



Impression Materials and Techniques for Maxillofacial Defects: A Comprehensive Review

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[Review Article](#)

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ABSTRACT

Rehabilitation goals are focused on restorative, palliative, supportive, and preventive aspects of treatment. Various advanced cancer or traumatic incidents may affect the soft and hard tissues of the jaws. The defect may result in oroantral, oronasal oro-orbital communications. And in this article, we have tried to overcome the challenges during the various impression techniques and materials for maxillofacial defects.

Keywords: Maxillofacial Defects, Rehabilitation, Impression Materials, Impression Techniques.

Introduction

The face is one of the most striking parts of the human body. It is the site of emotional expression and also defines the part of the personality. Unlike other parts of the body which may be covered up in clothing, the face is almost always left exposed. So defects of the face, therefore, apart from the functional implications carry very significant aesthetic concerns.¹

Maxillofacial rehabilitation is a multidisciplinary approach that includes Surgeons, radiation oncologists, and medical oncologists, oral surgeons, and prosthodontists. Treatment strategies developed for head and neck cancer patients must always consider the need to maintain or re-store oral functions and oral health. No longer should we hear the cliché so often echoed in the past, and even today, in reference to one of our patients: "The cure was worse than the disease."² In addition to being experts in their respective fields of responsibility, all members of the treatment and rehabilitation team must be familiar with the expertise of the other members of the team so that therapy and rehabilitation may be smoothly integrated. In keeping with the multidisciplinary nature of this topic, we have attempted to give the reader insights into the different techniques for defects associated with the Intraoral and extraoral³ (mandible, maxilla, soft palate, and facial) structures.



Historical Background: Facial prostheses were described by **Ambrose Pare in 1575** and tried many maxillofacial prosthetics for injured war soldiers with papier-mache, silver, gold, and copper. According to patient's demand who lost their maxillofacial figures, maxillofacial personnel has increased and prosthetic's skill has been advanced all of the worlds. Some accounts indicate that such replacements existed even earlier. Historically, these prostheses were made of cloth, leather, wrought or cast metal, vulcanite, porcelain, and acrylic resin. Today most are made of medical-grade silicone rubber.⁴

In the 1980s, two key technical advances—the introduction of osseointegrated implants and free vascularized flaps—were made, but in recent times the most significant changes are the result of improved collaboration between prosthodontic and medical researchers and clinicians. Many challenges remain; for instance, we have yet to find an effective means of minimizing the very significant long-term side effects of chemoradiation therapy. Yet, for the most part,⁵ we have made great strides in the last 15 years. Maxillofacial defects can be classified according to etiology, residual defect, incidence, and location into the: intraoral and extraoral, maxillary and mandibular as acquired and congenital.

Impression Materials: Maxillofacial prosthesis is an art and science of anatomic, functional, or cosmetic reconstruction by means of non-living substitutes in the region of maxilla, mandible, and face that are missing or defective because of the surgical intervention, trauma, pathology, or congenital malformation. Extensive research and developments in the field of materials have made it possible for the restoration of esthetics in the patient with gross defects of the face and the head.⁶

One of the most critical stages in rehabilitation is making an impression. Accurate facial impressions are essential to reproduce the defect for the construction of well-adapted prostheses.⁷ Various materials, including impression compound, plaster of Paris, and reversible and irreversible hydrocolloid and elastomeric impression materials, have been used in making facial impressions. With the advent of digital technology, impression free facial moulages have been made by using a computer numerically controlled (CNC) milling machine and a stereolithographic technique. However, these procedures can produce only a static imprint of the tissue bed without taking into account tissue movements during the function. If the prosthesis rests on tissues involved in facial expression, it may cause discomfort, pain, and may interfere with the patient's normal range of functional movements. In addition, tissue movements may cause distortion or failure of the prosthesis and its components.⁸

The objectives of maxillofacial prosthetic rehabilitation must be kept in mind during impression making is Restoration of esthetics or cosmetic appearance of the patient, Restoration of function, Protection of tissues, and Therapeutic or healing effect.

