

*Review Article*

## **Stabilising Denture Bases for Accurate Maxillo-Mandibular Relationship Records - A Review of Methods and Means**

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### **ABSTRACT**

Proper seating of the temporary denture bases on the cast and in the mouth of the patient is a prime requisite for accurate recording of maxilla-mandibular jaw relations. The block-out procedures carried out during the fabrication of temporary record bases tend to make the record bases unstable and unretentive in the mouth if there are severe undercuts present. This might lead to inaccurate seating, inaccurate jaw relation recording, and compromise in the aesthetics and phonetics. To overcome this, some techniques of stabilizing the record bases are essential. The purpose of this article is to put together the methods used to stabilize the temporary record bases and review their effectiveness.

**Keywords:** Stabilization of Denture Base, Stability, Temporary Record Base

### **INTRODUCTION**

A stable temporary record base is critical for recording an accurate maxilla-mandibular relationship. It is also important for the evaluation of the aesthetics and phonetics of the waxed-up trial denture. To ensure intraoral stability and retention of the record base, the base should maintain close adaptation to the cast and be dimensionally stable. [1] The record base must also be rigid and transferable from the cast to the mouth. [2]

Different methods have been introduced for the fabrication of stable and retentive record bases in an effort to obtain a more precise fit for accurate recording of maxilla-mandibular relationship and evaluation of aesthetics and phonetics of the

wax trial prosthesis. These methods have been reviewed in this article.

#### **Need for stabilization:**

In some cases, the residual ridge exhibits moderate to severe undercuts. They are most frequently encountered in the retro-mylohyoid area, the labial region of the mandibular ridge, the labial portion of the maxillary anterior ridge, or in the buccal portion of the ridge in the area of the maxillary molars. [3] These present a challenge when trying to fabricate a stable record base. When treating cases with severe soft tissue undercuts, some means of block out must be used to allow the rigid record base to go on and off of the master cast without damaging the stone surface. Traditionally, these undercuts are blocked

out with wax and the resulting record base is unstable in the mouth once the wax is lost. [4]

For temporary denture bases, the four basic materials that are most frequently used are shellac base plates, auto-polymerizing acrylic resin, vacuum- formed vinyl or polystyrene and baseplate wax. [3]

Shellac is a brittle material prone to breakage and it tends to warp when subjected to repeated changes in temperature. [3] Acrylic resin undergoes dimensional changes and polymerization shrinkage which produce gaps beneath the record base. Defects in the adaptation of the material and formation of a gap along the posterior border of the maxillary cast are common problems. [1] Use of vacuum only improves adaptation without addressing gap formation resulting from polymerization shrinkage. [1] Baseplate wax recording bases lack rigidity, dimensional stability and can be easily distorted. [3]

#### **Different materials used for stabilization:**

Several satisfactory materials are available for the purpose of stabilization namely:

1. zinc oxide eugenol [3]
2. light- bodied rubber base impression material [3]
3. soft denture- liner resins [1-3,5]
4. auto- polymerizing resins [3]

#### **1) Zinc oxide eugenol:**

It was first described by Fletcher (1951), Jamieson (1956), Kapoor and Yurkstas (1957). As per the method expounded by Winkler, tin foil (0.001 inch) is burnished to the final cast, after the existing undercuts have been eliminated with a suitable plastic material. Zinc oxide and eugenol is mixed, flowed onto tissue surface of the base and the base is pressed firmly against the cast. Excess material flows from around the borders of the denture base. The stabilized denture base is removed and the excess impression material is cut

away from the borders with a sharp instrument. Baseplate wax is flowed on any rough areas of the base border to provide a smooth surface. Disadvantage of using this material is that a thick layer could possibly compete for the available inter-arch space. Care should taken to ensure that only a thin layer of the set material remains between the base and the cast. [3]

#### **2) Rubber Base impression material:**

Freese (1956), Bodine (1964) and Malson (1964) were among the first to document the use of rubber base impression material for stabilizing record bases. They are indicated in moderate to severe undercuts. Bases stabilized with elastic impression materials show improved retention and stability. As per the technique described by Winkler S, the final cast is covered with tin foil. The plastic material used to block out undercuts is removed. Rubber base adhesive is applied to the entire tissue surface of the record base. Light-bodied rubber base impression material is mixed & placed into the record base. The base is then pressed firmly onto the final cast. Ten minutes are required for complete setting of the rubber base material. Then, the base removed & inspected. Finally, borders are adjusted & finished according to the operator. [3]

#### **3) Soft Denture- Liner resin:**

These contain varying amounts of plasticizers to provide resilient behavior. The technique used is similar to that described for rubber base materials. [3] However; resilient liners tend to tear and/or rebound from the record base from repeated seating and removal, resulting in inaccurate seating of the bases. [1,2] Also, the use of a soft liner, often results in a bulky flange, which distorts the desired contour of the labial polished surface. [5]

#### **4) Auto- polymerizing Resins:**

The earliest description in literature for the use of auto- polymerizing resins, as a

means to stabilize the temporary record bases, was by Boos (1956), Jamieson (1956) and Hall (1958). The technique is similar to that of Zinc oxide eugenol impression material. Care should be taken to ensure that more number of relief holes be given to allow the excess acrylic to escape. The disadvantage of this technique is that the acrylic tends to warp.

