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Different impression techniques employed in complete denture prosthesis: A case series

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Abstract
The initial step in any prosthesis fabrication is impression-making. A good impression is the foundation for a successful prosthesis. Every clinical case needs a new treatment plan and technique for recording impressions. This article provides an overview to the dentist about different impression- making procedures in various clinical situations in their daily practice with its advantages and disadvantages.

Keywords: Edentulism, putty technique, impression techniques, Winkler technique, conventional technique, Zoe impression, cocktail method, admixed

1. Introduction
Edentulism has been a serious public health issue in developing countries due to poor oral healthcare. It is a debilitating and irreversible condition and is described as the “final marker of disease burden for oral health.” The number of edentulous cases is rising per year and to meet the basic need of eating, complete denture prosthesis is a boon. An effective prosthesis starts with a precise impression. An impression is a negative mold or reverse copy of an object's surface, used to create a replica of a dental structure. The impression process involves capturing the details of the basal seat area so that a stone model can be cast using custom trays, allowing for the fabrication of dentures. An ideal impression should cover the maximum possible area with which normal muscle movements are possible. Every new case comes with a new challenge so it becomes essential for dental professionals to understand multiple impression techniques and choose the one appropriate and best suited according to the clinical situation.

Some important techniques for edentulous arches series
Klein technique
It was proposed for the development of impression without a tray, as a stock tray may cause some distortion of the tissue and may result in an over extended impression using a moldable material (putty silicone), reinforced by an internal metallic core, which was placed over the residual ridge and the borders molded by speech exercises is used along with a low viscosity material is placed on the impression surface of this tray and a functional preliminary impression is made.

Cocktail Method
In this approach, a custom tray is created using auto-polymerizing acrylic resin based on the dynamic impression method. The tray is designed with cylindrical mandibular rests in the posterior area and includes a 1mm wax spacer to account for the increased vertical dimension. The patient is instructed to close their mouth so that the mandibular rests align with the maxillary alveolar ridge, similar to the dynamic impression process. This positioning ensures the tray remains stable. Additionally, the lingual surfaces of the mandibular rests are shaped to be concave.

Modified wax impression technique

The primary impression is taken using an irreversible hydrocolloid. A custom impression tray is then made on the preliminary cast. Modeling plastic impression compound, softened to a workable consistency, is applied to the inner surface of the tray, specifically in the areas corresponding to the mandibular central incisors and both mandibular first molars, to act as a wax spacer. Border molding is performed with the compound, after which spacers are removed with a scalpel blade once molding is complete. The tray is adjusted by trimming over the crest of the residual ridge to create a window opening above the movable alveolar ridge using a No.8 round bur. Melted mouth temperature impression wax is then applied to the tray's borders, ensuring the wax is cooler than the modeling plastic to avoid any distortion. The tray is positioned over the edentulous ridge and left in place for about 5 minutes to allow the wax to flow to the periphery and set. Additional impression wax is applied to the remaining inner surface of the tray, built up incrementally on the slopes of the ridge until a smooth, glossy surface is achieved. Excess wax around the edges or window opening is trimmed away with a scalpel blade. Adhesive is then applied to the tray around the window opening and left to dry. The tray is placed back onto the residual ridge, and vinyl polysiloxane impression material is injected into the window opening. Care is taken to ensure the impression material is applied as gently as possible to avoid distorting the soft tissues. Finally, the impression is removed and encapsulated using a plaster and pumice mixture.

Admixed Technique

According to Mccord and Tyson, a mixture of impression compound and green tracing stick compound in a 3:7 weight ratio is placed in water heated to 60 °C and kneaded until it forms a uniform mass with a working time of approximately 90 seconds. After removing the wax spacer, this uniform mass is applied to the tray, and the patient performs various tongue movements to capture the borders.

All green technique

In this method, the mandibular secondary impression is taken with green stick tracing compound. The green stick compound is kneaded until it becomes a uniform mass, then placed on a special tray. The patient performs border movements to capture the impression. The final impression is then obtained using zinc oxide eugenol.

Flange Technique

Developed by Frank Lott and Bernard Levin, this technique, introduced in 1966, offers an anatomic and physiologic approach to enhance the retention, function, comfort, and appearance of dentures. It involves taking impressions of the soft tissues around the buccal, lingual, labial, and palatal surfaces and incorporating these extensions into the denture. Flange wax is rolled from the retromolar pad area to the sublingual region, ensuring it is large enough to accommodate anticipated resorption. The patient is then asked to perform vigorous functions, such as swallowing, to achieve border extensions that cover the maximum surface area.

