Ashur University College
Crown and Bridge
2nd year Prosthodontics
Technology dept.
Lect 10

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Wax pattern

The first procedure for the casting of an inlay or crown is the preparation of a wax pattern.

Wax pattern: it is the precursor of the final cast restoration were the wax placed on the prepared tooth, it should be clear, smooth, should be duplicate accurately the final anatomical feature of the original tooth and should be free from any debris.

The information needed to duplicate the anatomical feature is taken from the adjacent teeth, the opposing teeth and from the general knowledge of the dental anatomy.

lost-wax process : This technique consists of obtaining an accurate impression of the prepared tooth and making a cast from the impression on which a wax pattern that resembles the shape of the final restoration is shaped . A mold is then made around the wax pattern with a refractory investment material. When the investment has set, the wax is vaporized in an electric furnace. The hollow mold is then filled with molten casting alloy, reproducing every detail of the wax pattern. The metal casting is retrieved, excess metal is removed, and after polishing, the cast restoration is ready for clinical evaluation.

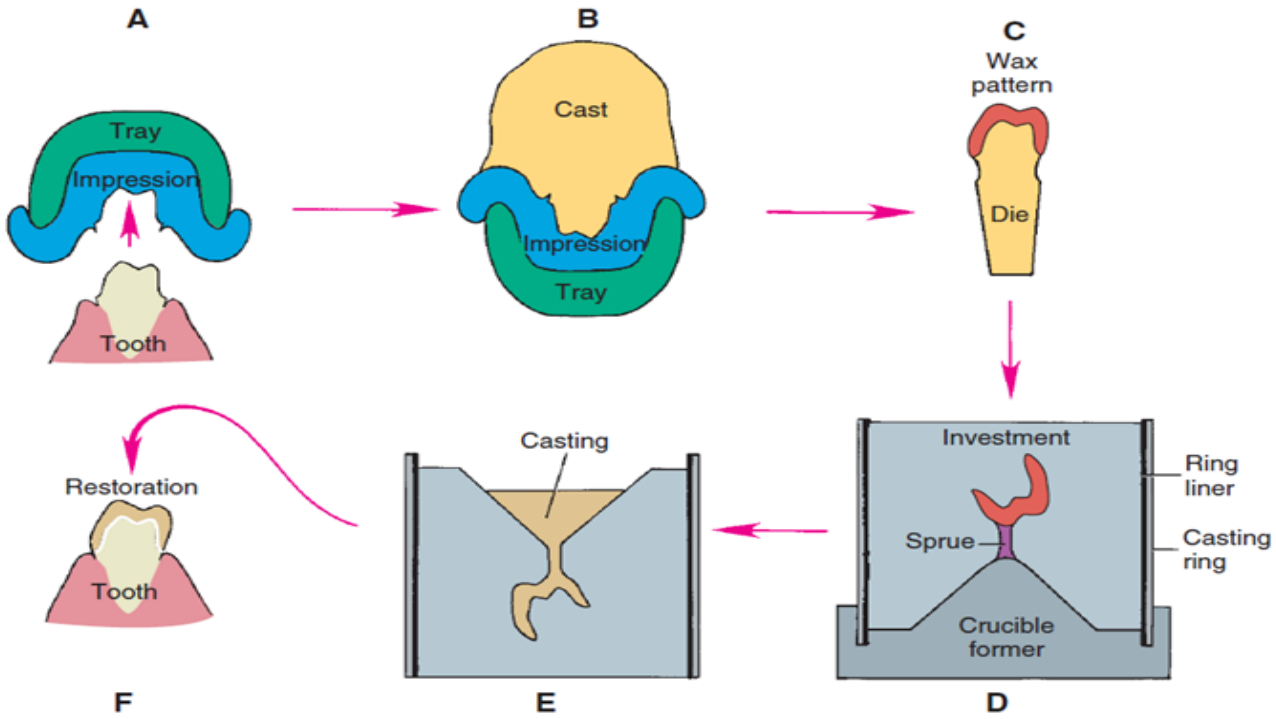


FIGURE 18-1 ■ Most dental castings are made indirectly by the lost-wax process. **A,** Impression. **B,** Cast. **C,** Wax pattern on die. **D,** The pattern is attached with sprue to a rubber crucible former and invested. **E,** Casting. **F,** Luted restoration.

Requirements of the wax pattern:

1. It should be smooth and free from any debris.

2. It should duplicate accurately the anatomical features of the original tooth. Information needed for duplication is taken from the adjacent teeth, opposing teeth, and from general knowledge of dental anatomy.

3. It should have a contrasting colour so that the margins of the pattern can be distinguished from the cast.





Why we use wax for duplication?