### **Different methods of stabilization:**

Different methods to stabilize the temporary record bases include the following:

1. use of denture adhesives [2,4]
2. use of inlay casting wax [2]
3. use of surveyor [5,6]
4. vacuum adaptation of the record base [1,3,7]
5. staged polymerization by covering the palatal portion of the record base [1,4,8-10]

#### **1) Use of Denture Adhesives:**

A record base is often secured intra-orally with the use of a denture adhesive. Oh and Morris state that the use of a denture adhesive between the oral mucosa and the record base could result in inaccurate seating of the record base. This could in turn lead to inaccurate recording of the maxilla-mandibular relation. [2,4]

#### **2) Use of Inlay Casting wax:**

Oh and Morris [2] described a modified method of fabricating a record base, in which the Visible-Light-Cured Triad tray material is adapted on a definitive cast and refined with a green coloured inlay casting wax to engage the undercuts in the cast. This method involves a two-stage polymerization procedure: initial and partial polymerization occurs with the record base material adapted to the cast, and final and complete polymerization with the record base off the cast. The record base is then fitted on the cast, and gaps along the border

of the record base are filled with an inlay casting wax to refine the borders.

#### **3) Use of a Surveyor:**

Sherman proposed a record base with wax placed in the undercut area. In his technique, a surveyor was used to locate a path of insertion that minimized the undercut of the stone cast. The record base therefore was not as bulky, and because the wax was pliable, the base touched the undercut area of the stone cast to some degree. The disadvantage of this technique is that wax can be distorted easily. [5]

Nishigawa *et al*, described a procedure for the fabrication of a record base for an edentulous maxillary arch, with severe undercuts in the labial aspect of the anterior residual ridge. This procedure, which makes use of a surveyor, allows fabrication of a record base from auto-polymerizing resin, without soft lining materials, and without block-out of the labial undercut of the stone cast. [6]

#### **4) Vacuum adaptation of the record base:**

In the vacuum method as given by Winkler, the cast is prepared by blocking out the existing undercuts with a suitable material which does not melt during heating. A sheet of baseplate resin is inserted in the frame located below the electric heater coil and the heater is activated. Heating is continued until the resin sheet begins to sag approximately one-half inch. At this time, the sagging sheet of softened resin is lowered onto the cast by means of the supporting frame and the vacuum is turned on. The sheet of softened resin is drawn into close adaptation to the cast. The heater is then turned off and the base is allowed to cool for one minute. After removal from the cast, the base is trimmed and finished. [3] Disadvantage of this method is that the use of vacuum only improves adaptation without addressing gap formation resulting from polymerization shrinkage. [1]

### 5) Staged polymerization by covering the palatal portion of the record base:

Boberick and McCool<sup>[8]</sup> showed that the dimensional stability of record bases, fabricated from light polymerized composite material, was more accurate when staged polymerization was done by covering the palatal portion of the record base. Multiple processing procedures in the polymerizing unit need repeated adaptation and are time consuming and impractical.<sup>[1]</sup>

Oh and May<sup>[1]</sup> described a simple two-stage technique for the fabrication of a light-activated Triad record base, to maximize the fit of the record base to the cast. The edentulous maxilla consists of a relatively flat portion in the middle of the hard palate and an inclined slope toward the residual ridge. Due to the geometric features of the palatal concavity configuration, the shrinkage occurring toward the residual ridge leads to lifting of the record base in the mid-palatal region, as put forth by Sykora and Sutow.<sup>[9]</sup> By dividing the Triad sheet into two pieces along the junction of the horizontal and vertical configuration of the palate, the stresses that develop during polymerization can be confined within each segment of the material, shifting the direction of shrinkage from the ridge crest area to two separate areas in the middle of the palate and the crest of the ridge.<sup>[1]</sup>

Triad material is simpler and quicker to use than the sprinkle-on acrylic resin and, because release of residual methyl methacrylate does not occur, it is nontoxic and bio-compatible, as put forth by Ogle *et al.*<sup>[4,10]</sup>

### CONCLUSION

Retention and stability of a record base is often compromised in the mouth because of block-out procedures performed before adapting a record base material on a definitive cast and dimensional changes and

polymerization shrinkage which produce gaps beneath the record base. This article has presented many techniques of fabricating stable and retentive record bases to ensure accurate recording of maxilla-mandibular relationship and correct evaluation of aesthetics and phonetics of the wax trial prosthesis.

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