

Crown Removers: A Review

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Abstract:- When tooth structure has been compromised by decay, massive fillings, fractures, or root canal procedures, dental crowns may be required. All-ceramic tooth-coloured crowns have been more popular over the last several decades because to developments in ceramic material characteristics and production techniques. All-ceramic crowns may now be fixed to the tooth thanks to improvements in bonding procedures. This has led to an increase in the use of all-ceramics in dentistry. Because of the rising need for tooth-colored restorations, dental ceramics are now being used more often for both visible anterior crowns and posterior teeth fillings.

I. INTRODUCTION

A fixed dental prosthesis with a loose retainer may be removed, secondary cavities under the crown can be removed, or a tooth with irreversible pulpitis can be treated with endodontics, all of which need the removal of a permanently cemented restoration.¹

In the dynamic oral environment, fixed partial dentures (FPDs) have a short lifespan. It is possible that the FPDs may need to be removed because of functional, biological, or cosmetic issues. Prostheses cemented to abutment teeth might damage the gums, teeth, and cores of the abutment teeth if they are removed from the teeth.

Root canal therapy (RCT), porcelain fracture, and gingival recession caused by narrow crown margins may necessitate the removal of fillings in multiple or secondary teeth. Periodontal disease, loose retainers, root fractures, and too contoured restorations might all need the removal of the prosthesis from the mouth. Because different materials and methods may fail to repair these restorations, such FPDs must be removed.¹

II. CLINICAL TYPES OF FPDS FAILURES

A. BIOLOGICAL failures

Periodic recurrent caries and infection have been related to pulp damage, over-prepared teeth, and inadequate pulp protection. There are several things to keep in mind when it comes to dental abutments, including abutment failure, inadequate oral hygiene, RCT or re-treatment, and metal allergies.²

B. MECHANICAL failures

Incorrect fit of a dental restoration may be caused by expansion of the metal substructure, marginal deformities, or dental bubbles in either the occlusal or margin areas.²

C. ESTHETIC failures

Inadequate shade selection, overly contoured FPDs, and a failure to demonstrate patient expectations may all lead to these problems.²

D. CEMENTATION failures

To avoid failure, it is important to ensure that all necessary preparatory elements are in place and that the correct cement is selected and that mixing processes are followed correctly.

a) Preoperative considerations

- If the patient's records do not provide a detailed dental history, the patient may provide a more cautious version of the tale.
- Prior to complete covering, radiographic recordings of the clinical crown (length, integrity, and restorative condition)
- The location of the coronal retaining pins (Moderate dislodging forces acting on a cast restoration, relatively innocuous to a core of structurally healthy dentin. could result in dentinal crazing and cracking if applied to a pin-retained core buildup)

b) Postoperative considerations

- Type of cement
- Previous retentive problems
- Inquiry into the withdrawal peculiarities of the stone die
- The condition of the roots as shown by radiographic images (length, bony support, fractures, root fillings, and presence and integrity of posts and dowels)
- The presence of periapical lesions, which may cause the patient's pain threshold to be exceeded by the percussion technique.

III. CLASSIFICATION OF FPDS REMOVAL TECHNIQUES AND SYSTEM

- More Conservative
- Conservative
- Semiconservative
- Destructive Technique

IV. MORE CONSERVATIVE

Techniques that are more conservative: we strive to break down the luting cement layer since this is the least dangerous option for the repair. A re-cementing procedure is possible if required.

Dissolving the luting cement enables removal of the prosthesis, which may then be replaced with new cement.²

V. ULTRASONIC

- A traumatic method for removing Fixed Partial Dentures that involves the placement of specific scaler tips in the restoration margins. It depends on the use of ultrasonic energy to break down the luting cement and remove the FPDs. Applying the vibration for an extended period of time might cause ceramic cracks, and the heat generated can harm the pulp, so a liberal use of water is required.
- It can be used on its own or in conjunction with other techniques to distort the luting cement and remove intact restorations. Its downside is that it takes time. Ultrasonic vibration has been shown to have a deleterious effect on the retention of restorations.
- Ultrasonic vibration for 15 seconds at the gingival border of the crown may result in a decrease in tensile bond strength because of the breakdown of the cement layer.
- Using a vibrating scaler tip and copious amounts of water, a tiny tunnel or groove in the restoration is opened up and the cement seal is broken.
- Infected patients, those with herpes or hepatitis B, and those with pacemakers in their hearts should stay away from ultrasonic treatments.
- A frequency of 5-10 hertz is used throughout the treatment, and the ultrasonic tip is positioned such that no porcelain or casting is damaged. On porcelain-fused-to-metal restorations, it will not adhere to the porcelain veneers. Aside from these considerations, it is not suggested for patients with impaired teeth or unstable restorations to use this procedure.¹

