

A MODIFIED TECHNIQUE OF ORTHODONTIC MODEL TRIMMING

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Abstract

Introduction: There are different tools in the diagnosis of an orthodontic case, the study models being one of them. They are helpful for three dimensional study of occlusion. Trimming the model is a very important task for an orthodontist. We have proposed certain modifications in the previously described techniques of model trimming. The purpose of this is to make the trimming easy, time saving, less laborious and more fruitful.

Materials and Methods: The bases are formed after removing the casts from the impression trays.

Conclusion And Result: We have suggested keeping the back width at least 8cm before trimming, the height from occlusal plane to floor at least 4cm and trimming the sides of upper and lower models at same angles. An elaborate method of adjusting the height of the casts is also suggested. The major bulk of trimming is done with both casts held in occlusion hence saving time. We have explained the fine details of every step necessary in model trimming making it a very uncomplicated and easily understandable procedure. We have also given model trimming procedure a systematic approach by providing a nomenclature for all the points, lines, angles and surfaces.

Key words: Orthodontic Models, Model trimming, Modified model trimming.

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INTRODUCTION:

The study models are an important tool in the diagnosis of an orthodontic case. They show the proper occlusion and the number of teeth present and any disturbance in morphology of teeth. Study models are essential as pretreatment record if any appliance therapy is to be carried out.¹ Trimming the models correctly is an important task for any orthodontic practice. Properly trimmed study casts have many advantages; it becomes easier to detect the arch form and any asymmetry,² trimmed models are more acceptable for presentation to the patient,² or to other dentists and patient's bite in the centric occlusion and centric relation can be

permanently registered into the trimmed models. All of these advantages cannot be achieved in untrimmed study models. Overall there is very scanty literature on orthodontic model trimming. However McNamara and Brudon previously described the dimensions and

angles to trim the models.³ Same method of model trimming has been recommended by the American Board of Orthodontics.⁴ Also Prof. Cecil Frith,⁵ Rani⁶ and Gurkeerat Singh⁷ have mentioned other methods of model trimming. With experience, we have made certain modifications in these methods which make the process less laborious and the outcome more fruitful.

The modified technique is explained step by step as follows;

STEP NO. 1: IMPRESSION

A high quality model trimming is not possible without an accurate impression. Impression of the dentition and the associated soft and hard tissue structures should be done using standard aluminum trays. The area of tissue attachment, particularly in the area of the labial frenum and the area adjacent to the upper first premolars, should also be reproduced in the impression. The impression also should extend posteriorly in the palatal area and lingually in the mandibular region (Fig: 1 and 2). After the impression has been made, it should be checked thoroughly. The impression should appear smooth with no voids, and the borders of the impression should be rolled with good extension into the vestibular area. Lastly the impression should be checked for the presence of any large air bubbles, especially on the occlusal surface of the teeth.

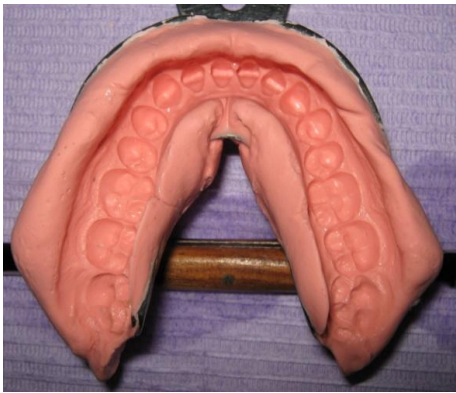


Fig: 1. Mandibular impression

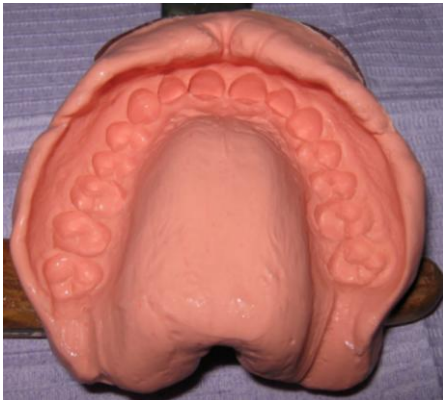


Fig: 2. Maxillary impression

STEP NO. 2: BITE REGISTRATION

The next step is to register the bite. Normally the bite registration is taken in centric occlusion, a tooth guided position. One or two thickness of yellow bite registration wax or modeling wax is used. Horse shoe shaped wafers of wax are first softened in warm water

or over a flame and then placed on the maxillary dental arch keeping in mind that the bite should not cover the buccal and lingual surfaces of the teeth. The patient should be asked to press on the wax bite until the upper and lower teeth completely occlude with each other. If the patient's bite is to be taken in centric relation, the clinician should use the finger pressure to press the wax against the buccal surfaces of the teeth to get a three dimensional registration of the bite.

