

Burç Gençel

## 8.1 Tray Selection for Preliminary Impressions

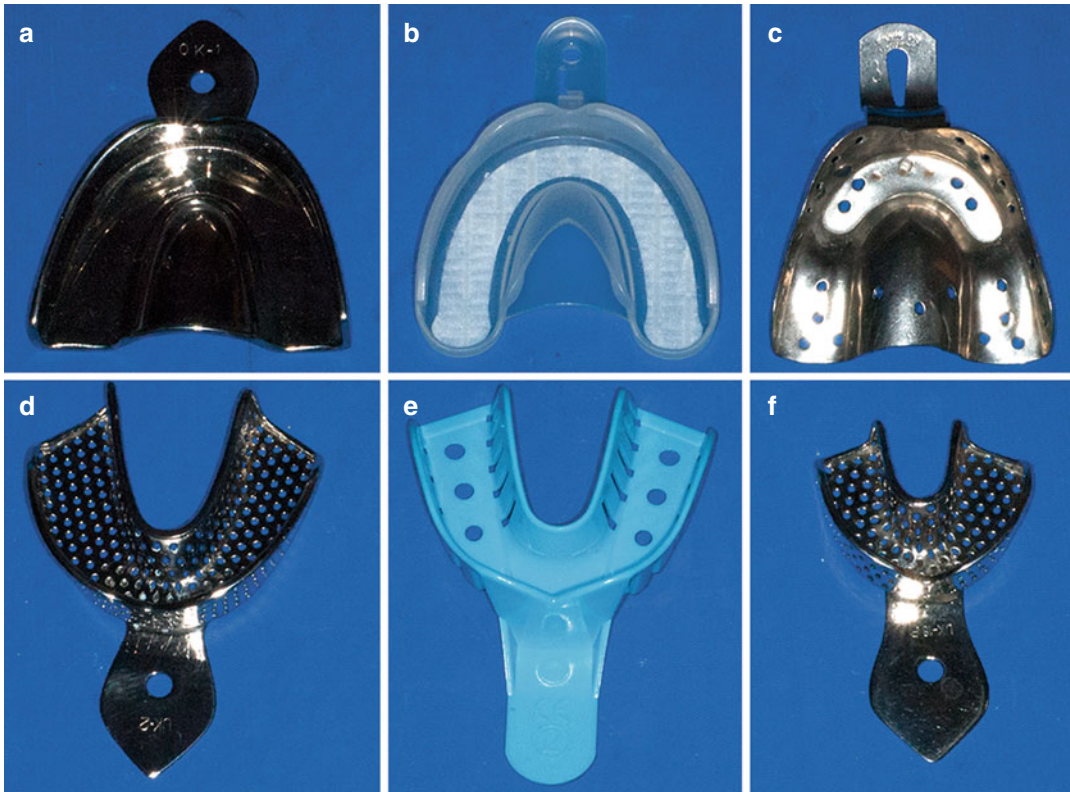
Alginate impressions are conventionally made with perforated or non perforated rim-lock metal trays (Fig. 8.1a, d). The accuracy of an alginate impression is not only dependent on the surface detail but also on the strength of bond between the material and the tray. The mechanical bond between the impression material and the tray is secured by the rim-lock borders and/or perforations. Tray adhesives for alginate materials provide surface adhesion and they are available in spray or liquid form. If the impression is separated, even slightly, from the tray then it should be repeated. Trays without mechanical retentions may need additional retentive modifications for proper impressions. Impression compound, wax, and acrylic resin are the materials to customize stock trays, both to improve coverage area and to create mechanical areas of retention (Fig. 8.2a, b).

There are non metal trays, similar in shape with regular metal stock trays. These trays can be safely used for impression making if they are rigid enough to keep their shape during impression making; otherwise, they should be avoided even for diagnostic impressions (Fig. 8.1b, e).

Stock trays are present in assorted sizes. Besides regular small, medium, and large sizes, there are extra small pediatric trays and extra large trays (Fig. 8.1f). It is commercially impossible to fabricate stock trays for every possible type of partial edentulism so they are available in the shape to fit fully dentate jaws. However, there are stock trays for Kennedy Class I cases with dentate anteriors and edentulous posteriors. A few manufacturers also produce stock trays for Kennedy Class II cases (Fig. 8.1c).

