

# Materials Used For Various Impression Technique

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## Abstract

Major advances in impression materials and their application have occurred during the last decade, with greater emphasis being placed on rubber impression materials than on dental compound, zinc oxide-eugenol, and agar and alginate. The increased use of agar impression material as a result of the development of the agar alginate combination technique should level off and continue at a modest level.

**Keywords:** Impression Compound; Agar; Alginate

## Introduction

Recording of denture bearing tissues for complete dentures is important from many aspects like health of the tissues, function and retention of dentures. Theories of impression making have evolved through trial of variety of materials and methods. Introduction of new materials has lead to evolution of newer techniques in impression making. Use of guttapercha, impression plaster, impression compound, alginate and elastomeric impression material for making primary impression has been quoted in literature of which guttapercha and plaster are no more in use because of manipulation difficulties. Initially tissues were recorded evenly irrespective of their anatomy and role played by them in retaining, supporting and stabilizing the dentures. All the tissues were recorded under equal pressure (mucocompressive technique) which resulted in compromised health of tissues. No technique was available for cases like atrophic ridges, fiabby tissues<sup>1</sup>. Dental impressions can give rise to the transmission of microorganisms and infections. Impression materials that have been exposed to infected saliva and blood provide a significant source of cross contamination<sup>2</sup>. Selection of the type of disinfectant for impressions is very important as it can induce changes in accuracy and detail. The addition silicone impressions in combination with any disinfectant other than the neutral glutaraldehyde produced casts with excellent accuracy. Polysulfide impressions can also be used successfully with disinfectants, but polyether impresions were not suited for disinfection by immersion. The acid-potentiated glutaraldehyde can contributed to an improvement in surface quality of stone dies. However, the surface quality was acceptable for all combinations of impression materials and disinfectants and hence disinfectants should be used in impressions prior to cast pouring<sup>3</sup>.

## History Of Impression Materials

The development of dental impression materials began in the mid-1800s. Dentists have realized that the construction of a prosthetic restoration required detailed reproducibility of the dental arches of patients, and the construction of plaster models. Beeswax was the first impression material, although the first important signs of evolution of dental impression materials are considered the introduction of trays at the beginning of the 1800s and the invention of gutta-gercha, thermoplastic resins and plaster of Paris. The double technique of impression combined with the concept of functional impression that was established after the mid-1800s, are also identified as fundamental innovations. During the 20th century, advances in material development slowed

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significantly because most of the current print materials had already been invented. However, the introduction of elastomeric impression materials in the dental prosthesis field that offered the advantages of accuracy and dimensional stability have substantially improved both the accuracy of the impression and the quality of the final restoration. Impression materials are used in many fields, including crafts for model reproduction. Continuous evolutionary drive leads to the discovery and use of hydrocolloids. Historically, alginate has been considered the first impression material to be valid from a clinical point of view and with regard to invasiveness of the patient<sup>4</sup>.

## Types of Impression Materials

There are various classifications of impression materials but the major types are:<sup>3</sup>

Mode of Setting	Rigid	Elastic
Set By Chemical Reaction (irreversible)	Impression Plaster, Zinc Oxide Eugenol	Alginate, Polysulfide, Polyether, Silicone
Set By Chemical Reaction (reversible)	Compound, Waxes	Agar hydrocolloid

## Rigid Impression Materials

**Impression Compound:** The application of dental impression compound has also decreased with the increased use of rubber impression materials, however, impression compound is useful for checking cavity preparations for undercuts and for making impressions of full crown preparations where gingival tissues must be displaced. It softens on heating and hardens on cooling. Majorly used for making preliminary impression for completely edentulous mouth<sup>5</sup>.

**Zinc Oxide-eugenol:** Although zinc oxide-eugenols are excellent materials for wash impressions of edentulous areas, they have been replaced to a large extent by light-bodied rubber impression materials. As a result of the diminished use, research papers on zinc oxide-eugenol impression pastes have been nearly non-existent<sup>6</sup>. No significant influence on accuracy or surface detail was observed after one hr of exposure to the disinfectant, and small but clinically insignificant changes in dimensions occurred after impressions

were stored in air for 24 hr after disinfection<sup>7</sup>.

### Elastic Impression Medium

**Agar:** The accuracy of agar impression materials was compared with that of eight alginate and one addition silicone systems of light, regular, and heavy viscosity. He demonstrated that, as a class, the agar impression materials were more accurate than the alginates and the addition silicone. However, if the addition silicone impressions were heated to mouth temperature and poured in a mix of stone at mouth temperature, they were the most accurate<sup>8</sup>.

**Alginate:** It is important to select the correct tray for the dental arch, which should be perforated. Alginic adhesives can be used in addition to perforations for the retention of alginate in the tray. The use of alginic adhesives exceeds alginate adhesives, which are available as paints or spray-ons. After applying an alginate adhesive, it is allowed to dry for 5 min. The changes to the tray can be made with wax or with silicone<sup>9</sup>. The alginate impression should be washed with a jet of water, disinfected and dried until the gloss disappears. Store with gauze and leave in a plastic bag with a waterproof zip closure until the model is made<sup>10</sup>. It's an irreversible elastic hydrocolloid. It is a mucous extract yielded from certain brown sea weeds. Its types are, Type 1 – Fast setting and Type 2- Normal setting. Applications are mainly used for impression making, when there are undercuts, in mouth with excessive flow of saliva, for impression to make study models and working casts, for making preliminary impression<sup>11</sup>.