STEP NO. 3: DISINFECTION OF IMPRESSION

The impression should be disinfected. A thorough rinsing of the impression before and after disinfecting is necessary to avoid possible adverse effects on the study models. Immersion disinfection usually will not distort or otherwise harm the impression if care is taken in the selection of the appropriate disinfectant and limiting immersion time as that recommended by the product manufacturer. After rinsing with excess water impression should be dried using gentle air flow because the water left in the dentition area dilutes the plaster during pouring and the teeth appear eroded with lack of fine details.

STEP NO. 4: MAKING TONGUE SPACE

Before pouring the impression we have to fill in the area occupied by the tongue in the mandibular impression. This can be done by placing a wet cotton piece in the tongue space. One scoop of alginate is mixed and placed in the area normally occupied by the tongue. Use a finger dipped in water to make a dome shape out of this and also smoothen out the alginate into the existing impression. Put this impression aside for some time so that it is finally set. Check the impression for any inaccuracy after alginate has been added in the tongue space (Fig: 3).

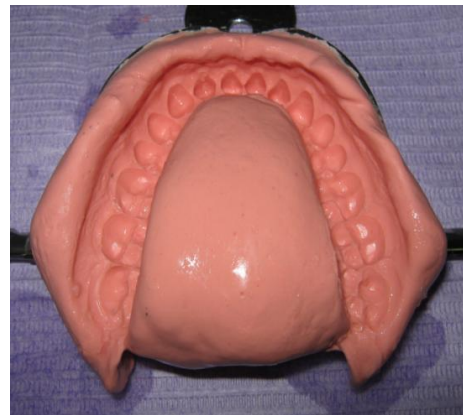


Fig: 3. Tongue space

STEP NO. 5: POURING THE IMPRESSION

The impression is poured using white orthodontic plaster (Fig: 4 and 5). The stone should be mixed in a vacuum mixer to eliminate bubbles that are entrapped

in the stone. The stone is poured in the tooth area of the impression, making sure that you keep on vibrating it while pouring. Additional stone is added with a spatula to complete the anatomical portion of the impression. The stone should cover the borders of the impression to register the entire sulcus depth. It is again left to be hardened so that the models can be taken out of the impression easily without any breakage.



Fig: 4. Poured maxillary impression



Fig: 5. Poured mandibular impression

STEP NO. 6: MAKING THE BASES

After taking out the models from the impression, the casts are dipped in water for some time, so that the plaster added to make the bases should adhere to it. Before pouring the plaster, mark a distance of about 8 cm on a flat plane, which will give reference for width of the back of the models, which should not be less than this. Now a thick mix of plaster is made and

poured out on this flat plane or a base former of an appropriate size. The rationale behind the thick mix of plaster is that the model should seat firmly and the material should not flow on the sides. The model is placed on this poured plaster in such a way that the occlusal surface is parallel with the floor. This can be checked by placing a flat surface like a protractor or a ruler on the occlusal surface of the cast. The height of the cast should be kept 4 cm on all sides, i.e. from occlusal plane to the base (Fig: 6).



Fig: 6. Adjusting the height

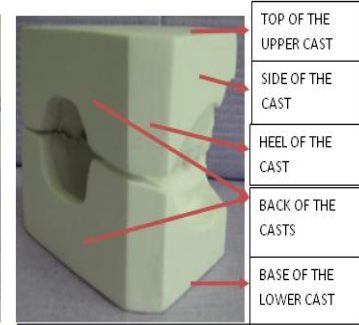


Fig: 7. Landmarks

Also keep an eye that plaster height on the sides should be at the level of the sulcus boundary. In this way both model bases are made.

This step is different from the other methods, in which the models are not taken out of the impression trays before making the bases^{3, 4, 5, 6, 7}. In those methods one cannot be sure that the occlusal plane is parallel with the floor because occlusal plane is obscured by the impression material. The thickness of impression material might be different at different areas due to uneven pressure applied during seating of the tray in impression taking hence causing difference in the levels of occlusal plane and the impression tray. Also the skeletal midline and that of the tray might not be coincident due to eccentric seating of the tray during impression taking. Similarly sulcus depth cannot be visualized while the models are still in the impression tray. By using dental casts as a guide line (rather than the impression trays) during base forming, we get an occlusal plane parallel with the floor, the casts' midline in the centre of the bases and enough material around the depth of the sulcus.

STEP NO. 7: PREPARATION BEFORE TRIMMING

Trimming of the casts is a challenging task that should be performed with care. It is advisable to soak the casts in water for approximately 10 minutes, immediately before trimming, to facilitate the easy plaster cutting. Care should be taken not to soak the casts for a longer span of time, as it would result in the dissolution of the plaster.

Prior to the trimming of the casts all the plaster nodules and the imperfections are removed with a sharp instrument like wax knife or carver. Also it is very important to place together the casts in occlusion to see any interference, especially in the occlusal areas and behind the last erupted molar.

