

Cast partial denture: Laboratory step by step

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Fabrication of a cast partial denture is a difficult process and every one does it a different way and in order to give a correct method, I have divided in to steps and given a pictorial method to make every one to understand the exact method of production of cast partial denture. It is an important process for every prosthodontist.

Key words: Chrome cobalt solder, gold solder, surveyer

Every prosthodontist knows about cast partial denture and they are aware of theory but practically the exact procedure of making a cast partial denture is different. In first person here the exact procedure is formulated and presented as a working catalogue.

The exact procedure is divided into five steps, four belonging to the metal frame work and the fifth one is the regular acrylic work.

1. Production of master model, surveying, blocking out, and duplicating
2. Production of duplicate model, hardening and modeling
3. Investing, preheating, and casting
4. Deflasking, blasting, finishing, polishing, and soldering
5. Preparing the metal frame work for acrylic work.

Since the procedure needs an extensive picturing I have inducted few pictures



Figure 2: Wax up of upper partial denture

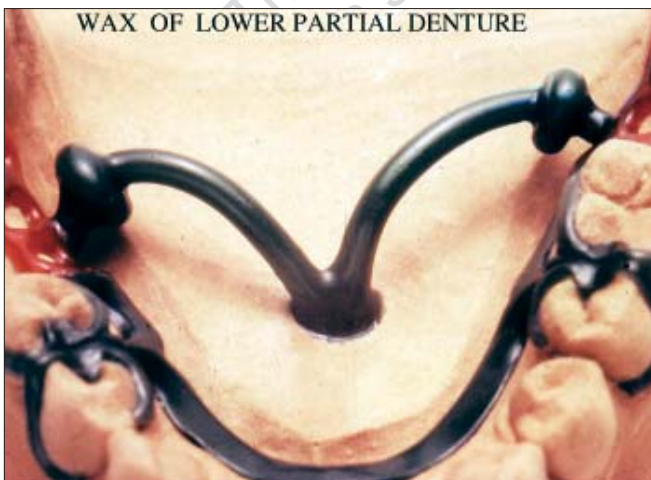


Figure 1: Wax up of lower partial denture



Figure 3: Metal being heated



Figure 4: Flame projected thro crucible



Figure 6: Molten metal to be casted

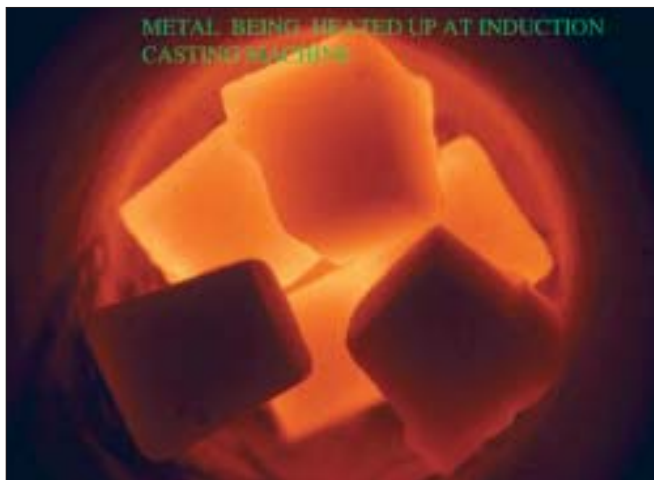


Figure 5: Metal heated in induction crucible



Figure 7: Completed frame work

Step 1 to step 4 in tabulated format.
Step 5. Preparation of the metal framework for acrylic

This procedure is the regular procedure of

articulation, arrangement of all the remaining teeth, wax up and finishing the acrylic framework in the usual way.

Step 1: Production of master model, surveying, blocking out, and duplicating

Process	Brief description	Time	Temperature	Equipment, materials, and aids required
Preparing master model	Pour mixed hard stone into impression and model base former. Grind model, if necessary.	45 sec. mechanized or 60 sec. manual	Water: 18 to 20°C	Superhard stone, vacuum mixer, model trimmer, model base former
Designing and surveying master model	Determine undercut areas with the surveying instrument and tracing rod. Place the rod of the undercut disc against the clasp tooth; the edge of the disc marks the tip of the clasp - or traces the retention areas continuously with the parameter undercut surveyor. Mark the curve of the equator and clasp. Only the last third of the clasp should lie in the retention area.			Good surveyer surveying instruments undercut disc or undercut gauge, tracer rod, pencil lead
Wax shoulder	Form a shoulder in wax underneath	Blocking-out or		