Before making the impression, the tray should be tried in the mouth. It should cover all the relevant structures, and the impression material should be supported by the tray over the whole impression surface. When the stock tray does not fit properly, the borders must be corrected with wax, acrylic resin, or impression compound. The unsupported impression material may possibly deform during plaster pouring and that would result in a corrupt cast. There should be sufficient clearance between the tray and the oral tissues for an accurate impression. The amount of clearance changes according to the impression material chosen (Fig. 8.2). For alginate, it should be 4–5 mm as it shows plastic deformation beyond 50 % elastic deformation.

B. Gençel, DDS, PhD  
Vocational School of Health Services,  
Cerrahpaşa Faculty of Medicine, Istanbul University,  
School of Dental Prosthesis' Technology,  
Istanbul, Turkey  
e-mail: [bgencel@istanbul.edu.tr](mailto:bgencel@istanbul.edu.tr)



**Fig. 8.1** Stock impression trays for preliminary impression. (a) Rim-lock, non perforated, metal stock impression tray. (b) Rim-lock, non perforated, rigid plastic stock impression tray. (c) Maxillary metal stock tray for Kennedy Class I cases with perforations and without rim-

lock borders. (d) Rim-lock, perforated metal stock tray. (e) Plastic perforated tray with flat borders. Flexible and not suitable for RPD impressions. (f) Pediatric size impression tray

## 8.2 Final Impressions

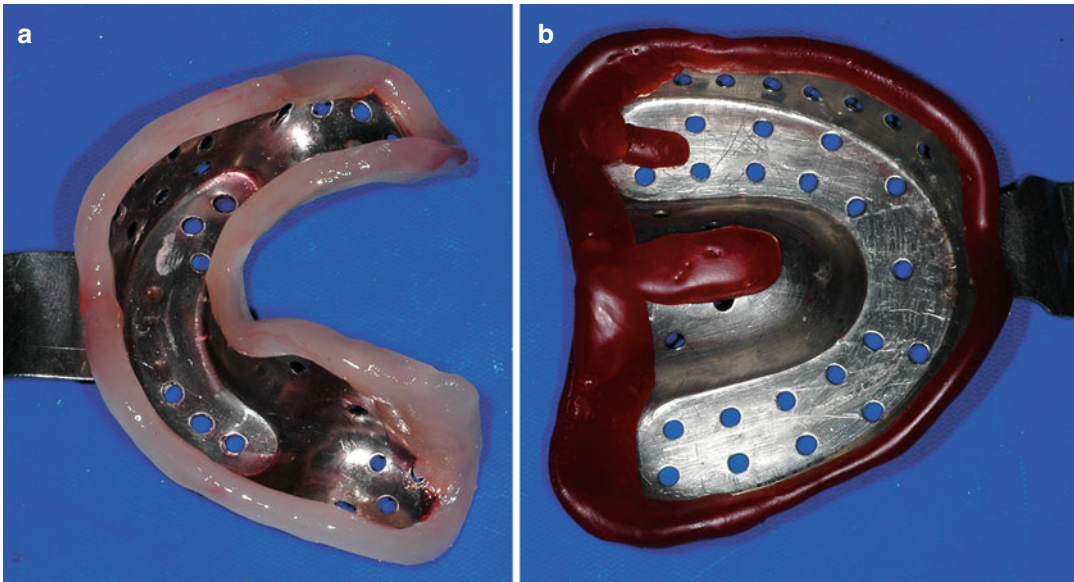
Once the diagnostic cast is analyzed and pre-prosthetic preparations are completed, a new impression should be made. This is referred to as “the final impression” as it is the recording of the final state of the mouth with all the altered tissues.

Final impression can be a single step procedure as a modification of the preliminary impression. It may also be a multi step procedure when free-end saddles of a Kennedy Class I or Kennedy Class II case are desired to be finished on a separate impression. The aim is not only to precisely determine the functional borders of the distal extension denture base(s) but also to provide additional support by compressing the mucosa under functional loads. This is referred to as “functional impression” if it is made at chair-side in the control of the clinician.