### Elastomeric Impression Materials

**Polysulfide Rubber Impression Material:** Polysulfide has become increasingly unpopular due to their unpleasant taste/smell. The material is presented as a paste to paste system mixed by a dental nurse prior to use. The material sets by a condensation polymerisation reaction. Initially the polymer chains increase in length causing a slight increase in temperature, of 3–4 °C. This is then followed by cross linking of the polymer chains and finally the release of water as a by-product. This later reaction slightly contracts the material making it stiffer and more resistant to permanent deformation. When poured and cast this slight contraction means the resulting model is slightly larger and as such creates space for the luting cement.

#### Advantages

- Ø Good tear resistance
- Ø Dimensionally stable – some shrinkage on set with release of by-product
- Ø Good Accuracy
- Ø Most flexible elastomer

#### Disadvantages:

- Ø Reduced patient satisfaction – distinct unpleasant taste and smell
- Ø Long setting time
- Ø Requires excellent moisture control
- Ø Difficult to mix<sup>12</sup>

**Polyether Rubber Impression Material:** Major advances have occurred in the past decade in the area of elastic impression materials, probably the most important being the development of the addition silicone system. The polymerization of elastomeric impression materials was studied by Cook<sup>13</sup> using rheological methods. He found that the polymerization kinetics of the

polysulfides appeared to be first-order with respect to coupling agent and water and possibly with thiol groups. Problems related to the concentration of water in the original pastes, the exact functionality, and the possibility that the reaction may be diffusion-controlled prevented a more definite statement. The data for condensation silicones could be fitted to kinetic equations, but the kinetics was not consistent with the stoichiometry. However, the dependence of reaction rate on catalyst-base ratio was qualitatively consistent with kinetic and network considerations. The reaction of polyethers was first-order with respect to monomer and initiator concentrations at high catalyst-base ratios but not when initiator concentrations were low as a result of decreases in initiating and propagating species. A detailed analysis of addition silicones was not possible because of lack of information on concentrations and functionality; however, the results were qualitatively consistent with kinetics and network structure.

### Special Impression Technique

1. "Wash impression"
2. Two phase one stage:
3. Two phase two stage:
4. Functional impression (also known as secondary impression)
5. Neutral Zone impression
6. Window technique
7. Altered cast technique
8. Applegate technique

### Impression For Provision of Fixed Prosthesis

When taking impression for provision of crown and bridge work, the preparation border needs to be accurately captured by the light bodied impression material. For this reason, the gingival tissues need to be pushed away from the preparation margin in order to make it accessible to the impression material. One way to retract gingival tissues away from the tooth is by insertion of a retraction cord into the gingival crevice<sup>14</sup>.

### Modified Impression Technique For Implant

Making a pick-up impression with a windowed tray is a routine technique for impressing dental implants. It may be difficult for the guide pins to protrude from the opening of the wax lid, however, because the impression material in the tray can obscure the guide pins during the procedure. It has been our experience that if the tray is repositioned several times, the impression may be distorted and/or contains bubbles. If the opening of the wax lid is too wide, or if the wax lid is out of place, the impression pressure may decrease, and the impression material may not extend over the soft tissue around the implants, especially in the maxilla. Incomplete soft tissue impression around implants hinders the fabrication of a superstructure with a proper emergence profile. A modified implant impression technique is presented as a solution to these problems<sup>15</sup>.

### Digital Implant Impression

More recently, one of the major developments in implant prosthodontics has been the adoption of engineering principles in the form of computer-aided design and computer aided manufacturing (CAD/CAM) to construct implant prosthesis. This technology utilizes 3D intraoral scanners which has revolutionizing the way we take impressions. The digital implant impression technique has proven its possibilities as an effective alternative for the analogue impression-taking technique<sup>16</sup>.

### CAD/CAM Technology In Removable Partial Denture Prostheses

Fabrication of cast partial dentures can be done using Co-Cr Alloys or commercially pure Titanium and Ti-6Al-4V Alloy by utilizing CAD-CAM technologies. William et al have demonstrated a method of fabrication of removable partial denture framework design using CAD/CAM technologies. Using CAD/CAM software the removable partial denture framework design is built on a Three-dimensional scan of the patient's cast<sup>17</sup>.

### CAD/CAM Technology In Fixed Prosthodontics

CEREC in Lab system - The tooth preparation die is secured in the scanning platform and data is captured with a non-contact laser. A Ceramic block (ingot) is placed in the milling chamber. Two milling diamonds create the precise restoration. Porcelain build-up is done which results in anaesthetically pleasing restoration. Then the fit is confirmed in the patient's mouth and required adjustments are done<sup>18</sup>.

### CAD/CAM Technology In Maxillofacial Prosthodontics

CAD/CAM is widely used for the fabrication of maxillofacial prostheses, extra oral radiation devices, individual respiratory masks and facial protection devices etc. Three dimensional surfaces imaging is done by using CAD software. This 3-D surface image aids in the fabrication of resin model with Lithographic technique and then wax pattern is made. Of this completed wax pattern, once again computer assisted three dimensional imaging is done. Data is entered in computer and prosthesis is milled by computer aided milling machine. Thus, a silicone maxillofacial prosthesis is fabricated using CAD/CAM technology<sup>18</sup>.

### CAD/CAM SYSTEM

### Conclusion



The doctor should have complete knowledge regarding the components used during impression, the choice of impression materials and the selection of suitable impression techniques based on clinical situation. Various techniques are available for making impression for prosthesis. Since a good impression forms the foundation for the fabrication of a successful prosthesis it is wise to choose the impression technique according to the clinical situation.

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