Nasser: Cast partial denture

	the clasp guideline: it is reproduced later on the investment material model showing the exact position of the clasp guide line.	preparation wax		
Blocking out and under laying	Block out undercut areas near to the saddle with blocking out or preparation wax. Scrape off excess wax. Lower: Find, with the aid of tin foil, the limit of the saddle area to be lined. Uppers: Cover sufficient width of the area of saddles to be lined with preparation wax.			Surveying instrument with blocking out wax
Soaking the master model	Soaking extracts trapped air from the model and ensures that no moisture is taken from the duplicating material during duplication. Blow model thoroughly dry, but do not use cold compressed air!	5 min. 5 min	Tap water temperature approx. 12-15°C then at 38°C	Electronically controlled water bath heater
Duplicating the master model	With the aid of a duplicating flask, a base is formed on the duplicate model, which exactly fits to the mould formers.		Duplicating material temperature 45°C, Cond. Temp 40-42°C	Duplicating materials and duplicating units and duplicating flask
Cooling the duplicating flask	Do not cool in water since this jeopardizes the accuracy of fit and hardening of the investment material (rough places on the underside of the base).	approx. 1 hour approx. 1.5 hour	Room temperature	zaskcooler

Step 2: Production of the duplicate model, hardening, and modeling

Process	Brief description	Time	Temperature	Equipment, materials, and aids required
General description of investment material	Accurately fitted castings as a result matched high expansion. A 400 g portion bag is sufficient for two models. The aluminum foil prevents moisture impairing the quality. There are therefore no storage problems and reliability is improved. (Use within a year).	Processed in about 3-4 min	Store investment dry at 20°C at room temperature	
Production of the duplicate model in Investment meant for Cast partial denture	Remove master model carefully from the duplicating material with lifting tongs. Mix investment under vacuum. Vibrate on a low intensity setting on the vibrator. Use funnel former for lower jaw. Use Investment with liquid. Optimum accuracy of fit with transversal bars as well. Dilute mixing liquid 1:1 with water. For duplicate models only.	Mechanized 1 min or manual mixing of 2 min	Water/liquid: 18-20°C	Lifting tongs for master models, Investment for chrome-cobalt metal, with liquid, vacuum mixer, vibrators, extraction unit for fine dusts
Hardening the duplicate model	Before removing from the duplicating material cut duplicating material strip off parallel to the base. If investment material is still sticking, wait until hardening is complete.	45 mm		
Drying the duplicate model	Pre-dry models until the edges turn a light brown color. The drying cabinet can be pre-heated to 250°C.	40-60 mm	250°C	Drying cabinet
Hardening the duplicate model	Due to dipping in the hardener the models become resistant and their edges firm. Close the container tightly after use.	5-10 sec. Cast Soaked in Model hardner)	(Do not heat the hood, dipping hardener, immersion basket for three duplicate models, tongs for duplicate models	Immersion hardening unit with extraction
Allowing model hardner to permeate	Allow model to drain after hardening and then dry in the drying cabinet with the unit switched off.	5-10 mm 250°C	Cabinet temperature 250°C	Drying cabinet

Nasser: Cast partial denture

Preparing model for modeling	Heat model until warm to touch to improve adhesion of the wax.	about 40°C		Model pre-heater
Modeling	Transferring the design, modeling with preformed wax plastic parts for faster work and greater reliability: wax terminal border with retentions for uppers, bar-base-set for lowers, etc.			Wax melting pot, modeling outfit, wax and plastic patterns, plastic adhesive
Casting sprues	Uppers: casting strips 2×6.5 mm. Use funnel former and give wax generously. Air vents are required for large bases. Lower: round casting sprues 2.5-3 mm in diameter. Sprue reservoirs are generally to be used for full elements, backing plates, etc.			Casting strips, wax wire on rolls for casting sprues