STEP NO. 8: TRIMMING THE TOP AND THE BASE

The first step is to adjust the height of the maxillary and mandibular casts which should be approximately 3.5 cm from occlusal plane to the top and base of the models (Fig: 7). For this we first put the occlusal surface of the upper model on a flat plane and then with the help of a divider or a ruler make markings on the exterior of the model (Fig: 8). Then connect these points to make a line. In the same way the height of the lower model is marked by holding both the models in occlusion and keeping the total height 7 to 7.5 cm (Fig: 9). Now grind the top of maxillary cast and base of the mandibular cast parallel to the lines marked, keeping in mind that the grinding should not over extend the lines.



Fig: 8. Marking the height of upper cast



Fig: 9. Marking the height of lower cast

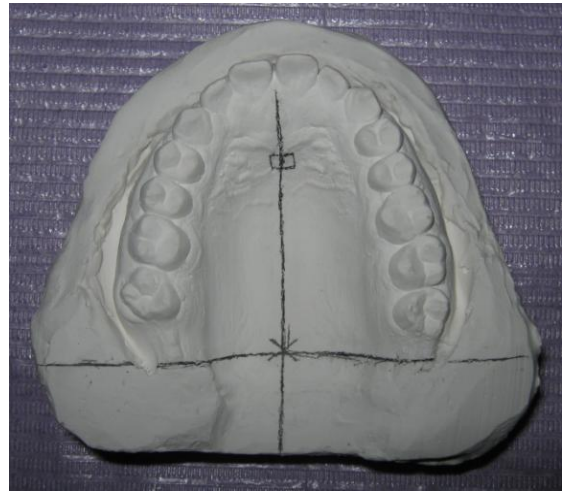


Fig: 10. Midline and perpendicular line

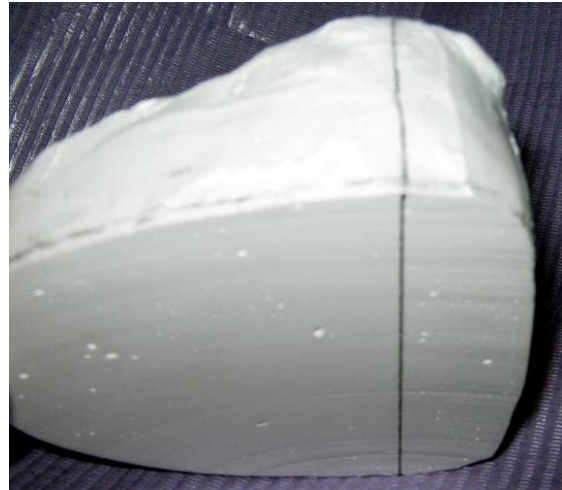


Fig: 11. Transferring the perpendicular line through the sides to the top of the upper model

STEP NO. 9: MARKING THE MIDLINE AND THE PERPENDICULAR LINE

The next step is to mark the skeletal midline of the palate. This is done by marking the mid of the second pair of rugae and the mid of the fovea palatinae, ⁸ and then joining them in one line (Fig: 10). This line is the *skeletal midline*. Draw a line perpendicular to the skeletal midline distal to the last erupted tooth. This line is the *perpendicular line*. Transfer this line through the sides to the top of the model (Fig: 11).

STEP NO. 10: TRIMMING THE BACKS

From this point onwards both models are trimmed together in each step. The backs should be ground, parallel with the perpendicular line and at right angle to the top and the base, in such a way that there is at least 5mm distance from the most distal tooth. Please note

that in class I and particularly class II cases, the most distal tooth will be in the mandibular cast and in class III cases, the most distal tooth will be in maxillary cast. This is different from all the methods of model trimming described earlier. By this modification we have tried to achieve a number of advantages. The upper and lower model sides are parallel to each other and the trimming of both models are done together which makes it less laborious and it also saves time and energy.

**STEP NO. 11:
TRANSFERING THE MIDLINE POINT ON THE PATIENT**

Transfer the midline through the back to the top of the upper model and mark a midline point at the most posterior border. This point is the *posterior midline point* (Fig: 12).

**STEP NO. 12:
MARKING THE LINES AND ANGLES (Fig: 12)**

Mark 4 cm points on both sides of this posterior midline point. These are *side points*. This is the safest distance on the model to which it can be trimmed without disturbing any of its land marks. However, this is not a fixed point; it may vary with the morphology and size of the arch. A line is made when we join the midline point and the two side points, which is the *top perpendicular line*. Mark two points, one at 68° and the other at 34° from the top perpendicular line, while keeping the midpoint of the protractor on one of the side points. Repeat the process on the other side. Join these points with their respective side points to get 2

lines on each side. One is the *68 degree line* and the other is *34 degree line*. This modification in the angles is done to make sides of the models parallel to the arch form and to each other. In all the earlier methods of model trimming, the outer angles are different for the maxillary and the mandibular casts. For maxillary it is 70° and for mandibular it is 65° or 55° .³ Hence the lower angle is very narrow as compared to the outer ridge angulations of the mandibular arch, making the buccal sulcus wider from the posterior and narrower from the anterior region.

