"A novel impression technique for recording bilateral severe undercuts with rigid impression materials in completely edentulous patients"

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Abstract

Completely edentulous patients who present hard tissue undercuts along with overlying soft tissue, especially after extraction of proclined natural teeth find their treatment prosthesis deferred for months, especially in situations where one has limited access to elastomeric impression materials. Hard tissue undercuts intensify retention of the prosthesis obtained biologically and are the most commonly available mechanical means of retention in completely edentulous patients. Hard tissue undercuts that range from moderate to severe are often referred by a prosthodontist for surgical correction, as they cannot be recorded using rigid impression materials without altering the design of the final prosthesis. A final impression technique that suffices the advantages of rigid impression materials and prevents surgical intervention for managing hard tissue undercuts in such cases needs to fulfill all the principles of impression making, besides fulfilling the objectives of primary or final cast fabrication. This article in the form of a clinical case report presents a novel final impression technique that is based on the principle of dual impression making and requires simple modification of the custom tray. The technique being simple and inexpensive is indicated in completely edentulous situations with bone and soft tissue undercuts that are contraindicated for surgery.

Keywords: Complete denture, Dual impression, Edentulous, Impression materials, Undercuts.

Introduction

Hard tissue undercuts in edentulous patients range from mild to severe. Clinically the undercuts are either favourable or unfavourable, depending on the location, extent, anatomy and ability to be recorded while making the impressions. Depending upon their relation to each other and to other undercuts in the oral cavity, management varies from a conservative approach to surgical intervention. Removal of severe undercuts in the form of pre prosthetic surgery is considered as essential mouth preparation before complete denture fabrication.[1] Severe undercuts demand extensive bone removal followed by a long recovery period. Patients should be made aware in such cases how surgical procedures will help for future denture wearing.[2,3] One of the conservative means of utilizing undercuts without sacrificing them to surgical intervention is the use of resilient liners. Besides, even distribution of the functional load and prevention of local stress concentrations, the liners being flexible can be easily removed and inserted in severe undercut areas without traumatizing the tissues.[4-9]

With advances in soft liners, surgical removal of undercuts will not be preferred in the near future as these liners can serve for a long period.[10,11] In cases where surgical correction is not indicated, bony undercuts are recorded by using an irreversible hydrocolloid or addition silicone. Impression techniques that utilize these materials possess disadvantages like dimensional instability, imbibition, reduced tear strength in case of irreversible hydrocolloids[12] and technique sensitivity and cost in case of silicones.[13,14]

Within the scope of impression materials used for complete denture prosthesis, zinc oxide eugenol is still the most preferred material for final impression making in complete denture fabrication due to its ability to record tissues in function, besides being inexpensive and a dimensionally stable material.[15] Added advantages of zinc oxide eugenol impression pastes include its easy availability, ease of disinfection, eco-friendly, easy to remove and its ability to be modified. Except elastomers, the only choice of material for recording impressions in such cases is irreversible hydrocolloids which have many drawbacks. Therefore an attempt has been made through this report that describes an innovative technique which allows a clinician to use a combination of zinc oxide eugenol impression material and a minimum of irreversible hydrocolloid to record severe bilateral favourable/unfavourable undercuts in the anterior region of the maxilla or the mandible.

Clinical Case Report

A male patient aged 63 years reported to the department of Prosthodontics for routine fabrication of the complete denture prosthesis. Medical history of the patient revealed that he was suffering from diabetes and hypertension since last 7 years and was on regular medication. Dental history suggested that the patient had never worn any dentures. The patient had lost most of his teeth due to periodontal disease and was edentulous since last five years. Clinical examination disclosed the presence of bilateral undercuts in the anterior region of the maxillary residual ridges that ranged from 4-6 millimeters anterior-posteriorly. Treatment plans presented to the patient included either surgical

correction of the undercut followed by the fabrication of conventional complete denture or utilization of undercut with slight modification in the design of the complete denture prosthesis.

Preliminary impressions were made using irreversible hydrocolloid (Jeltrate Alginate, Fast Set; Dentsply Intl, York, Pa) from which diagnostic casts were obtained and then analyzed on a dental cast surveyor. Surveying of the diagnostic casts disclosed bilateral undercuts below the height of contour in the anterior portion of the maxillary residual alveolar ridge. Extension of the undercuts bilaterally was from labial frenum to buccal frenum. The maximum depth of the undercut was about 1cm lateral to the right undercut and was 7 mm deep. Both primary casts were marked for maximum height of contours, relief lines and respective spacer designs. The cast was then blocked with undercut wax (Harvard, Germany) in the region of the labial vestibule on either side of the labial frenum. A special tray was fabricated from self-cure denture base acrylic resin (DPI, India) on the maxillary cast without the labial flanges **(Fig. 1)** and with a handle made of tray compound which could be easily removed before making a dual impression. The custom tray extended up to the maximum height of the residual alveolar ridge labially on either side of the labial frenum. The special tray was provided with relief in the region of the midpalatine raphe and palatine rugae.