If a long-term corrective impression during function after the RPD is delivered to the patient is made then this is called a “muco-dynamic impression.”

### 8.2.1 Tray Selection for Single Step Final Impressions

Stock trays can also be used for final impressions if the selected tray has suitable clearance from oral tissues for the selected impression material and sufficient coverage of the impression area. However, unless a conventional RPD is meant to be constructed without any mouth preparations with a single impression, it is best to use a custom tray that is prepared on the diagnostic cast. These are conventionally produced with self-curing acrylic or light-curing urethane dimethacrylate resins (Fig. 8.3).



**Fig. 8.2** Customization of stock impression trays. (a) Mandibular stock metal tray for Kennedy Class I case. Disto-lingual borders are extended and mechanical retention is provided with utility wax. Alginate adhesive is also applied to improve impression-tray bond. (b) Utility wax is added to the borders and the inner surface of the impres-

sion tray. The wax on the borders not only provides mechanical retention for the impression material but also helps to adjust the borders to cover all related structures. The clearance between the tray and oral tissues is customized with the wax added on the inner surface



**Fig. 8.3** Custom tray for a Kennedy Class II RPD. Material is light-cure urethane dimethacrylate

- The position of the tray on the diagnostic model can be transferred to the mouth with acrylic stops (Fig. 8.4).
- The clearance between the tray and the tissues can be adjusted prior to fabrication. Material-specific clearance delivers best possible results. Functional borders can be molded and surface details can be precisely captured (Fig. 8.4).
- They can provide mechanical retention and/or chemical adhesion to the impression material with custom perforations and adhesive agents; therefore, impressions can be removed safely from deep undercuts and other retentive areas without damaging the integrity of the impression.

Advantages of custom trays:

- They are rigid and dimensionally stable. They provide excellent support for the impression material.
- They are tailored to have superior fit to the impression area. They usually need little to no adjustments prior to impression making.

### 8.2.2 Impression Materials for Single Step Final Impressions

Alginate is still an accepted choice for final impressions. It was reported to be in the curriculum of more than 60 % of dental schools in the



**Fig. 8.4** Acrylic stops transfer the position of the tray from the diagnostic cast to the mouth. Borders and the clearance of the tray are also adjusted according to the materials chosen for impression making



**Fig. 8.5** Final impression made with alginate and stock tray

USA and 70 % in Turkey. It delivers a single step, mucostatic impression with fair surface detail which is satisfactory for many RPD cases. However, the expansive borders, weak tear resistance, and limited surface resolution are a few drawbacks. Postimpression needs of the material may also cause problems. Particularly, the plaster should be poured immediately once the alginate is set and this mostly requires a skilled personnel if the dental laboratory is not nearby. However, there are extended pour type alginates which may allow the transfer of the

impression to the dental laboratory without dimensional changes. They are also not suitable for the transfer of implant positions with either closed or open tray impressions.

The final impression procedure for a tooth-supported RPD is very much like the preliminary impression. These are mostly Kennedy Class III and IV cases. However, when the distal free-end edentulous space is short and the support from the free-end saddle is not crucial, then it is also valid for Kennedy Class I and II cases as well. Whole impression surface is captured with a single step impression made with a stock tray if it fits the arch sufficiently (Fig. 8.5).

A-type silicones, polyether reinforced A-type silicones, and polyether impression materials are current alternatives to alginate which deliver better surface detail and several other advantages. Some of these materials are improved to have hydrophilic properties, but this is a little misleading. It does not mean that they work precisely in wet environment like irreversible hydrocolloids. To achieve better results, the impression area should be dried before impression making. The hydrophilic property of these materials actually makes them friendly with dental stones. They can be applied with non perforated stock trays, or for further precise impressions custom trays can be used. Regardless of the type of tray, these materials should always be used with an appropriate tray adhesive. They serve perfectly with open and closed tray techniques in implant involved cases. They can also mold functional borders almost precisely with superior surface detail. They are more resistant to disinfectants and they can be safely transported to the dental laboratory without any dimensional changes (Fig. 8.6).

