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The Fabrication of an Inlay and Crown

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RESD 1115 W Fixed Prosthodontics I

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Fixed prosthesis, what is it and do we need it? In this day and age it is almost impossible to not find yourself battling with some sort of dental complication. Often times, one of the approaches to resolving these issues is to turn to what we call a fixed prosthesis. Fixed prostheses are the replacement of missing tooth or parts of a missing tooth which the dentist attaches to the mouth and cannot be removed by the patient. There are multiple types of fixed prostheses, however only two types will be discussed in this paper, the fabrication of inlays and crowns.

Inlays are a dental restoration that fits a cavity that has been prepared and comes in multiple classes; classes I to V. Each of these classes is based on the location of the surfaces that is being restored. Class I deals with the occlusal surfaces of premolars or molars. Class II deals with restorations on the occlusal surface combined with one or both proximal surfaces. Class III involves the mesial or distal surfaces of anterior teeth, not including the incisal edge. Class IV is made for the mesial and distal surfaces of an anterior tooth plus one or both or its incisal angles. Class V is limited to the facial surface of any of the teeth. The inlay restoration that was needed for the given situation was class II.

One of the many types of dental restorations involves crowns. A crown covers more than half of the tooth’s surface and restores all or part of the clinical crown; it is an extracoronal restoration. They can be made from different types of materials such as metal, porcelain, acrylic resin and etc. (AFPAM47-103V2, 14-6)

The fabrication of an inlay and metal crown involves a series of steps; beginning with the patients visitation to the dentist. Procedure wise, the dental technicians would receive cases from the dentist which may include cases such as an inlay or crown restoration. Prior to receiving the final impression, the technician receives a preliminary impression from the dentist and pours the diagnostic casts and creates custom trays if requested. Upon retrieval of the custom tray which was made by the dental tech, the dentist makes a final impression and sends it back to the dental laboratory. The dental tech receives the case, disinfects the final impression and begins their process of fabricating the given restorations.

Firstly after the disinfection of the final impression, the dental tech fabricates master/working casts and dies using improved stone. Working casts is a cast that is used to represent the patients prepared tooth/teeth and dies are positive reproduction of the prepared portion of a tooth. After the improved stones set, the models are then needed to be trimmed to acceptable measurements. Before trimming the models, wet the models and make sure the maxillary and mandibular base surfaces are parallel to one another. Trim models according to these measurements; maxillary cast should be about 10 mm high from the bottom base to the gingival margin of the tooth, the mandibular cast should be about 15 mm high from the base to the gingival margin of the tooth. After the model is dry, use the router to trim the inside of the models.

Pindexing is done after the models are trimmed properly; the purpose is to drill holes where pins will be inserted. Models should be completely dry before carrying out this process. Use a red/blue pencil to mark the center of the occlusal surface of tooth that needs to be restored on the maxillary model, align the pindex machine light with the marked surface and drill a hole. Check each hole with the pin to see if it fits all the way into the rim. As with the mandibular cast, just drill three holes, one near the centrals and one on each side towards the molars. Pindexing can be done with two types of pins, dual pins or dowel pins. After the holes are drilled, pinning is done. Pinning is the placement of pins into the drilled holes and making sure that all the pins are parallel to each other for easy removal. Apply glue to the end of the pins and place them inside the holes. Once the glue dries, place sleeves and rubber ends over the pins.

Base mold construction is the next step following pindexing. The idea of base mold construction is to create a base for the prepared casts. Apply separating agent onto the surface of the base of the models before pouring the stone into a mold, let the separator dry completely. Prepare a mix of dental stone that will be used for the base construction. Place the cast into the mold and fill it with stone on the vibrator. While the stone is setting center the midline of the model with the midline in the mold and let the stone set for 45 to 60 min. After the models set, it is time to separate the models from the base.

Models are then separated from the base and ready for die sectioning. Only separate the maxillary model since the mandibular model will not be worked on in this step. Die sectioning is the process of cutting the dies as parallel as possible to one another. This process can be done by hand, bur or electric saw. When die sectioning, make sure not to cut the surfaces of the teeth or the pins inside the dies. Only make cuts on the maxillary model, cuts are not necessary for the mandibular model. After this is done check bite registration and then articulate.

Articulation establishes contact relationships between the occlusal surfaces of the teeth during function. In this process, the models are to be mounted onto an articulator, for crown and inlay restoration we used a simple plastic hinge nonadjustable articulator. Given the plastic articulator, assemble it onto the models and center it, apply Krazy Glue to the ends that are attached to the base model to hold it into place. Let the glue dry then prepare for the die preparation step.

Die preparation involves exposing the margins on the die that requires restoration. The die preparation process is composed of trimming and ditching. Trimming is the removal of any excess stone from the axial surface of the root portion of a die; for easy removal from the model. Ditching is a process of exposing the margins on a die for easy margin identification. Prior to trimming and ditching, obtain a red/blue color pencil to highlight the margins. Then the die may be trimmed and then ditched. Use a carbide bur to trim the dies and a round carbide bur to ditch the die. Also check for undercuts.

After the dies are trimmed and ditched, apply die hardener to cover the entire preparation. The die hardener hardens the die and helps create resistance to breaking. Now apply two layers of die spacer onto the prepared crown, this is not necessary for the inlay restoration. Apply two coats of either silver or gold and then you’re ready for the inlay and full crown waxing process.

Before waxing always remember to identify the margins and apply die separator onto the preparation to prevent wax patterns from sticking to the die. After those steps are carried out, you are ready to wax the inlay and the full crown that was requested by the dentist. There are two types of waxing techniques, negative and positive waxing. Positive waxing is done by adding small increments of wax and negative waxing is a buildup/ carving technique.

The steps following the inlay and crown waxing is spruing and investing. Spruing is done by attaching a prefabricated plastic or wax tube to the wax pattern that will aid the transfer and flow of the melting alloy during the casting process. There are two methods, indirect and direct; indirect is done by using a runner bar to sprue multiple wax patterns and direct is done by using a single reservoir sprue for single or multiple wax patterns. Obtain a casting ring and place some wax onto the ring base and seal it. In this case, the direct spruing method is uesd, sprue should be placed on a 45degree angle to the long axis of the tooth and at the thickest part of the waxed restorations. Place the wax patterns into the casting ring and make sure the wax patterns is in the cold zone and outside of the thermal zone. After spruing, investing is done. The process of investing is to create a mold for the casting process. Mix investment according to manufactures instruction. Before pouring the investment into the ring, spray the wax patterns with debubblizer to reduce surface tensions. Then pour the investment into the ring using a vibrator and fill up the ring, then place the invested ring into the pressure unit for 15-20 minutes to eliminate air bubbles.

 After the invested ring is removed from the pressure pot, gently trim the top surface of the ring. Now the burn out process is ready to be carried out. The burn out process is done to eliminate wax from the waxups along with the sprues that was in the investment ring to provide space for metal to enter. Place the investment rings into the oven and apply heat according to manufactures instructions. Following the burnout step, casting is done next; in which metal will be shot into the casting ring. Remove the ring from the casting machine and let it cool. Divesting is done after the ring cools. The purpose of divesting is to remove the restoration from the investment. After this is done, you finish and polish, disinfect and the restoration is ready to be sent back to the dentist. . (Budny, Lab notes)

References:

 Dental laboratory technology- fixed and special prosthodontics.(2005). Air Force Pamphlet 14-16, 35, Vol 2.

 Budny, R. (2012). Lab notes for RESD 115-Fixed prosthodontics I.