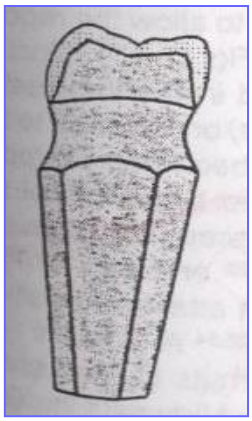
CROWN AND BRIDGE

Waxing

Lecture: 7 Dr. Farid

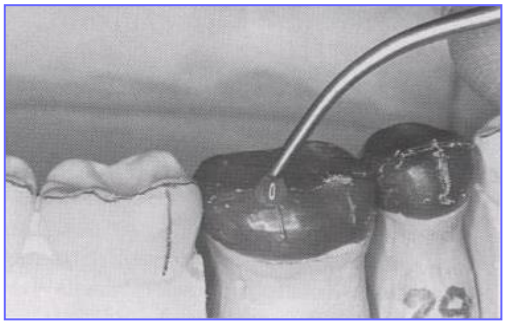


Ditching (Undercutting):

It is trimming of the stone representing the gingival around the prepared tooth that shows the finishing line clearly.
It is done by using a sharp hand instrument.

Wax pattern:

It is the precursor of the final cast restoration that will be placed on the prepared tooth. It should be:



1- Clear and smooth.

2- Duplicates accurately the anatomical features of the original tooth and

3- It should be free from any debris.

Wax is used to construct the wax pattern because:

i) It is easily manipulated.

ii) Inexpensive.

iii) Easily eliminated from the mold cavity during burnout procedure.

The type of wax used in construction of the wax pattern is inlay casting wax. There are two types of this wax which are:

1) Type I inlay casting wax; it is a hard wax and used for intraoral waxing technique. It has a higher melting temperature.

2) Type II inlay casting wax; it is a softer wax than the type I and is used for extra oral wax technique. It has a lower melting temperature. It is used to construct the wax pattern on the cast.

Requirements of good inlay casting wax:

1- It must flow readily when heated and rigid when cooled.

2- It must be carved without chipping when it is done in fine margins.

Techniques of construction of wax pattern:

1- Intraoral technique (Direct technique)**:**

The wax pattern is constructed inside the patient mouth using type I inlay wax. This technique is mostly used to construct the posterior inlay restoration and anterior post-crown.

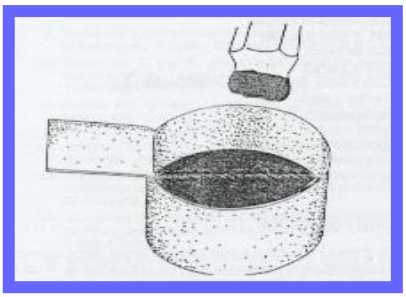
2- Extra oral technique (Indirect technique)**:**

Type II inlay wax is used to construct the wax pattern on the die of the working cast.

Steps in working procedure:

1- Apply a wax lubricant (die spacer) on the die within 1mm from the finish line and leave it to dry (obtain a relive of 20 to 40 microns). Then apply die lubricant (separating medium) to the die.

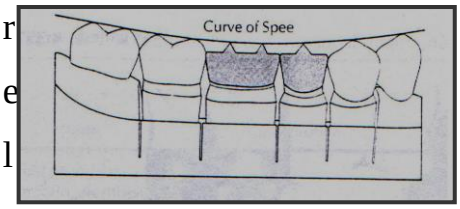
2- Cover all the preparation in one time with molten wax to make a coping of wax. This can be obtained by immersing the preparation in a dish containing molten wax (this is the first layer of wax pattern).

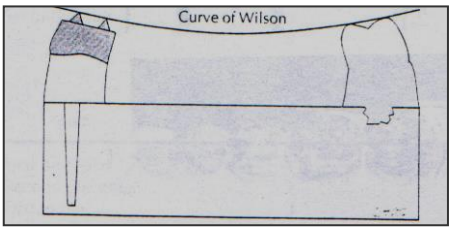


3- Add wax to the proximal surfaces of the preparation to build the proximal surfaces and contact areas with the adjacent teeth.