### 8.3 Handling the Impression

There are specific hints for each impression material and there are commons of impression making.

- Tray selection and modifications as well as the amount of clearance between the impression and the tray should be according to the material chosen.
- All precautions to secure the impression-tray bond should be taken. Providing mechanical



**Fig. 8.6** Final impression made with a custom tray and polyether material

retention, using an appropriate adhesive or both may be crucial for the matter.

- Care must be taken not to entrap air in the impression material while loading the tray. Alginate should firmly be stuffed in with a stiff spatula. Dough-type materials should be well kneaded, rolled, and stuffed in the tray with finger pressure. When loading auto-mix materials, the tray should be filled from one side to another and the impression tip should always be kept in the flowing paste. It may be useful to wet undercut areas and teeth surfaces with the impression material before inserting the tray.
- Rima oris should be held open with a diagnostic mirror on one side and the impression tray on the other while inserting the tray. Lips should be pulled to cover the impression tray.
- The tray should be positioned with mild finger pressure giving the material time to make its thixotropic flow.
- The tray should be kept still with fingers on the premolar area during the setting of the material as any movement of the tray during setting will result in a defective impression.
- The tray should be pulled parallel to the long axis of teeth for easy and safe removal. A small initial movement will release the adhesion of the impression, and the lips should be pulled to let air to the impression-tissue interface.
- Once removed, the impression must be checked for material-tray integrity, surface details, and borders.

- After proper cleaning and disinfection, a suitable type of plaster should be poured. If an alginate impression is taken, it should be poured immediately.

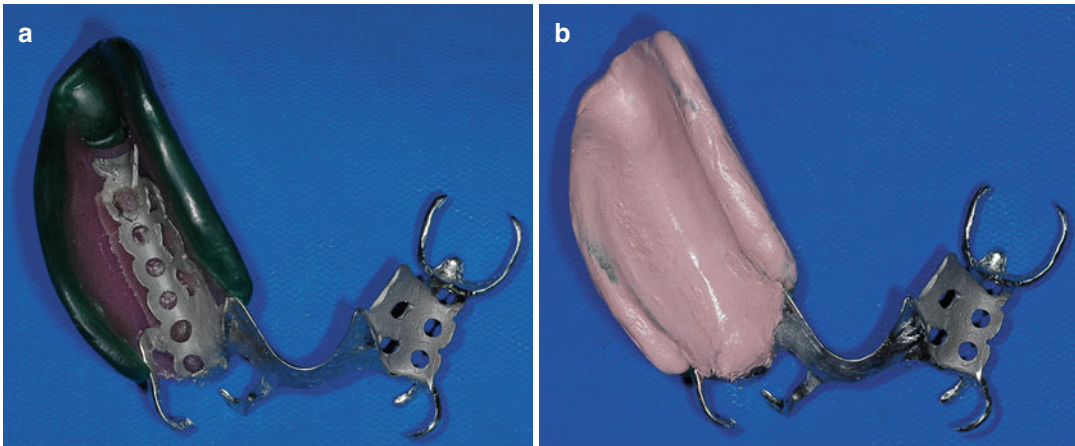
## 8.4 Functional Impressions

The idea of making an impression of the functioning mucosa goes back a while. The aim is not only to cover as much area as possible but also to record the shape of the ridge within the limits of its resilience and fully employ the primary stress bearing areas in order to provide mucosa support for the free-end saddle. It is mostly meant for mandibular Kennedy Class I and II cases where mucosa support is weak. The maxillary coverage of an average RPD is much wider and the hard palate provides a firm support to the denture eliminating the need for a functional impression.

Several methods are introduced to clinical practice, yet there are basically three types of making functional impressions. After diagnostic cast is analyzed and mouth preparations are complete, the conventional technique, originally introduced by Applegate, describes a multi step impression in which a stock or occasionally a custom tray is used to make an overall impression only to design and construct the metal framework. The functional part of the impression is carried out after the framework is cast and the subsequent procedures are carried out on the new or modified cast. The other approach makes the use of a custom tray, which is prepared to make the final impression of all structures at a single appointment. In this concept, the master cast is poured and all following procedures, including the metal framework, are carried out on this final cast. Another option is to finish the denture without making a functional impression and then make an early reline.

