Quick and Easy Diagnostic Wax up Technique—Description and Illustration for the Undergraduate Students

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Abstract

Planned restorations if developed in wax on a diagnostic cast can provide the patient with a three-dimensional example of the final case. This diagnostic wax up can help achieve the desired aesthetics and function by determining optimal clinical and laboratory procedures. It helps in increasing patient acceptance and also allows better communication between the three—patient, dentist and lab technician. Purpose of this article is to present educational material that will allow dental students understand and apply principles of tooth morphology to create diagnostic wax up.

Keywords: Planned Restorations, Desired Aesthetics, Diagnostic, Wax Up, Patient Acceptance, Education Material.

Reference to this paper should be made as follows:


INTRODUCTION

The dental and gingival component of the smile can be manipulated to create a beautiful smile. A multidisciplinary role between restorative dentist, periodontist, and orthodontist is often required when designing a smile for a patient.\(^1,2\) Just like assembling many pieces into a completed jigsaw puzzle, the information gathered from the initial examination is integrated and a unique, complete treatment plan suitable to the patient’s dental health in the form of diagnostic wax-up is developed.

As a part of the Prosthodontic laboratory assignments, dental students practice waxing-up teeth with missing tooth structure in order to restore correct dental morphology or wax up for prostheses for their presentations and necessary tool for treatment planning in their comprehensive care clinics.\(^3,4\) These assignments simulate different clinical situations in which the student needs to restore missing tooth structures in the dentition. Such exercises
can improve students’ psychomotor skills while acquiring the knowledge needed to identify teeth, their normal anatomy\(^5\) and possible morphological variations and also guide them in treatment planning for their comprehensive cases.\(^6\)

The purpose of this article is to present educational material that will allow and help the dental students to perform diagnostic wax ups on their own for their clinical cases.

**Types of diagnostic wax up**

Generally, there are four types of diagnostic wax-ups commonly requested by restorative dentists\(^7\): the basic diagnostic wax-up, the full contour wax-up, case presentation wax-up, and the orthodontic wax-up.

**The basic diagnostic wax-up** uses minimal waxing on deficient areas only. Models can be marked to depict necessary gingival crown lengthening. Wax can then be flowed down or up in those areas to provide a good visual of the improvement. Cusp tips, lingual contours, incisal length can be added to improve centric stop areas, anterior guidance functions, and desired length or position respectively.

**The full-contour wax-up** is the wax-up of choice for big cases and used when the treatment planning includes improved aesthetics and contours and is done using more wax but the same visualization process as the basic wax-up.

**The case presentation wax-up** is very impressive and shows the end result of the personalized treatment plan to the patient. It is built-up to proper contour and function and the visual effect for the patient is completed by adding pink baseplate wax is added to the tissue areas.

**The orthodontic wax-up** can help determine as to how much interproximal reduction will be necessary. It helps the practitioner visualize the possibilities available when repositioning is an integral part of obtaining optimal results on a given case. Reductions can be measured and documented throughout the diagnostic wax-up.

**Various determinations can be made using the diagnostic wax up**

- Whether additive or subtractive equilibration is necessary, possibly a combination of the two;
- Whether the plane of occlusion is in need of correction so that the fundamentals of occlusion can be achieved;
- Are there are sufficient stable centric stops both posterior and anterior for occlusal stability;
- Whether the anterior guidance functions can be maximized or even obtained.

The restorations on the diagnostic models are the trial run of the treatment plan: it is better to make changes in the treatment plan at this stage than with a hastily made decision at the chair. The diagnostic wax-up after completion becomes the blueprint of the treatment plan.

**THE PREREQUISITES**

The following records are must in order to successfully work through the strategic session for
the diagnostic wax up:

- Well-made models (two sets: referral and working);
- Face bow transfer;
- Centric relation (CR) /maximum intercuspation bite;
- X-rays-full mouth IOPAS, panorama;
- Periodontal probing chart;
- Noted observations of temporomandibular joint (TMJ) status and muscle examination;
- Clinical photographs.

Armamentarium

- Cast molds with preparations on anterior and posterior teeth for direct and indirect restorations;
- Hanau torch or Bunsen Burner;
- Sharp red pencil;
- Green inlay casting wax: This pattern material accurately represents desired mold space for inlays, onlays, and crowns. Characteristics required include good adaptation, homogeneity, thermal stability at ambient temperatures and complete pyrolysis at high temperatures.
- Half Hollenback Instrument: Used for carving and shaping the wax.
- LeCron Instrument: Has a small spoon at one end and a ‘knife’ at the other. Used for carving and trimming wax.
- Wax spatula #7: Used to hold small bits of wax over the flame.