1. It is easily manipulated.
2. Inexpensive.
3. Easily eliminated from the mold cavity during burn out procedure.

Correction of Defects

Even a very small undercut on the die of a tooth preparation results in an inability to remove the wax pattern. There may be small dimples in the die (resulting from caries removal or loss of a previous restoration) that are undercut in relation to the path of placement of the new restoration. Blocking them out on the working die may be more practical and convenient, as long as the defect does not extend to within 1 mm of the cavity margin. Zinc phosphate cement is a suitable material, but other commercial products (e.g., resin) are available for this purpose.









Provision of Adequate Space for the Luting Agent

A space should exist between the internal surface of the casting and the prepared surface of the tooth everywhere except immediately adjacent to the margin. The space provides room for the luting agent (a material that on hardening fills the space and binds the tooth and crown together) and allows complete seating of the restoration during cementation. At the preparation, margin, there should be a band of close adaptation (about 1 mm wide) to prevent disintegration and dissolution of the luting agent.

If the luting agent space is too narrow, the casting does not seat properly during cementation because of hydraulic pressure that develops when the viscous mass of luting agent cannot escape through the narrow gap between crown and preparation as the restoration is seated. Conversely, if the luting agent space is too wide, the casting is loose on the tooth, resistance form is reduced; in addition, the risk of the crown loosening during function increases considerably, and its longevity is adversely affected.





Increasing the luting agent space

A number of factors increase the luting agent space for a complete crown:

1. Increased thermal and polymerization shrinkage of the impression material.
2. Use of a solid cast with individual stone dies.
3. Use of an internal (initial) layer of soft wax in the wax pattern.
4. Use of die spacers.
5. Increased expansion of the investment mold.
6. Removal of metal from the fitting surface by grinding, air borne particle abrasion, etching with aqua regia, or electrochemical milling.

Reduction of the luting agent space

A number of factors reduce the cement space:

1. Reduced thermal and polymerization shrinkage of the impression material.
2. Use of resin or electroplated dies.
3. Use of alloys with a higher melting range.
4. Reduced expansion of the investment.

Armamentarium for waxing procedure



- Bunsen burner
- Inlay wax
- Waxing instruments
- Cotton cleaning cloth
- Sharp colored pencil (contrasting color to wax)
- Separating liquid
- Occlusal indicator powder (zinc stearate* or powdered wax)
- Soft toothbrush
- Double-sided brushes (soft/rigid)
- Cotton balls
- Fine nylon hose.