4- Build the axial wall (buccal and lingual wall) to the normal contour.

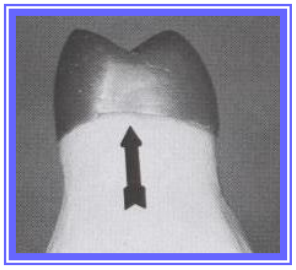
5- Build the occlusal surface of the restoration following the curve of spee and curve of Wilson, then check and adjust the occlusal





relation with the opposing teeth in centric and eccentric relation.

6- Check the margins of the wax pattern to ensure that the margins of the wax pattern have no over or under extension.



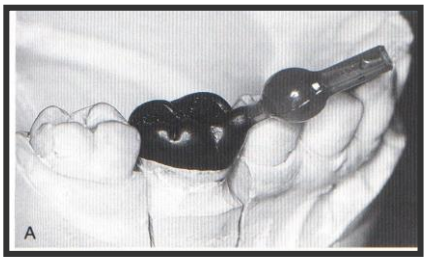
Investing:

It is the embedding of the wax pattern in a heat resistant material that can accurately duplicate the shape and anatomical features of the wax pattern to obtain the mold after burning the wax pattern (lost wax technique).

Lost wax technique:

It is the process which includes surrounding the wax pattern with mold of heat resistant investment material, eliminating the wax by heating, and then introducing molten metal into the mold cavity through channel called the "sprue".

Sprue:

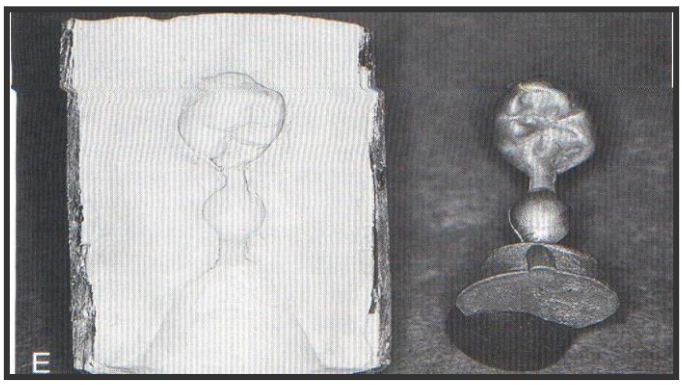


It is a small diameter pin made of wax, plastic or metal, one end of it is attached to the wax pattern

while the other end is attached to the crucible former. It provides a channel after burn out procedure to act as inlet for the gold which is forced in the mold cavity.

Mold cavity:

It is a space created inside the investment after burnout procedure that was occupied by the wax pattern, sprue and crucible former.



Requirements of the sprue:

1-The sprue must allow the molten wax to escape from the mold cavity.

2-It must allow the molten metal to flow into the mold cavity with little turbulence as possible.

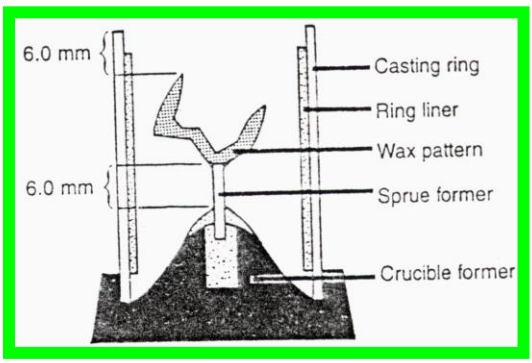
3-The metal within the sprue must remain molten slightly longer than the alloy that has filled the mold. This will provide a reservoir to compensate for the shrinkage that occurs during solidification of metal casting.