### 8.4.1 The Altered Cast and Its Modifications

The classic altered cast technique was the first effective clinically applicable method that found ground in dental practice. The popular derivative

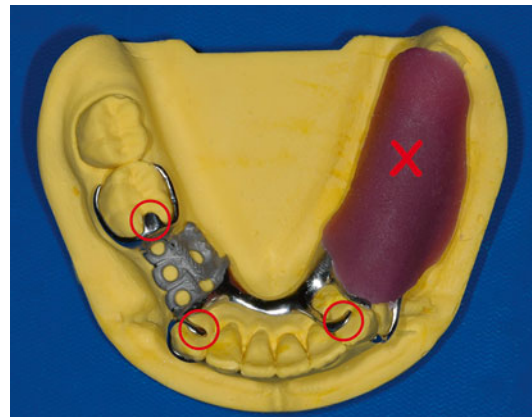


**Fig. 8.7** (a) Acrylic saddle is border molded for functional impression. (b) Functional impression is completed with zinc oxide and eugenol paste

of the technique is a multi step procedure starting with a conventional impression, which is benefited to construct the metal framework. The metal framework is then used to make the impression of the free-end edentulous space(s) with the help of acrylic saddles built on the retentive gridwork. The saddles are treated like an individual tray for a complete denture, first the border is molded and then surface impression is made (Fig. 8.7a, b).

The alignment of the framework in each insertion is critical for the success of this procedure. To prevent any clinic born errors, during border molding and final impression, the framework should be fixed in position by pressing at least three supporting points at each insertion. These supporting points can be occlusal, cingulum, or incisal rests and the part of the major connector that provides tooth support, but the location of metal stops under the retentive gridwork should be avoided. In other words, while holding the framework in “position,” pressure should not be applied on the saddles as the resilience of the mucosa, which we are trying to capture, may probably cause a rotational movement around fulcrum axis (Fig. 8.8). This will eventually lead to a faulty impression.

Once the functional impression is complete, the relevant parts of the initial cast is cut and the final cast is prepared by replacing the removed parts with the help of the impression made with the metal framework. The framework is seated



**Fig. 8.8** Pressure points when the framework is seated. Pressure should not be applied on the acrylic saddle

and fixed on the grinded cast. The borders of the impression are boxed and plaster is poured as supplementary to former prepared cast. The final hybrid cast is then used for consecutive procedures (Fig. 8.9a–c).