The point where both the 34 degree lines cross each other is the *central midline point*. Another point is made where the 68 degree line of one side and the 34 degree line of the other side intersect; this is the *side bisecting point*. These two side bisecting points are joined to get the *bisecting line*.

Mark another point at 25° from the bisecting line by keeping the center of the protractor on the side bisecting point. Repeat the process on the other side. Join the 25° points to the respective side bisecting points to get *25 degree lines*

The point at which these two lines intersect each other is the *anterior midline point*. Now join the posterior, central and anterior midline point to construct the *skeletal midline* on top of the model. Draw a perpendicular to the 34 degree line on both sides, near the posterior end of the model which should connect the top perpendicular line and the 68 degree lines. This is the *heel line*.

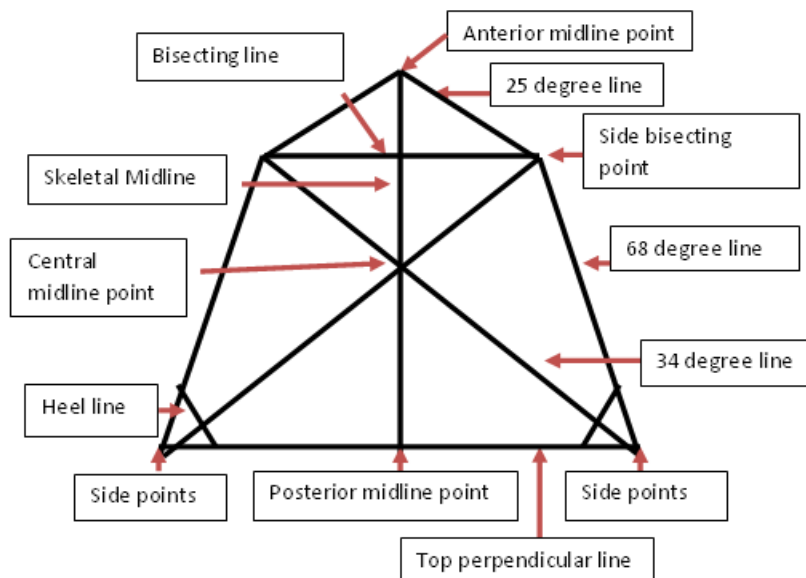


Fig.12. Guide Lines for trimming the upper and lower casts.

STEP NO. 13: TRIMMING THE SIDES

The trimming should not necessarily extend to these lines. Take these lines as a guide and trim the posterior part of the sides to the 68 degree line and anterior part parallel to 25 degree line leaving at least 5 mm or a pencil width of sulcus all around (Fig: 13). After trimming the sides, trim the heels on both sides parallel with the heel line keeping in mind that the total length of the heels should be 13 mm.



Fig: 13. Pencil width on the sides



Fig: 14. Rounded anterior portion of the mandibular cast and angled anterior portion of maxillary cast

Till this point the models are trimmed together with the wax bite in occlusion. After this the anterior border of the mandibular cast is rounded off separately (fig: 14). An important point to remember is that frequent washing of the models after every step of trimming should be done so that the plaster should not adhere to the anatomic portion of the models.

STEP NO. 14: FINAL TRIMMING

After washing the casts, they are trimmed with a light hand to smoothen out scratches or lines left by the grinding wheel. At this stage the models are still held together but without the wax bite to eliminate the thickness of the wax bite between the models.

STEP NO. 15: CARVING

While the models are still wet, carve the excess material from the buccal and labial surfaces following the anatomical landmarks like depth of sulcus and all the frenum attachments. This is done with the help of plaster knife. The key to perfection of this step is to carve out all the plaster from the outer boundary of the buccal and labial sulci, so that full sulcus depth and anatomy of the area is visible when viewed from front and sides.

STEP NO. 16: FINISHING AND POLISHING

Inspect the casts for any voids or air bubbles both on anatomic and artistic portion. These should be filled with a thin mix of plaster by the use of a finger or a brush at this stage when the models are still wet. Leave the models to dry. Now with the help of a sand paper smoothen out all surfaces of artistic portion. Soak the models in model gloss solution for half an hour or in soap solution overnight. The casts are then removed from the solution, allowed to dry and then polished with the help of a lathe buff (Fig: 15 and 16). Finally the casts are labelled with the name and age of patient as well as date of impression on the back of the maxillary model.



Fig: 15. Finished casts, front view



Fig: 16. Finished casts, side view

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