreate the natural gum peaks between teeth or implants.

Ehancing anterior esthtics:
Using Provisional Restoration [13]
This technique uses a temporary (provisional) crown to help shape and guide the soft tissue around the implant
- A custom abutment is placed first.
- The provisional crown helps define the final crown margins and the shape of the surrounding gums.
- While taking the impression, both the abutment position and the soft tissue shape are recorded.
- This allows for accurate transfer of gum contours to the final restoration.

Customized Impression Copings [14] - (Fig.4)

This technique helps to accurately capture the shape of the gums (gingiva) around implants after they've been shaped using a provisional restoration.

A custom impression coping is made by adapting dual-cure (dual polymerizing) composite resin to a regular open tray impression coping.
The resin is shaped to match the gum contour using instruments.
Care is taken to avoid resin going too deep toward the implant.

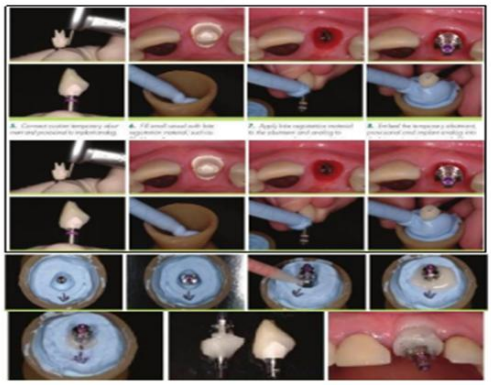

Fig. 4 Customized impression coping technique

Benefits:
Captures the exact soft tissue shape around the implant and pontic site
Reduces mismatch between what is in the mouth and the lab model
Helps dental technicians design the final crown or bridge more accurately

Implant retained overdenture:
Functional impression technique

This method is used for implant-retained overdentures, which get support from both the implants and the gum tissue (like complete dentures).The impression must consider the difference in flexibility between the firm implants and the soft gums.

This technique captures the soft tissue while it's under function (movement or pressure), giving a more accurate picture of how the denture will fit in real life.It also records the position of the implants at the same time.

- Combines the open tray technique with a functional impression.
- Uses vinyl polysiloxane (VPS) material.
- Border molding (shaping the edge of the tray) and the impression are done together in one step.

Two step pickup impression technique [15]

Achieving a passive fit (no tension or stress on the components) is crucial for the long-term success of dental implants. A poor fit can lead to biological issues (like inflammation) and mechanical failures (like screw loosening or fracture). Every step—from taking impressions to making the final restoration—can affect the final fit.

The process can be affected by:
- Flexing of the lower jaw (mandible)
- Distortion of the impression material
- Errors in the impression technique

Dual impression technique [16]

Dual impression techniques were introduced to produce a “corrected cast” so that the teeth are recorded in anatomic and residual ridge is well. Sina Jannesar et al , have described a technique for a two stage selective pressure impression technique using a custom tray for implant- retained over-dentures.

Deeply placed implant technique:

For implants placed deep in the gum, getting a good impression of the surrounding soft tissue can be tricky.One solution is to use a longer impression coping to reach the tissue and increase surface area, but not all implants allow this.

Simple Technique by Tomas Linkevicius et al.[17]
- Use a roll of composite resin, tray adhesive, and a small amount of occlusal registration material (a hard material) around the transfer coping.
- Occlusal registration material is harder than vinyl poly-siloxane (VPS), so it helps keep the coping stable during the impression.
- The composite resin around the coping creates undercuts and increases surface area, improving the impression material’s grip.
- This added bulk prevents movement of the coping when attaching the implant analog and pouring the cast.
- Since both occlusal registration material and VPS are similar materials (A-silicone), they stick well and don’t detach.This method improves impression accuracy for implants placed deep in the gums.

Implants with close proximity impression technique:

When implants are placed very close together, taking accurate impressions becomes more difficult due to limited space.

McCartney et al [18] suggested using gold cylinders instead of regular impression copings. These provide better access in tight areas.

Chaimattayompol et al [19] used screw-retained titanium or friction-fit plastic index copings as alternatives to manage the limited space more effectively.

Full arch implant impression technique [20]: (Fig.5)
Mandibular Implant Prosthesis with Shim method

This technique is used when making a full implant-supported prosthesis for the lower jaw (mandible), especially when it's opposing a complete upper denture.
4 implants are placed between the mental foramina (front area) to support the denture.
2 additional implants are placed in the molar regions to act as stops and add stability.

This method is based on the shim technique, which makes the process faster, cheaper, and uses fewer components.

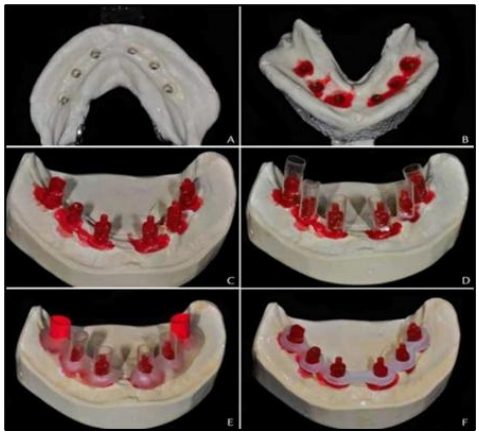

Fig. 5 Full arch impression technique - shim method

Advantages:
- Easier and faster lab work
- Less time needed in the dental chair
- Comfortable and efficient for both dentist and patient

The other technique uses only 1 set of implant impression copings and analogs, therefore need for fewer implant components.