Fig. 1

Technique

After verifying the tray in the oral cavity for necessary extension and fit, border molding was done using low fusing green stick compound (Pinnacle tracing stick, DPI, Mumbai, India) except on the labial flange which was non-existent on the special tray **(Fig. 2).** Recording of the posterior palatal seal area was done at this stage. A stock tray (perforated) was selected that would engulf the custom tray in the mouth with irreversible hydrocolloid loaded onto it. In the first stage, zinc oxide eugenol impression paste was mixed and loaded in the special tray except on the borders of the tray and final impression was made **(Fig. 3)**. After the material was set, the handle of the special tray was removed while the tray was still present on the oral tissues and the stock tray (perforated) loaded with irreversible hydrocolloid was placed over the special tray making sure that the borders of the stock tray were well beyond the borders of special tray. This would also ensure that the border molding of the labial vestibule region was carried with irreversible hydrocolloid. After the material was set, the impression was analyzed for accuracy of fit at the junction between the irreversible hydrocolloid on the stock tray and the first impression **(Fig. 4)**.

Fig. 2

Fig. 3

Fig. 4

Analysis of the impression at this stage included the relationship at the junction in the anterior region, which should blend rather than have any extension or overhangs. In the posterior region the material in the stock tray should go well beyond the borders of the special tray. This ensured that the first impression in the custom tray had not moved while the second impression was being made. After pouring the impression with dental stone the rest of the clinical and laboratory procedures were done in the conventional manner. The final denture design modification was done in the form of placement of permanent soft liner in the region of existing undercuts. This ensured insertion and removal of the prosthesis without injuring the mucosa. The patient was thoroughly trained as to how such dentures should be inserted and removed.

Discussion

Dual impressions are not new in removable Prosthodontics. There are various techniques mentioned for cast partial denture fabrication that are based on such approach. However the main purpose of these techniques in cast partial denture is gaining maximum support from the underlying bone tissue especially in distal extension bases.[15,16] Preservation of bone at any stage is fundamental to the principle of impression making. An important advantage of the above mentioned technique is that it prevents the loss of bone (especially the labial/buccal cortical plate) that would be otherwise necessary to correct or minimize the undercuts. When planned, with use of resilient soft liners (permanent) in the final finished prosthesis then the drawback of deferring the treatment for few months commonly associated with other conventional techniques is also overcome. If for some reason soft liners are not to be used, the above mentioned technique still can be used by modification of the labial flanges of maxillary complete denture or surgical removal of only one undercut. Besides the above mentioned advantage of soft liner, the technique also provides the added advantage of shock absorption and tissue protection while insertion and removal from the undercuts, bonding with the denture base resin and preservation of residual alveolar bone.[17-19] Besides, there are patients who either do not want to undergo any surgical correction or are contraindicated for surgery due to underlying systemic conditions. Therefore an edentulous patient with bilateral bony undercuts who wants prosthesis immediately, but cannot undergo surgical correction is an ideal candidate for the above mentioned technique. Limitations of the technique include the border molding of labial vestibule in irreversible hydrocolloid loaded on stock tray rather than the conventional custom tray.

Currently elastomeric impression materials are being used in complete denture treatment with minimal research,[20,21] except polyether impression material that too is to be used for border molding of the final impression tray only.[22] Although the reliability of elastomeric impression materials cannot be doubted for fixed prosthodontics, drawbacks that are associated with elastomeric impression materials in general {like adhesion to special tray,[23,24] time dependant dimensional accuracy, elastic recovery, release of by products,[25-29] differences in hydrophilic behaviour[30-33] (which is extremely important while recording completely edentulous tissues which cannot be dried unlike the surface of natural tooth) or the technique of impression making for example the choice between a monophasic or a biphasic, single mix or double mix; do not make them a likely choice for use in complete denture impressions. Besides previously mentioned disadvantages of elastomeric impression materials and techniques, cost associated with their use for a dental school makes the relevance of above mentioned technique using zinc oxide eugenol more significant.

Conclusion

The presented impression technique in combination with the use of soft liners provides a conservative treatment approach in the presence of severe undercuts (without the need of radical surgical procedures) in the provision of complete dentures for edentulous patients.

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