Impression Techniques: The art of obtaining a facial impression in preparing a working model is essential to a well fabricated and fitting facial prosthesis. Making the facial impression requires more time and energy in preparing the patient and the materials than in carrying out the technique. The basic steps in obtaining an accurate impression are outlined here. The materials vary according to the result desired. If great accuracy is needed, the reversible hydrocolloid or plaster of Paris is best. If the prosthodontist needs good detail quickly he/she can use irreversible hydrocolloid or silicone. General contours, and not much detail, can be obtained with orthopaedic plaster bands or impression compound. The model from these two materials can be used to form lead radiation-protector shields.⁹



Extraoral Impression Techniques: The patient should be either reclined in a dental chair or better, lying on a table with his head slightly elevated. This position achieves a relaxed muscle tone of the face and easier material application. Also, gravity helps to stabilize the material. Leave uncovered only the essential areas to be reproduced. The face should be free of make-up and eyeglasses. The eyelashes, eyebrows, moustache, beard, etc, should receive a coating of petroleum or cocoa butter as a suitable separating medium. The area of the defect may need undercuts blocked out with wet gauze or cotton. The deepest area of the defect may be better filled in with wet gauze or cotton for a safety precaution. At times string should be tied to the blocking out material so that it can be retrieved rapidly should an unexpected swallowing, aspiration, or other problems occur during application of the material. The face of external borders of the defect or that part to be reproduced should be boxed in with boxing wax held in place by an assistant. This confines the material and avoids a mess. An adequate airway needs to be considered if the mouth or nose enters into the impression.

Care is needed to provide unhurried breathing and prevent anxiety in the patient. This airway can be maintained with straws placed into the nostrils or mouth or the impression material can be gently and carefully applied to the nose up to but not including the nares with a small paint brush.¹⁰

- 1. Reversible Hydrocolloid Technique:** The hydrocolloid can be applied with a small 1 to 2-inch paintbrush to all areas, building up the thickness until the entire surface is covered with at least 3 mm of this material. Once the desired thickness is applied but before it completely sets, paper clips are bent into an L shape, and one end is imbedded into the hydrocolloid for reinforcement. Upon cooling, in approximately 5 minutes, the Plaster of Paris is applied to the area to a depth of 1/4 to 1/2 inch at the borders. This unites the hydrocolloid via the paper clips to the firm backing of plaster. When the plaster has set and cooled, the subject is asked to wrinkle his face to loosen the impression, keeping in mind the location of the undercuts. With a quick tug, the boxed out area containing the impression is removed. After removal, the accuracy should be checked, and the impression is placed in cool water to prevent cracking of the hydrocolloid under the dental plaster's heat due to the exothermic reaction occurring. The impression or mask is then poured into stone to form the moulage.¹¹
- 2. Irreversible Hydrocolloid Technique:** For intraoral usage the ratio of powder to water is different for every scoop of powder, 1.5 to 2 parts of cool water should be used. This enables the material to flow readily into all undercuts and depressions. A second variation in usage as compared to the reversible hydrocolloid technique is that it is not applied with a brush. It is poured over the face and pushed or directed to the desired area with a spatula. After being removed from the face, this impression should be rinsed clean of any debris and immediately poured, using stone or any other material of choice.¹²

Extraoral impression techniques include impressions for Nasal defects, Orbital defects, Ocular defects and Auricular defects.

- 1. Intra Oral Impression Techniques Plaster of Paris Technique:** This material gives excellent accuracy of slight facial defects. However, it is not to be used when the defect is fresh, bleeding or large, or where deep undercuts exist and need to be reproduced. Also, the material should be an extremely thin mix compared to intraoral use to increase the flow and adaptation. Plaster of Paris is painted on the face. Since the material is exothermic during the initial setting phase, a light petrolatum coating should be applied to the whole area to be reproduced.
- 2. Orthopaedic Plaster Band Technique:** This easy-to-use material is on hand in all hospitals for emergency use. The pieces are cut to the width of the face while they are still dry. For a whole face, six pieces of overlapped are usually necessary. These are dipped in water and positioned over the

lubricated face. Once set, the rough mask is removed and painted with a separating medium of glycerine or petrolatum before being poured into stone.¹³