Materials used in the construction of the sprue:

1) Wax: It is the preferable material to make a sprue because it melts at the same temperature of the wax pattern.
2) Plastic: The plastic used should be of a low melting temperature.
3) Metal: It should be made from non-rusting material to avoid possible contamination of wax.

Dimension and location of the sprue:

1- Diameter: The size of the sprue or the diameter of it must be as large as possible to improve the flow of the molten metal into the mold cavity and ensure the reservoir to compensate for the shrinkage of the metal during solidification.



2- Length: The length must be adjusted so that when we attach it to the crucible former, the margin of the wax pattern should be about 6 mm away from the end of the casting ring. It is made so that the wax pattern will be in the center of the casting ring and surrounded by a uniform thickness of investment material.

3- Location: The position of the attachment of the sprue with the wax pattern should be to the bulkiest area of the wax pattern and should be at an angle to allow the incoming gold (or metal) to pass freely to all portions of the mold cavity without any turbulence. The attachment should also be at the bulky non centric area.

Purposes of investing:

1) Provide accurate production of the anatomical form of the wax pattern.

2) Provide sufficient strength to withstand the heat of burnout procedure and the actual casting of the molten metal.

3) Provide compensation expansion equal to the solidification shrinkage of the alloy, therefore, the mold cavity should be larger than the mold (if this does not happen the restoration will be smaller than the wax pattern).

Casting ring:

The casting ring is made of metal used to hold the investment material in place during setting and to restrict the expansion of the mold. If we use the casting ring alone, we will not have expansion.

Ring liner:

The liner is used to line the inside of the casting ring. It is made from a compressible material. E.g. asbestos (0.6mm thick) that allows the investment material to expand to some degree, but as it is carcinogenic other materials as fiberglass may be used. If there is no room for expansion outward the mold cavity would produce a small casting. The liner should be 3mm shorter than both ends of casting ring because it will bind the investment to the ring to prevent the slipping of the whole mass during casting procedure.

Purposes of the liner (advantages):

1- Provide a room of pliable material against which the investment can expand to enlarge the mold cavity to compensate for solidification shrinkage.

2- To permit easier removal of the investment and casting from the ring after burnout procedure.

3- Act as an insulator against loss of heat during casting procedure.

The crucible former:

It is a conical or tall shape base made of rubber or metal. It forms the base of casting ring, to which the other end of the sprue is attached.

The purpose of using the conical crucible former is:

1- To get proper position of the crucible former inside the investing ring.

2- To create conical shape and this is for the direction of molten metal.

Materials used as investment material:

According to the type of the binder we have 2 types**:**

1. **Gypsum bonded investment material.**
2. **Phosphate bonded investment material.**

Both consist of a binder and a refractory material (silica).

1. Gypsum bonded investment material**:**

The binder is calcium sulfate hemihydrate (CaSO4.1/2H2O), it is used with an alloy which has melting temperature decomposition of calcium sulfate occurs which occurs with result in release of sulfur into the mold-mixed with gold-brittle casting, so it is unstable in burnout temperature (above 650 C).

2. Phosphate bonded investment material**:**

Used with high melting temperature alloy. The binder is magnesium phosphate and ammonium phosphate. The binder can withstand high casting temperature therefore it is used for investing and casting alloys with higher casting temperatures.

Types of dental alloys:

There are 3 main types**:**

1- Precious alloy.

2- Semiprecious alloy.

3- Non precious alloy.

1. Precious alloy:

Consists of a minimum of 60% by weight of noble elements, at least 40% of the alloy must be gold.

1) Type I Soft.
2) Type II Moderate.
3) Type III Hard.
4) Type IV Extra hard.

2. Semiprecious alloy:

Minimum of 25% by weight of noble metal, with no requirement for gold.

3. Non precious alloy:

There are two main alloys used which are nickel chromium alloy (75% Ni, 15% Cr) and cobalt chromium alloy (60% Co, 25% Cr). The phosphate bonded investment is used with these alloys to withstand their high melting temperature.

Reference: Contemporary Fixed Prosthodontics