VI. RICH WILL FPDS REMOVER

- To get rid of FPDs, people used to use Rich will resin, a thermoplastic glue.
- To remove a removable prosthesis, use a water-soluble resin tablet called Rich will resin. This resin tablet softens when placed in warm water for 1-2 minutes before being pushed into the incisal or occlusal surfaces of the device.
- Resin blocks are compressed until they are about two-thirds of their original size, then cooled by spraying water from a triple spray syringe until they are solid.
- An immediate and forceful opening of the mouth was required of the individual. Because of the cement seal, this movement would cause the crown to be dislodged.
- The procedure should be avoided if there is an unstable restoration or filling, or if a movable tooth may be detected in the opposite arches.
- Consequently, a comprehensive evaluation of the opposing tooth or restoration is necessary, or the restoration or movable tooth may be removed.
- Tie a piece of floss around the pill to avoid aspiration.

VII. TRIAL CROWN TRACTORS AND REMOVER

- They are called "gripping forceps" because they employ rubber or soft grips and powder to move the repair without damaging the ceramic border while yet maintaining a tight hold on it.
- To prevent the crown from being crushed, some tractors include turn screws on the grips that operate as an inward push.
- It is best to use a Crown Tractor or Remover to remove a prosthesis that is either temporary or has been bonded in place with temporary cement.²

VIII. LASERS

- There is no need to worry about the underlying tooth structure being damaged during the removal of any ceramic restorations using a 2780 nm wavelength YSGG (Erbium-chromium-doped yttrium, scandium, gallium and garnet) lasers.
- As Erbium in the water included in the luting agent absorbs the laser wavelengths that cannot be absorbed by porcelain structures, the laser wavelengths penetrate porcelain.
- Remove the restoration by using YSGG at 20 Hz on each side for around 1-2 minutes on each side for a few seconds at a time.

IX. CONSERVATIVE TECHNIQUES

- Conservative systems work by disintegrating the sealed luting cement and allowing the prosthesis to be removed using a percussive or traction force.
- The prosthesis is still usable and intact. It has the potential to harm the cores and periodontally affected teeth.

X. CROWN TAPPER

- Crown tapper was intended to remove temporary prosthesis, and the tip of the instrument can completely destroy the edges of the restoration with a gliding weight that is manually induced.
- Include a simple design that releases the prosthesis with short, rapid taps and a low cost. The use of this system may cause discomfort to the patient as well as periodontal ligament injury.⁶
- The hammer may accidentally slip off the axis of the abutment when the weight is activated. Tooth fractures can be caused by aggressive percussion.^{1,2}

XI. RESIN COPING

- Assume a metal-ceramic restoration is difficult to remove during or after cementite, whether temporary or permanent. In that scenario, a mechanical procurement area for a puller can be created using auto polymerizing acrylic resin. The crown extractor is placed under the resin undercut after the resin coping has completely set. A feeble tapping force is applied on the resin coping to carefully remove the crown. This technique eliminates the chances of the puller slipping during crown tapping or extraction.

XII. COPPER BAND

- A copper band is tightened around the tooth in this process. Above the level of the tooth, a nail is used to penetrate the copper band, which is then filled with cement.
- The nail is moved in a rocking motion once the cement inside the band sets, loosening the crown and eventually allowing it to be removed. In the clinical setting, this procedure has been superseded with newer methods due to technological improvements.³

XIII. CHISEL AND SLIDING HAMMER REMOVER

- An appropriate tip was used to engage the crown margin, after which a weight was slid along the shaft in a series of short, rapid taps to loosen the restoration.
- They cause discomfort to the patients and are no longer in use. It is not indicated for periodontally compromised teeth since it could damage the porcelain margins.¹

XIV. BACK-ACTION CROWN REMOVERS

- Back-action crown removers provide an impact force to the restoration and are available in manual, spring-loaded, spring-loaded semi-automatic, spring-loaded automated and pneumatic models.