3. **Impression Compound Technique:** This thermoplastic material is best used for a rapid but rough impression in which is to be poured only once. After several cakes of compound (three to five) have been warmed and tempered, they are flattened in the prosthodontist hands to the approximate size of the facial area and laid over this area. Then the compound is pressed lightly to conform to the face.¹²
4. **Silicone Technique:** Room temperature vulcanizing (RTV) silicone is an excellent material for obtaining a clear, detailed reproduction of the face. However, since a large amount of material is necessary to cover the face, other factors should be considered before silicone is used solely. These other factors are the cost, the number of the moulages desired, and the storage of the mask. This material is more expensive to use than any other. However, many pours can be made if needed. And it can be stored easily with little deformation or distortion.¹⁴

There are variables in the patient's preoperative or post-operative oral anatomy which should be considered during impression making. Often there are incomplete palatal closures and fibrous bands with perforations into the maxilla, nose, or sinuses. These possible maxillary defects should be looked for prior to any impression they may occur in the labial vestibule, alveolar ridge, or hard and soft palates and they may be so inconspicuous as to be hidden from immediate view.

Once these small defects are found, they should be blocked out with moist cotton or gauze. The gauze or cotton can be lubricated with petrolatum for easier insertion. Accidental intrusion into the nasal - maxillary sinus cavity can be prevented by packing the opening with cotton to which a piece of dental floss is tied.

Larger defects with gross superior or lateral undercuts can be packed with the 4x4 inch gauze squares, which can be more readily retrieved should they be shoved into the depths of the defects. Gross defects pose few problems, whether undercuts exist or not. The defect may also require some special addition or correction to the impression tray. This is easily done with the periphery wax or hard stick compound added to build the tray up or out to capture the anatomy as needed.

The prosthodontist acquires clinical judgment with regard to which areas need blocking out prior to impression. This judgment is best obtained by careful visual examination, and the guideline should be "When in doubt about undercuts and impression removal, pack the defect."¹⁵

Intraoral impression techniques include impressions for Mandibulectomy defects, Maxillectomy and hard palate defects, Soft palate defects, and Glossectomy defects.

Conclusion

A good impression must fulfil MM: Sophistication in the surgical and prosthetic reconstruction of structural and functional defects in the craniomaxillofacial region improves the final rehabilitation results, if carefully planned, unbiased rehabilitation regimens are established.

Since the sixteenth century acquired surgical defects have been restored by prosthetic replacements constructed from a variety of materials and techniques. The cosmetic and functional disabilities following radical surgery for oral and paraoral cancer are significant and disabling. Definitive reconstruction should be performed wherever possible as part of the ablative procedure. When definitive reconstruction is coordinated and combined with maxillofacial prosthetic rehabilitation, head and neck defects can be restored to near-normal function and appearance in many cases.



Rehabilitation of patients with maxillofacial defects has always remained an enigma for the prosthodontist due to the unpredictable nature of the defects and uncertainty of recurrence. The rehabilitation is not merely by closing a defect with a prosthesis but goes much beyond that. To reach these goals a multidisciplinary approach needs to be adopted although, the advances in materials have been remarkable, and the subspecialty has not reached its full potential. There is thus, a need for prosthodontists to take interest and involve them in this endeavour to rehabilitate these patients to feel and function normally and integrate back into society with confidence.¹⁶

The traditional concept of a one-time prosthesis that supplies the patient's requirements through the course of life is no longer realistic or valid. If the prosthesis is fabricated in an acceptable fashion to meet the physiologic, anatomic, functional, and cosmetic requirements of the patient, there is no predictable method of calculating its longevity.

Initial decisions on primary handling of traumatic defects or meticulous planning of surgical reconstruction can change the final result of surgical endeavours. Unprejudiced decisions of surgeons, prosthetists, and anaplastologist collaboration are needed. Teamwork instead of separate sequential procedures are needed.¹⁷
"It is the God given right of every human being to appear human".

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