Technique proposed by author's Freese

The goal is to create an impression that accurately captures the tissue surfaces without excessive displacement from their functional positions. To achieve this, an oversize soft metal impression tray is chosen and trimmed to exclude any attachments to the border tissues. Low-heat modeling plastic is employed, and the patient is guided to perform various movements, such as running their tongue along their lips, sucking in their cheeks, pulling in their lips, and opening and closing their mouth.

Digital impression technique

Modern advancements in digital impression technology utilize 3D scanning to create a virtual map of a patient's teeth and oral cavity. This procedure involves using an intraoral scanner that captures images of the mouth with light pulses. The data collected is processed by specialized software to generate a 3D model. The dentist can review this model on a computer screen and send it to a lab for the production of dentures, crowns, bridges, and other restorative devices**.**

Some case reports performed case 1: Winkler technique

A 67-year-old male reported to the Department of Prosthodontics with the chief complaint of difficulty in chewing food due to an edentulous upper and lower arch. Clinical examination revealed an ovoid-shaped resorbed mandibular arch form with normal mucosa. The patient had a normal labial and buccal frenum. Extra-oral examination revealed a Class 1 facial profile and sunken cheeks with slight discomfort in TMJ movements. The lip was unsupported with a normal lip length. The treatment plan was to fabricate a complete denture prosthesis by recording the tissues using the functional impression technique.

The primary impression was made using a muco- compressive thermoplastic impression compound(Y- Dent, India). The preliminary cast was fabricated using a type II gypsum product on which an acrylic temporary record base with borders 2 to 3mm short of sulcus was fabricated. After the fabrication of the acrylic base plate, maxillomandibular jaw relation was recorded with appropriate VDO and VDR (Fig.1a). The tissue conditioner (GC tissue conditioner, Australasia) was mixed in a ratio of 1:1 followed by application on the intaglio surface of the base plate in 3 layers. After the application of each layer patient was asked to close the mouth at the recorded vertical dimension and perform functional movements which included puffing, blowing, whistling, and smiling (Fig.1b and 1c). Then a final wash impression was made using light body elastomeric impression material (AVUEU, India) to record the finest details (Fig.1d) The jaw relation was sealed. A master was poured using die stone (APL Dentrock, India) and articulated on a mean value articulator. The teeth arrangement was done and denture try-in was performed (Fig.1e). The denture was cured conventionally in heat cure acrylic resin followed by finishing and polishing. Denture insertion was done (Fig.1f) and post- insertion instructions were given to the patient.

Fig 1: (a) Recording of jaw relation (b) mixing of tissue conditioner material (c) recording impression with functional movements in tissue conditioner (d) final impression (e) denture try-in (f) Prosthesis *in-situ*

Fig 2: (a) Pre-rehabilitative view (b) post-rehabilitative view

Case 2: Elastomeric impression technique

A 60-year-old female presented to the Department of Prosthodontics with difficulty chewing food. She had been edentulous for 6-8 months, and her medical history was unremarkable. Intraoral examination showed edentulous upper and lower arches with minimal resorption. Extraoral examination revealed normal cheeks and typical temporomandibular joint (TMJ) movements. The treatment plan involved using heavy body elastomeric impression material for single-step border molding, followed by a light body final impression. Preliminary impressions of the maxillary and mandibular arches were taken using a hydrophobic thermoplastic impression compound. (Fig. 3a) followed by the creation of a custom tray on a dental stone cast. Tray adhesive was applied to both the internal and external surfaces of the acrylic custom tray to ensure the silicone border molding material adhered properly. An addition silicone putty with an extended working time was used to load the borders of the special tray. The tray was then placed in the patient's mouth for border molding, with the patient instructed to move their tongue according to standard impression techniques. After removing the tray, the impression was examined. Light-body addition silicone impression material was then applied to the impression and reinserted into the mouth. The patient was asked to perform vigorous tongue movements while the light-body material was molded along the buccal and labial flanges. After the material is set, the impression is removed from the mouth and examined for any discrepancy (Fig. 3b). A master cast was poured over which record bases were fabricated. Occlusal rims were made and jaw relation was recorded. The casts were articulated followed by teeth arrangement using acrylic teeth. Denture try-in was performed and fabrication of the denture was done conventionally followed by finishing and polishing. The denture insertion was done and the patient was satisfied with the prosthesis (Fig. 3c and d).