Shim Technique for Implant Impressions (Simplified Steps) : (Fig . 6 -8)
1. Take a Preliminary Impression :Use irreversible hydrocolloid to make a first impression of 6 implant impression copings.
2. Inject Acrylic Resin: Inject a thin mix of acrylic resin into the coping areas of the impression to mark their positions.
3. Pour a Preliminary Cast: Create a preliminary stone model from this impression.
4. Add Vinyl Tubing: Place vinyl tubing loosely over the impression copings on the model.
5. Reinforce with Acrylic Resin: Wrap the tubing with light-cured acrylic resin material and then light polymerize (harden it using curing light).
6. Shim Formation: The hardened acrylic structure now forms a shim that fits passively and accurately around the implant copings.

Uses:
- Ensures proper alignment
- Prevents movement of impression copings
- Helps in accurate transfer of implant positions

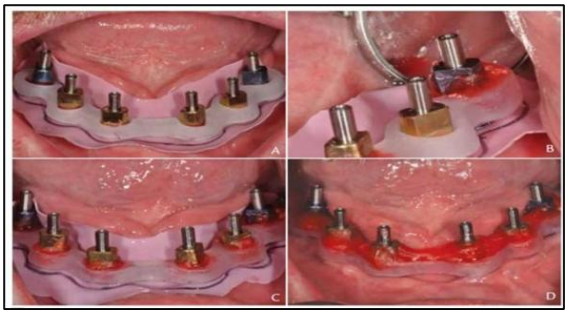

Fig. 6 Place rubber dam and shim around impression copings, Lute shim and impression copings with acrylic resin, All impression copings luted to shim, Reinforce shim splinting framework after initial acrylic resin has polymerized

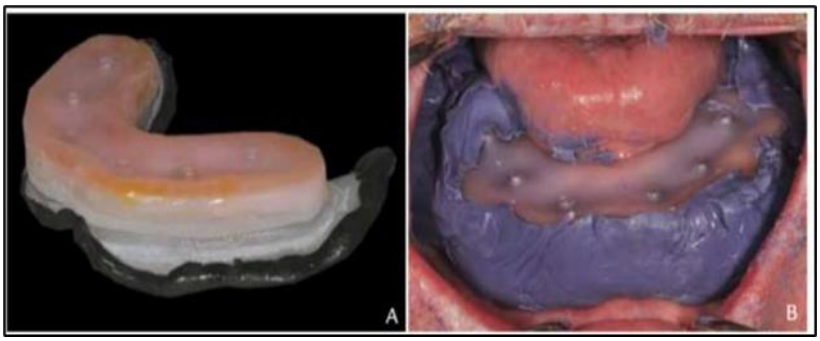

Fig.7 Seal open-top tray with 1 layer of baseplate wax. Imprint each guide pin on wax lid, Seat impression tray such that all guide pins contact underside of wax lid

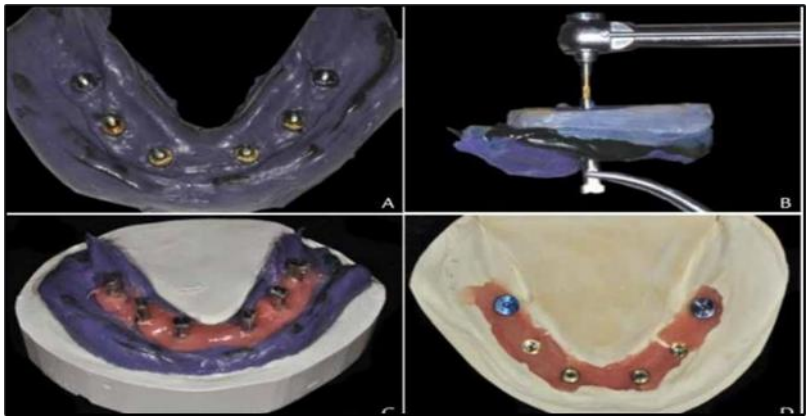

Fig. 8 Intaglio surface of impression, Torque each implant replica onto impression copings to 15 Ncm while using hemostat to counter torque, Place silicone soft tissue moulage around each implant replica, Definitive cast

IV. Discussion

In implant dentistry, making accurate impressions is essential for ensuring a proper fit and long-term success of the prosthesis. Since implants are directly anchored to the bone and lack the natural cushioning of teeth, even small errors in impression making can lead to complications such as screw loosening, discomfort, or bone loss.

Impression making in implant dentistry was decided, based on prosthesis later a predictable implant impression technique is selected. For example: When esthetics are a concern, methods for transferring the soft tissue contours shaped by provisional restorations to the master cast were also considered.

V. Conclusion

The introduction of modern dental implants has transformed the way we replace missing teeth. A successful implant-supported prosthesis depends greatly on using the correct impression technique.

An ideal implant impression should accurately capture: The position, depth, and angulation of implants, The rotation of hex connections, The soft tissue shape or emergence profile.

Each impression technique comes with its own advantages and disadvantages. A skilled clinician must understand the indications, limitations, materials, and steps involved in each method to achieve the best outcome.

This article is designed to be a beginner-friendly guide, helping readers understand the basic protocols, procedures, and technologies involved in making accurate implant impressions.

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