Waxing instruments

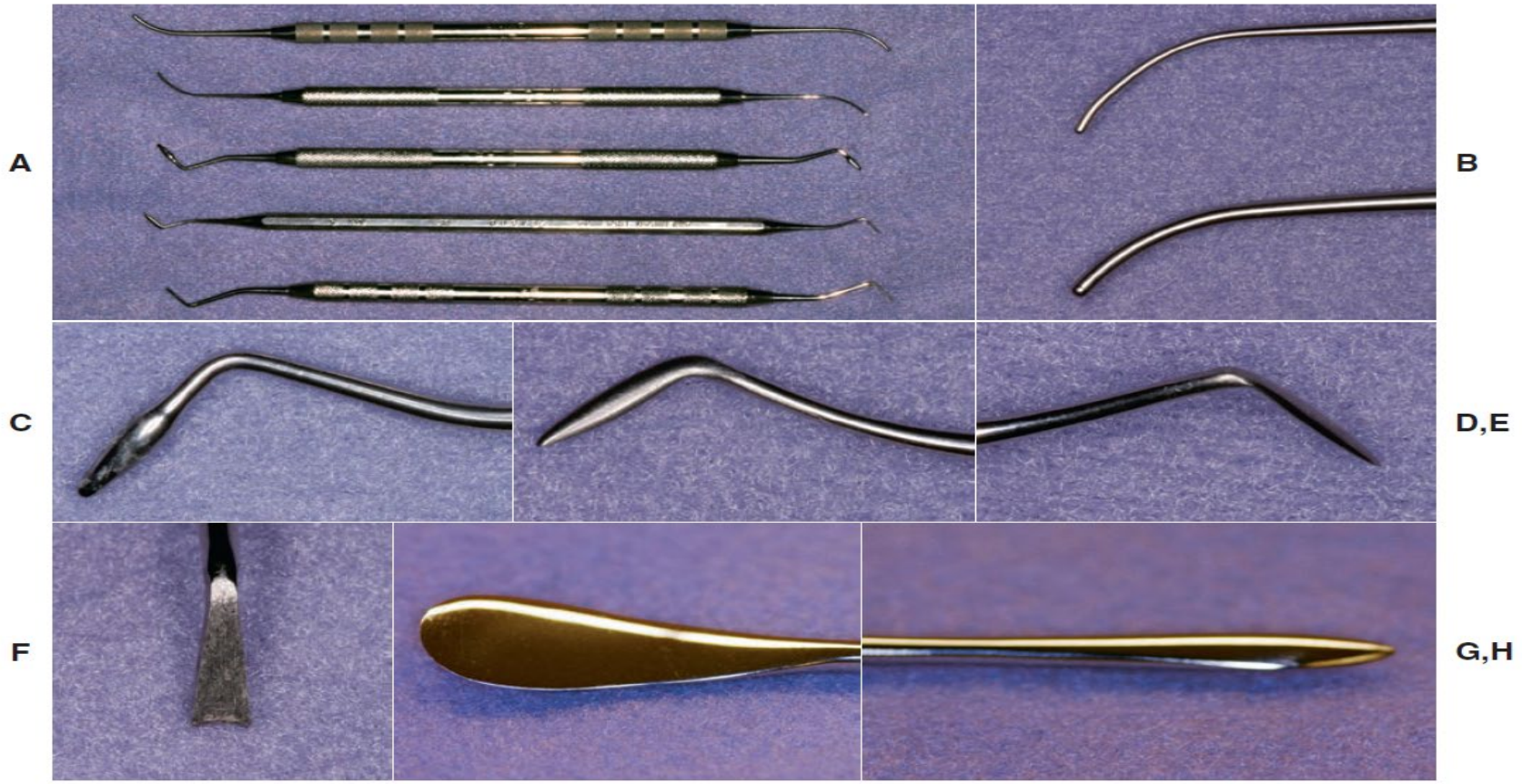


FIGURE 18-12 ■ Waxing instruments. **A,** Top to bottom: PKT Nos. 1 to 5 instruments. **B,** Top to bottom: PKT Nos. 1 and 2 wax addition instruments. **C,** PKT No. 3 burnisher. **D** and **E,** PKT No. 4 wax carver. **F,** PKT No. 5 wax carver instrument. **G** and **H,** PKT No. 7 waxing spatula.

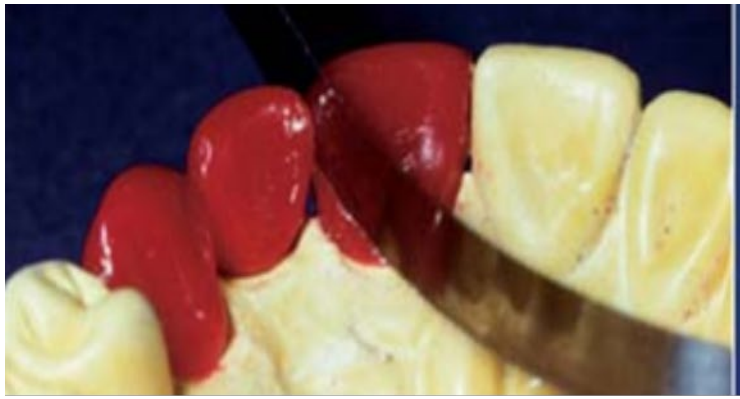
Types of wax and techniques used for construction of the wax pattern:

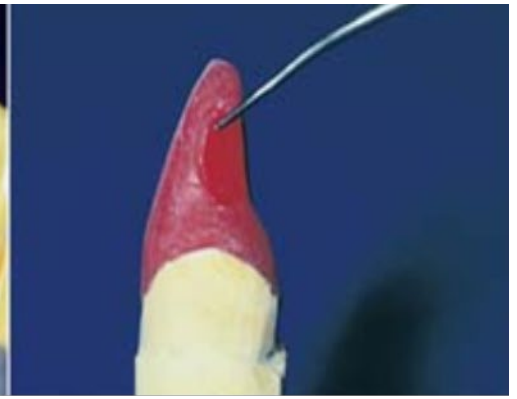
According to the ADA, there are two types of inlay casting wax:

1. Type I inlay casting wax: which is a hard wax used for intra-oral waxing technique (direct technique), (the wax pattern constructed inside the patient´s mouth, which is mostly used for anterior post crown), this type of wax has a higher melting temperature.

2. Type II inlay casting wax: which is a softer wax used for extra-oral waxing technique (Indirect technique), (wax pattern constructed on the die of the working cast), this type of wax has a lower melting temperature.







Requirements of good inlay wax:

1. It must flow readily when heated.
2. It must become rigid when cooled.
3. It must be capable of carving without chipping or smearing when it is done in fine margins.