XV. MANUAL BACK ACTION REMOVER

- It is comparable to the Pulpdent FPDs Remover, which uses a tip attached to a shaft to engage the margins.
- The shaft features a sliding weight that is manually activated to apply impact force. The rod may readily move away from the long axis of the crown to be removed when the load is activated.
- It may be a little distressing for the patient, as well as causing discomfort and ligament luxation. It is mostly used to remove temporarily cemented FPDs.

XVI. SPRING LOADED BACK ACTION REMOVER

- They have a spring-loaded back action that is manually compressed and released to produce the impact force.
- There are manual, semiautomatic, and automatic spring-loaded back-action instruments.
- The spring is manually compressed and released to deliver the impact force in manual instruments like the Kohler spring-loaded crown remover (Kohdent Roland Kohler) and the Kentzler-Kaschner Dental Type C crown remover (Kenzler-Kaschner Dental).
- Automatic Crown Remover (Medesy)—one-handed operation. To release successive shock impulses, the clinician presses the handle. As a result, the instrument does not need to be removed in order to be reactivated.⁶

XVII. SPRING LOADED SEMI-AUTOMATIC REMOVER

- This can be operated with ease using one hand while the other can be used to engage the device at the FPDs margin. As a result, when tapping forces are applied, they have better directional control. The exterior tube is slid over the interior tube to compress the spring. When the button is pressed, the prosthesis is removed due to back action. Every time these devices are used, they should be removed and reactivated.
- Semiautomatic instruments, like the Bontempi crown remover (BMT Medizintechnik), the Crown-A-Matic (Peerless International), or the Kentzler-Kaschner Dental Type A crown remover (Kenzler-Kaschner Dental), give the clinician more control over the direction of force as the instrument tip is secured at the crown margin with one hand while operating the system with the other. After each deployment, these instruments should be removed and reactivated.⁵

XVIII. SPRING LOADED AUTOMATIC REMOVER

- Spring Loaded Automatic Removers may be operated with one hand, and they need not be removed to reactivate.
- Shock impulses are released successively by pressing the handle. This is fitted with loops that run through the connecting area and transmit impulses to remove FPDs.
- Examples include the Dexell automatic crown remover, KentzlerKaschner Dental Type B, and Medesy Crown Clix.

XIX. PNEUMATIC CORONA FLEX FPDs REMOVER

- Automatic devices that used to remove cemented cast restorations include Pneumatic crown removers—such as the CORONAflex, the Safe Relax (Anthogyr), and the Easy Pneumatic Crown and Bridge Remover II (Dent Corp). The dental handpiece is activated to give short, repeated, low-impact forces as compressed air is released to break the cement seal, with the tip of the instrument positioned at the crown margin.⁷
- For single crowns, a pliers-type instrument is employed, and for the removal of this restoration type, a wire loop is threaded around a fixed partial denture using a metal holder.
- Manual crown and bridge removers provide long, gradual blows, whereas the CORONA flex crown remover delivers a short, sharp impact force, resulting in cement seal breakage instead of tooth fracture.
- Although automatic crown removers are expensive, they can save time and money by facilitating nontraumatic restoration removal (especially for fixed partial dentures), treatment of the underlying abutment, and prosthesis recementation.
- Various clamps and jaws have been devised for adaption to the outer surface of the crown before a back-action percussion instrument is used to remove it, in order to prevent harm to the tooth, gingival tissue, or crown margin.

XX. SEMI CONSERVATIVE TECHNIQUES

- These techniques use a small access hole made through the restorations to actively engage the FPDs and support the abutment while the lifting force is applied to the prosthesis.^{1,9}
- Their benefits include saving time, making the patient more comfortable, allowing the detachment from each other, and requiring lesser amount of force to dislodge the prosthesis.⁶
- These can also be used as provisional FPDs if necessary.