Fig 3: (a) Primary impression (b) heavy elastomeric impression border molding (c) pre-rehabilitative view (d) post-rehabilitative view (e) occlusal rim (f) light body used final impression

Case 3: A combined compound and zinc oxide eugenol (Zoe) impression technique (conventional technique)

A 63-year-old male reported to the Department of Prosthodontics with a complaint of missing teeth in the upper and lower arch and difficulty in eating food. The patient had a history of mobile teeth due to periodontal problems. He had undergone extraction of mobile teeth 8 to 9 months ago.. Clinical examination revealed a posteriorly resorbed mandibular ridge with a thick ropy saliva. A maxillary medium-sized ovoid ridge was present with no intra-oral pathology. Extra- oral examination revealed slightly sunken cheeks.

Preliminary impression was recorded using a thermoplastic muco-compressive impression compound (Fig. 4a). A model cast was poured and a spacer around 1.5-2mm short of sulcus was created , over which special custom tray was fabricated to further record secondary impression.(Fig. 4b) Using a green stick, border molding was done to record the seal. Post that, spacer was scraped off using a BP blade to provide adequate space for ZOE impression. ZOE base and catalyst paste were mixed on a glass slab and applied to the preliminary impression made in the impression compound to record a wash impression by performing appropriate movements (Fig. 4d). A master cast was fabricated using a die stone on which an acrylic base plate was made. Occlusal rims were fabricated (fig 4e) and jaw relation was recorded followed by teeth arrangement. Try-in was done followed by the fabrication of dentures. The denture was inserted, post-insertion instructions were given and the patient was satisfied with the denture.(fig 4f)

Fig 4: (a) Primary impression (b) spacer and special custom tray (c) edentulous pre operative mouth (d) final ZOE impression (e)occlusal rims (f) post- rehabilitative view

Discussion

The success of complete dentures depends on achieving the three fundamental properties: retention, stability, and support. Denture retention is affected by factors such as cohesion, adhesion, fluid dynamics, viscosity, atmospheric pressure, the oral-facial musculature, and occlusion.

Advancements in impression materials and techniques have enhanced the clinician's ability to record tissue details accurately across various clinical scenarios, thereby improving denture retention. The literature describes several impression techniques, each with its own set of advantages and disadvantages.

In the first case, the closed-mouth functional impression technique by Winkler was employed. This method offers several benefits, including (a) time efficiency, (b) elimination of tray handling interference, and (c) reduced risk of under- or overextensions since the patient performs the movements and applies pressure similar to natural occlusion. However, this technique has some drawbacks: (a) dependency on patient cooperation with limited control over patient movements, (b) restricted anterior tongue movement, which may affect the anatomy of the lingual border, and (c) the need for 3-4 applications of tissue conditioner.

In the second case, elastomeric impression material was used, combining the advantages of single-step border molding with heavy body material and precise recording of details with light body material during the final impression. This approach enhances denture retention, reduces time expenditure, and minimizes patient discomfort. Nonetheless, the drawbacks include (a) inability to correct slightly short or over-extended borders once set, (b) higher cost, and (c) reduced working time.

In the third case, an initial impression was made using impression compound, followed by scraping to create space for the final impression material. This technique offers benefits such as fewer clinical visits and reduced chairside time compared to traditional border molding. However, it also has disadvantages, including (a) insufficient space for zinc oxide eugenol if the impression compound is not adequately scraped, (b) inconsistent thickness of the final impression material due to arbitrary scraping, and (c) lack of tissue stops.

Conclusion

The primary goal of a maxillary or mandibular impression is to capture all available denture-bearing surfaces. Understanding the biological principles of impression making helps in effectively identifying these surfaces. The aim is to enhance the supportive function of the denture foundation through both functional and anatomic approaches. Preserving the supporting tissues is a crucial responsibility that must be upheld.

Applying foundational concepts and leveraging advances in the basic sciences are essential to maintaining this responsibility. As prosthodontists, it is our duty to provide meticulous and informed prosthodontic care, with the aspiration that, in the future, we may better control residual ridge resorption. Selecting the appropriate impression technique based on clinical experience and knowledge is crucial for the successful fabrication of complete dentures.

Conflict of Interest

Not available

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