PKT instruments (Figure 1)

- P.K. Thomas Waxing Instrument #1: Has curved and tapered points that are used for positioning of functional and non-functional cusps.
- P.K. Thomas Waxing Instrument #2: Has curved and tapered points that are used for eliminating voids remaining on the occlusal surface (smaller when compared to PKT #1).
- P.K. Thomas Waxing Instrument #3: Used to perfect and enhance the supplemental grooves and developmental grooves.
- PKT No.4 is a modified carver used to perfect the external contours and remove excess wax/smoothening at the axial surfaces.
- P.K. Thomas Waxing Instrument #5: Used to remove excess wax as cusp ridges are developed. Its contour maintains desired convexity at ridges.
Figure 1: PKT instruments (1-5, from top to bottom)

THE SEQUENCE

The wax up begins after the data collection and analysis phase is completed. The maxillary anterior teeth are waxed first, followed by the mandibular anterior teeth. This is done to establish the labial aspect, anterior-posterior position, labial inclination, incisal edge position (incisal tooth length), midline (location and inclination), incisal plane. After the mandibular anterior labial surface and incisal edge is established in wax, the lingual morphology is created. The palatal morphology of the maxillary anterior teeth is waxed to establish the contact to mandibular incisal edges which includes the minimal space required to maintain adequate strength of the restorative material, the vertical dimension and the pathway of function between the centric occlusal contact and the edge-to-edge position.

- Maxillary posterior teeth are waxed establishing the cusp length, the occlusal plane and the buccal width (buccal corridor).
- Mandibular posterior teeth are waxed establishing the buccal cusp height, the occlusal plane, curve of Spee (A-P curve), curve of Wilson (lingual cusp height) and the occlusal morphology.

For anterior teeth:

1. The student first marks the teeth required for diagnostic wax up. Also, if anterior crown lengthening is required, the final gingival margin is marked. Diagnostic cast is taken and mock preparation of the tooth is done in order to create space for molten wax (Figure 2).
2. PKT 1 instrument is heated and wax is placed on the cervical region of the prepared tooth. Wax cones are then placed for the mesial and distal point angles and mesial and distal marginal ridge are created (Figure 3).
3. The area left in between is filled with wax with pkt no.1 Axial contours are then developed with PKT No. 4. Two planar carving should be done on the labial aspect. Over contouring should be avoided because of its destructive potential and can be checked by placing the finger along the labial surface of the anterior teeth. PKT no. 2 can be used to give the proper embrasure form and contact area (Figure 4).
4. W shaped fossa is then carved in the palatal aspect using PKT No. 5 and marginal ridges are smoothened to form the final refined wax pattern. (Figure 5)
E.V. Payne gave functional waxing technique to develop this relationship. Following are the steps involved in the technique:

1. Wax cones are placed for functional and non-functional cusps with PKT No. 1 keeping in mind that the cones for non-functional cusps are shorter than functional cusps so that there is easy disocclusion during excursion (Figure 6). To get optimal heights for the cuspal cones, articulator is closed and moved in various lateral and protrusive movements.
2. Marginal and axial ridges are then added with PKT No. 1 which should never be at a higher level than cuspal cones. Proximal contacts with posterior natural teeth are located in the occlusal thirds of the pattern (Figure 7).
3. Next, the triangular ridges are added which extend from central groove to the cuspal tip. Triangular ridges are convex both buccolingually and mesiodistally and the tip of the triangular ridge is at the cusp tip with base in the central groove.
Articulated casts are moved in all the excursions and unwanted contacts are removed. PKT No. 4 is then taken to develop the axial contours. Straight profile should be developed in the gingival third of the axial contour. Over contouring should be avoided because of its destructive potential.

4. PKT No. 3 is then used to smoothen the grooves and marginal ridges are smoothened with PKT No. 5 to form the refined final wax pattern with proper occlusal morphology (Figure 8).

5. Zinc Stearate powder is dusted on the wax pattern intermittently before checking the occlusal contacts.

6. A tripod configuration is preferred at the contacts formed by each opposing cusp form (Figure 9).

7. Margin finishing is done last. Margin should be checked carefully for the discrepancies like over waxed margins, short margins, ripples, thick margins and open margins.

Figure 6: Wax cones on occlusal surface

Figure 7: Occlusal and axial wax up

Figure 8: Completed occlusal and axial wax up
Figure 9: Tripodal configuration

Alternate method for anterior and posterior diagnostic wax up

The acrylic pontic is attached in the missing space with wax, taking care of the occlusion. Silicon putty index is made. Pontic is removed and mock preparation is done (Figure 10 and 11).

1. Index is filled with molten wax using wax spatula. Index is placed over the teeth and wax is allowed to set. Index is removed and the excess wax is removed and polishing is done (Figure 12 and 13).