XXI. THE MTALIFT SYSTEM

- It works on the "jack-screw" principle, which involves drilling a precision hole through the occlusal surface of FPDs with a diamond bur, then undermining the area around the periphery of the hole before winding a threaded screw into the space.
- When the device is stopped from moving forward by contact with the underlying core, a thread is cut in the metal of the prosthesis. The crown is displaced from the abutment as the screw continues to rotate.
- The cement seal is broken when the instrument is turned against the dentin past the metal.
- To reduce the risk of cracks, the amount of ceramic removed from the area where the hole is drilled should be sufficient.³

XXII. THE KLINE SYSTEM

The Kline system is a stainless steel plier-like tool with a pin (which engages a hole made on the cusp tip) that is 6 mm long and 1.6 mm in diameter on one end and a flat and pointed tip on the other. The pressure created by squeezing the handle breaks the cement thickness.

XXIII. THE WAMKEY SYSTEM

- It is a simple narrowshanked cam device that uses oval shaped keys with dimensions ranging from 2.5 to 5 mm on any surface of the crown. It is available in three sizes.
- It is put into the tunnel made between the preparation's occlusal and the FPDs' fitting surface, with the cam's widest surface parallel to the occlusal surface, until it is centrally placed when rotated 90 degrees around the shank's axis.
- The force should be given in the direction of FPD insertion, which is easily removed.
- Before extending the channel across the occlusal surface, the cement layer should be evaluated in this approach.

XXIV. THE HIGA SYSTEM

- A wire is interlaced under the soldered joint that connects the crown to the pontic and pulled into a parallel loop in this system.
- The FPDs are pulled up by a cable system, while the prepared tooth is held in place by a support peg.
- The support pin is placed into the hole on the occlusal surface, and when the cable is tightened, equal pressure is

delivered to the prosthesis in an upward direction, forcing it to lift up while the pin supports the abutment.

XXV. BUCCO-LINGUAL 'DIMPLE' TECHNIQUE

- The amount of harmful intraoral grinding of porcelain and metal that is required to remove cemented FPDs may be reduced with this technique in certain clinical settings
- With a tiny spherical bur in the gingival third, dimples are produced on the buccal and lingual surfaces of the prosthesis.
- To accommodate a variety of intraoral uses, they come in straight and contra-angled versions.
- Over-tapered prepared teeth and short clinical abutments exhibit the greatest outcomes, but its usage is not recommended for patients with impaired dentition, an unsatisfactory crown-to-root ratio, or teeth that are too mobile.
- It is possible to remove FPDs that have been temporarily glued or retentive using the GC pliers (GC America, Alsip, Illinois).
- Rubber points on the beak ends of the tool allow it to grip the restoration without harming the finely polished topography. As an extra layer of friction and protection against scratches, emery powder is placed to the rubber tips.⁹

XXVI. DESTRUCTIVE TECHNIQUE (CROWN SPLITTERS AND SPREADERS)

- The prosthesis are normally sectioned with a diamond bur in this technique, resulting in non-reusable or damaged prosthesis.
- When an underlying mobile or root canal treated teeth is present, teeth cemented with resin cement, aesthetic and periodontal failures, it is indicated to remove failed FPDs while preserving the adjacent tooth structures.
- Crosscut tungsten carbide burs are used to section base metals, while course diamond burs are used to section high-noble alloys.
- A wide variety of course carbide burs, as well as special Talon burs (metal and crown cutters), have blades on the top that allow them to cut both vertically and horizontally.⁹

XXVII. CONCLUSION

When removing cemented prostheses, various factors should be taken into account; type of cement used, condition of the abutments lying beneath and associated tissues, the condition of the prosthesis during and after their removal.

The removal of temporary prosthesis is usually simple, while the removal of permanent one has always been unpleasant, anxious, risky task for dentist and patient. Its removal should be prevented to avoid harming the underlying tooth or/ supporting structures and allow to reuse the prosthesis. It is difficult to suggest a universal system for FPDs removal. Selection of an ideal system depends on the clinical condition. Ultrasound, Richwill adhesive resin and crowns tractors are the instruments of choices in removal of temporary cemented restoration, resulted in breaking the luting cement and enabling it to be re-cemented. Manual

back, spring loaded back, automatic loads systems may cause fracture of the cores and extraction of periodontally involved teeth.

The Mtlift, Kline and Wamky Systems are the choices for unfavorable path of insertion, resin cemented FPD prosthesis. Destructive techniques are used for periodontally involved and grossly decayed teeth to prevent damage to the abutment and supporting tissue, irrespective of the used luting cement. The modified techniques have also been discussed in this article for multi unites joined.

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