Step 3: Investing, preheating, and casting

Process	Brief description	Time	Temperature	Equipment, materials, and aids required
Fine investment	Coat entire model in a single operation with Fine investment immediately to obtain a smooth casting free from bubbles. Do not pre-treat with surface reducing agents.	about 3 min		Paint fine investment with paint brush
Pre-treatment for investing (without fine investment)	Coat model thinly with surface reducing agents and blow dry.			Apply Surface reducing agents and blow it dry with blow-off nozzle
Investing	Oil or grease mould former with Vaseline. This makes it much easier to remove the mould. Mix Investment with water that has been allowed to stand, using the mixer with vacuum. Vibrate on the medium intensity setting. After 10 min when the investment material has hardened press out mould and allow to set for a further 20 mm.	60 sec. total of 30 mm	Water: 18-20°C	Vacuum mixer, mould former (which matches to the duplicating flask) and vibrator
Pre-heating	Lay mould on its side in furnace, which is cold or preheated to 240°C. Always preheat crucible at the same time. Hold at 240°C constantly for a time depending on the charge in the furnace, then heat up to following temperatures: (HF and flame)	at least 15 mm.	240°C 1000-1080° C According to the Manufacturer of Investment material and the wax pattern	Electric preheating furnace with electronic control unit, 70 hour timer and interval switch and furnace extractor
Number of approx. 6.0 gram ingots required	Lower base about four ingots Partial or skeletal. Upper base about five ingots full base about six ingots			Extra hard chrome cobalt alloy
Melting and casting in HF induction casters	Moment of casting for chrome cobalt Release centrifuge is when the last ingot collapses into the melt and there is a uniform surface.			Centrifugal casting machine and casting torch Or induction casting machine and mould tongs
Melting with flame and casting	Move flame in a circle with burner positioned about 7 cm from the ingots. Moment of casting: When the ingots collapse. Melt must not be reflective. chrome cobalt as soon as the edges of the ingots become rounded.			Natural gas/oxygen or acetylene/oxygen melting units and motorized casting machines, mould tongs.

Step 4: Deflasking, blasting, finishing, polishing, and soldering

Process	Brief description	Time	Temperature	Equipment, materials, and aids required
Cooling	Allow cast mould to cool until warm to the touch. Do not quench in water!	about 30 min.	Room temperature	Flask cooler
Deflasking	While deflasking to avoid dust while	Deflasking unit,		

Nasser: Cast partial denture

	working and distortion of castings. Set casting cone against head. (manual: work carefully so as not to damage the cast).	hammer, plaster saw	
Blasting	Blast off remnants of investment material and oxide layer. The wet blaster offers completely dust-free fully automatic operation. The surface of the casting is given a slight shine by the mixture of water and blasting material rather than being roughened.	fully automatic: about 20 mm.	Wet blaster, sand blasting material, 250 micron
Cutting off casting sprues, finishing	Cut off casting sprues with high-speed grinder for speed and greater reliability. Extractor resp. mouth protection required when finishing. (Do not inhale grinding dust!)	drawer, separating and perforated discs, rough	High-speed grinder, milling unit, extraction and fine grinding stones
Electrolytic polishing	The amperage of all the electrolytic polishing units's controlled completely and automatically. Coat insides of clasps, milled shoulder of shear distribution arms etc. with varnish if necessary. (Neutralize spent Electrolytic polishing liquid by mixing 1 L with a solution of 100 g of sodium carbonate and 0.5 L of water). NB: collect liquid and dispose of as it is a harzardous waste.	with movement of object: 4 to 6 mm without movement of object: 2x4 to 6 mm.	Operating temperature: 45-55°C Electrolytic polishing units, electrolytic polishing liquid
Boiling out	Soak the master model briefly and boil out. Fit frame.		Wax boiling-out units, hot water cleaner and steam cleaner
Rubber-polishing	Rubber-polish the surfaces to be given a final polish. The insides of clasps, stippled surfaces, undersides of upper bases are not rubber-polished. Extraction unit is required when rubber-polishing.		High-speed-grinder, rubber-polisher, Extraction drawer
Polishing	Polishing with the blue chrome-cobalt polishing paste. It may be necessary to provide an alabaster polishing base for delicate upper jaw constructions.		Polishing unit, blue chrome-cobalt polishing paste, polishing brushes
Cleaning	With steam cleaning unit, in ultrasonic 3-5 mm. bath or with hot water.		Steam and hot water cleaner, steam cleaners, ultrasonic cleaner, cleaning agent
Soldering	Chrome cobalt with chrome cobalt: use chrome cobalt solder with Soldering unit - gold to chrome Cobalt: Solder with gold solder using flux.		Spot-welding unit, soldering table with object holders, parallel holder, white gold solder (soldering temp.1020°C), WG II white gold solder (soldering temp. 930°C), chrome-cobalt soldering strips, gold solder (soldering temp. 810°C), flux, microflame solder unit.

CONCLUSION

A step-by-step procedure of making a metal framework has been dealt in detail with the exact procedure, type of work done, materials and the Equipments needed

for every step has been included. This can be used as a step-by-step manual.

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