Figure 10: Mock preparation following making the index with acrylic pontic (anterior teeth).

Figure 11: Mock preparation following making the index with acrylic pontic (posterior teeth).

Figure 12: Wax up done with help of index (anterior teeth)
Figure 13: Wax up done with help of index (posterior teeth).

**Tips**

Use PK Thomas instruments or wax spatula #7 to carry wax to the tooth preparation. The instruments should be adequately heated and the wax added to the preparation in small amounts to avoid trapped bubbles as wax starts to cool and gain viscosity. If the wax is too hot, it will flow all over the preparation without control. Sink the heated instrument down to the base of the preparation when melting a new wax layer to the previously placed wax, so that they do not separate during carving. Add a slightly greater amount of wax than that needed to restore tooth morphology (0.5 to 1.0 mm above margins). Make sure all margins around the preparation are properly sealed.

Carving: Use the wax carving instruments to refine the tooth morphology. PKT #3 is good to enhance grooves. The LeCron and the manual half Hollenback will refine the whole morphology, removing all flash and excess material so that no wax is extending over the pencil mark. Lay the sharp cutting side of the manual half Hollenback carver on a cusp (around 45° inclination) with the point of the instrument in the groove at the centre of a tooth. Scrape away the excess wax following the line of the cusps. This will give you a proper groove anatomy as well as shaping the cusps correctly. You will aim to mimic the mirror image of the same tooth in the adjacent quadrant. The marginal ridges should be at the same level as the adjacent teeth. You can check if you carved your wax enough by occluding your upper and lower models together. If they do not occlude properly (i.e., seem too high or are contacting more on the side of the preparation) you will need to reduce the height of the wax.

Finishing: In the presence of voids or if too much wax was removed, add little amount of wax and re-carving is done. Polish your restoration with a toothbrush, gauze, and/or a piece of nylon or cotton.

**General wax-up characteristics**

- **Margins:** Wax should be flush with the margin of the tooth preparation with no overhangs, sub margins or open-margins.
- **Contour:** Should be smooth and curved with no flat (under) or bulbous (over) contour.
- **Outer surfaces (facial, lingual, mesial, distal):** Should respect proper convexity, appear smooth, even and polished (with no scratches, waviness or voids).
- **Morphological structures:** All ridges, fossae, cingulum area and grooves should exhibit a polished surface with no scratches. The junctions between these structures should flow naturally.

**Instrument care**

- Always keep your instruments clean and sharp.
• PK Thomas #3 and wax spatula #7 can go into the flame.
• Dental explorer, manual half Hollenback and LeCron should not go into the flame.
• They might lose sharpness or break.

Clinical Implications

Clinically, the preservation of the anatomical features of teeth such as height of contour, embrasures, proximal contacts and contour are important to protect and ensure the health of the surrounding soft tissues. Adequate interproximal contacts serve to anchor all teeth within the same arch, to avoid tooth migration or inclination and avoid food trapping between the teeth. Proper occlusal anatomy and interocclusal contacts confer comfort to the patient as well as harmony and stability of the occlusion. Harmonious incisal planes, anterior lines and point angles, and overall anatomy relate especially to patients’ aesthetics but also functional satisfaction. Therefore, the knowledge and maintenance of tooth morphological characteristics will certainly lead to restorations with improved aesthetics and oral functions.

DISCUSSION

Correction of dental aesthetic inconsistencies needs careful evaluation, planning and multidisciplinary approach. Anatomic wax mock-up is one of the most important tools when planning to alter the patient's smile. The various benefits of an anatomic mock-up for smile designing are as follows:

- Diagnostic mock-up allows the clinician to visualize the alterations needed to achieve a pleasing smile and assist him/her in treatment planning.
- The diagnostic wax mock-up allows the clinician to communicate with the patient regarding the final aesthetic result. It can be transferred into the patient's mouth with the help of silicon index and provisional material to fabricate preevaluation temporaries.
- With the preevaluation temporaries in place, the aesthetics, the phonetics and even the occlusion can be evaluated and necessary corrections be made.
- Once the size, shape and proportion of the veneers have been finalized by the patient and the dentist, an impression is taken with the preevaluation temporaries in position. This can act as a guide for the ceramist in the fabrication of the ceramic veneers. This will also aid in the ceramic build-up of incisal edge using the cut-back technique.
- Anatomic wax-up can also be used in the fabrication of a gingival-contour surgical stent, which is used during the crown-lengthening procedure to visualize the proposed final gingival contours at surgery.
- These anatomic temporary veneers will act as a tooth preparation guide for preservation of tooth structure as in the present case.

REFERENCES


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