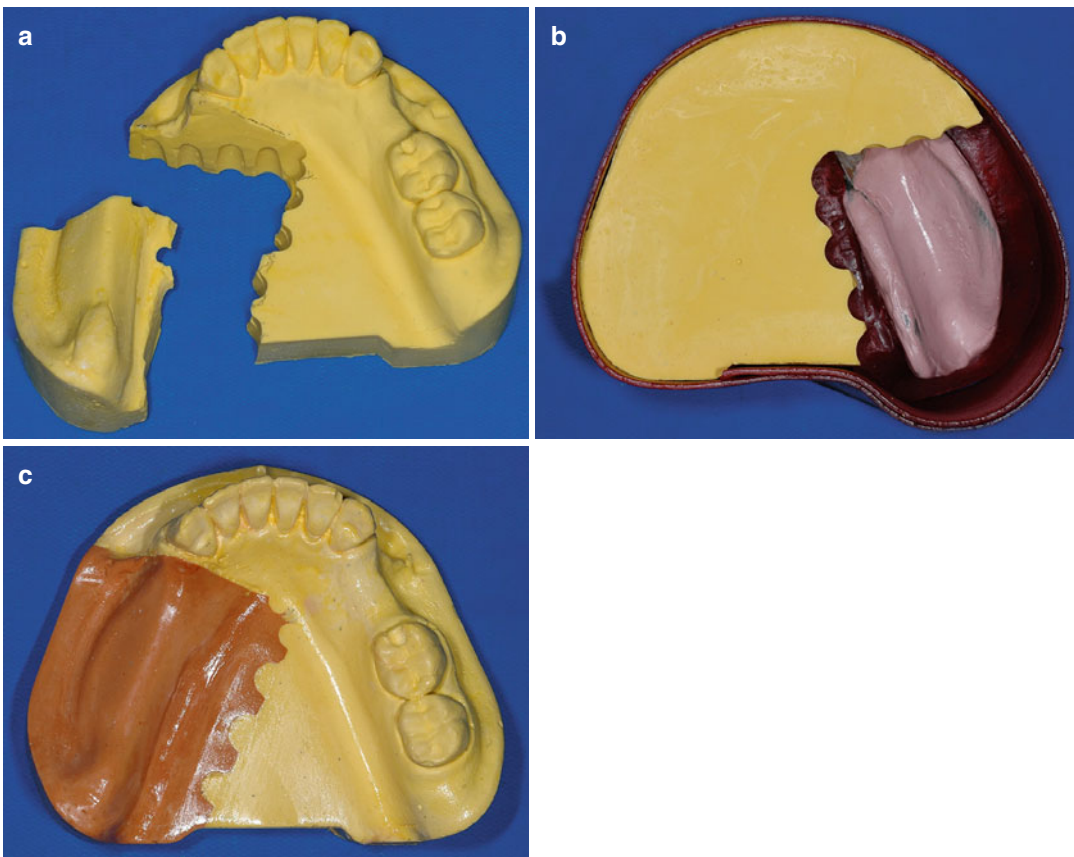
This is a sophisticated method which needs delicate work even in the hands of an experienced clinician. The laboratory work is also critical not only when preparing the altered cast but also at previous stages. Any slight difference in the seating of the framework between the mouth and the cast, which is possible due to numerous reasons, may result in a defective cast as the alignment of the saddles with the rest of the mouth would not have been transferred correctly.

Once a defective cast is produced, it becomes complicated to proceed with the following steps. A new impression has to be made while the framework is seated in the mouth to provide a fresh working cast after which you can either choose to repeat the functional impression or to skip the step and make an early functional relines after the prosthesis is finished.

There is a wide spectrum of modifications made to simplify, shorten, and secure the outcomes of the process both regarding the materials used and the procedures applied. The corrective Korecta waxes used in the original method has almost been abandoned. The modeling impression compound stands out as the most popular border molding material available. Almost 80 % of dental schools in the USA and 100 % in Turkey are reported to be using impression compound for functional borders. Alternatives to impression

compound are light-cured composite resin, utility wax, zinc oxide and eugenol paste, and tissue conditioners, and the materials used for final surface impression are polysulfide, polyether, polyvinyl siloxane, zinc oxide and eugenol paste, and tissue conditioners.

The laboratory procedures of making a hybrid cast is also a sensitive procedure, which can ruin the delicately made clinic work. To eliminate the risks in the process of cast altering, an overall impression over the finished functional impression in place can be made; thus, the position of the framework, as it is in the mouth, can be transferred to the new cast along with the functionally shaped surfaces. This can be done with stock trays and one of any elastic impression materials available (Fig. 8.10). Care must be given to prevent any movement of the framework while making the cover impression. If the impression material



**Fig. 8.9** (a) The cast is cut before transferring the final impression. The free ridge is cut away and retentive grooves for the supplementary plaster are prepared. (b)

Functional impression is seated on the initial cast, fixed, and boxed. (c) The plaster is poured and the altered cast is ready

leaks to the functional impression-mucosa interface that means a hyper expansive impression is made and the framework has moved from its place during the procedure. The cover impression should either be short of the functional impression borders or it should flawlessly continue expansively. If it is short, the exposed borders of the functional impression are boxed, if it is expansive

and masking the borders than the expansive material is cut away to clear functional borders before pouring the cast (Fig. 8.11a, b).