The advantage of the indirect over the direct tech.:-

1. It reduces the chair time so it saves the dentist time and more comfortable to the patient.

2. It offer opportunity for the visualization of the restoration and readily (direct) access to waxing the margin.

3. It is probably the easiest mean of fabricating cast restoration.

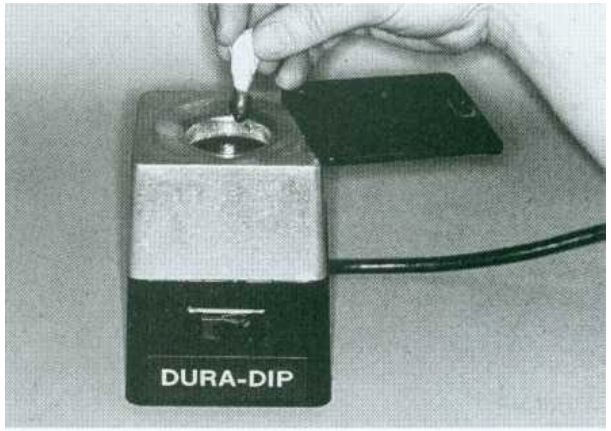
Waxing techniques:

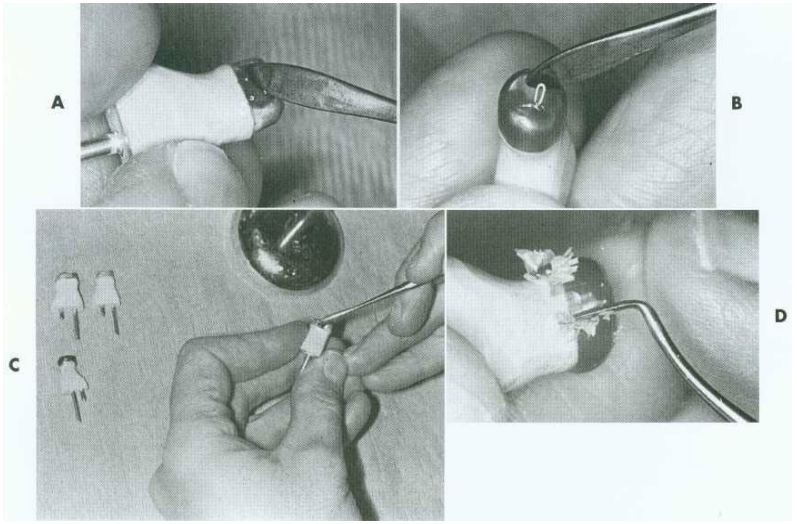
1.Wax adding technique: Flow the molten wax onto the die from a well heated large waxing instrument.

2.Dipping technique: Dipping the lubricant die for making well adapted internal surface.

3.Adapting technique: applying sheet of soft green casting wax (0.5mm) gauge to the die.



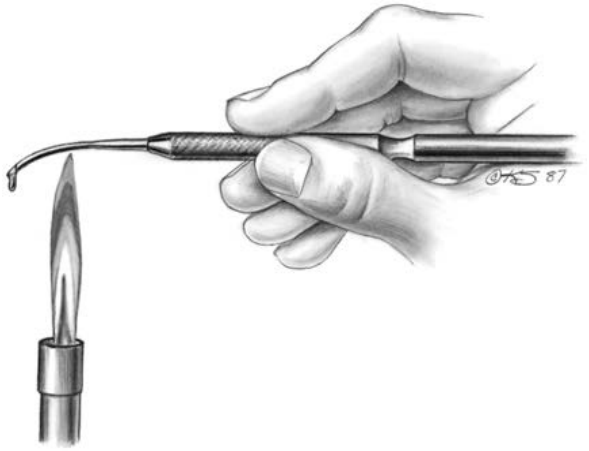




Waxing Instruments

Manual instruments:

Wax is added by heating the instrument in the Bunsen flame, touching it to the wax, and quickly reheating its shank in the flame. Wax flows away from the hottest part of the instrument, so that if the shank is heated, a bead of wax flows off the tip.



Electric waxing instruments are preferred by some technicians because:

1. They allow precise temperature control of the wax, which is important for proper manipulation.
2. Carbon buildup can be kept to a minimum, which easily results from overheating a waxing instrument in a Bunsen flame.







Burnishing: Burnishing consists of slightly warming a blunt instrument and rubbing the wax which is an alternative to carving for obtaining a smooth wax pattern of the desired contour.

The PKT No. 3 instrument is useful for burnishing the occlusal surfaces.

The PKT Nos. 1 and 2 can be used for burnishing as well as for wax addition.