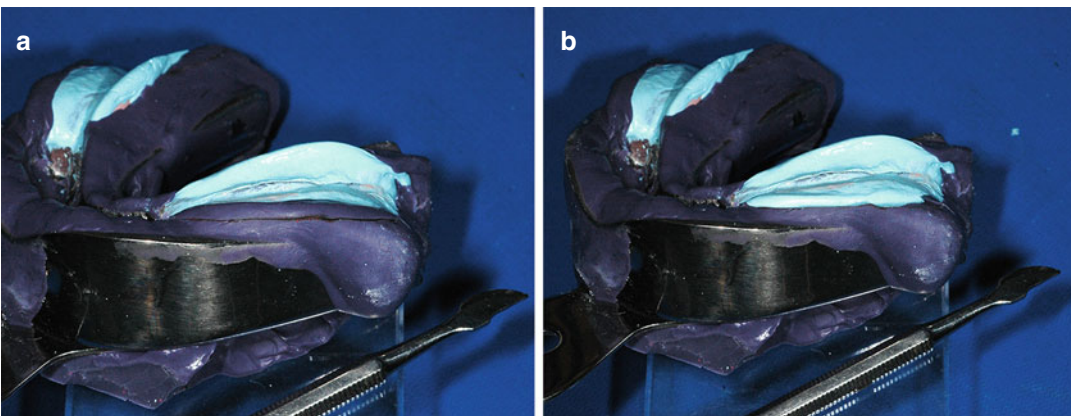
#### 8.4.2 Single Tray Functional Impressions

This is actually a derivative of single step final impression with a custom tray. The custom tray is shaped similar to the acrylic saddles in the altered cast technique over the free-ending edentulous ridge and the dentate area is produced in the conventional manner. The clearance between the tray and the cast is adjusted according to the impression material to be used. Acrylic stops over teeth keep the tray position during impression making.

The clinical procedure is first to make functional part of the impression with one of the border molding materials and then to make an overall wash impression with one of the elastomeric impression materials (Fig. 8.12a, b). This single piece impression is relatively simple, time saving, and easy to process. All parts of the RPD including the metal framework are produced on this final cast. Furthermore, the clinical outcomes of altered cast technique and single step functional impressions are reported to be similar (Fig. 8.13).

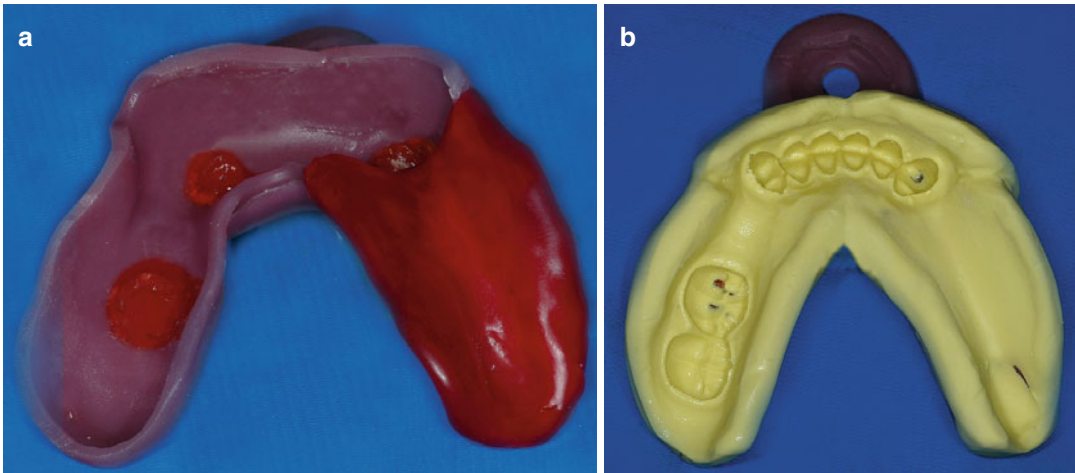


**Fig. 8.10** Overall impression to transfer the functional impression to the final cast



**Fig. 8.11** (a, b) The overextended overall impression is cut at the boxing level to clear the functional borders; thus, the borders can be seen on the master model





**Fig. 8.12** (a) Border molding of the custom tray. Tray adhesive is applied on both the tray and the impression material. (b) Impression completed with polyvinyl siloxane



**Fig. 8.13** Single piece cast from the single tray functional impression

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