



Canal Projection: Restoring the Past, Building the Future

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Abstract

Mutilated teeth that require root canal treatment may present with minimal coronal tooth structure and are a challenge for isolation and restoration. If the functional integrity of the tooth is not maintained it leads to a guarded prognosis. This article demonstrates the concept of canal projection which 'projects' the canal orifices from the chamber floor to the cavosurface providing better visibility and access, and also ensures optimum isolation and reinforcement of the tooth structure whilst preventing canal blockage.

Introduction

Endodontic failure has been associated with coronal leakage within the canal system following obturation. The literature suggests that coronal leakage is far more likely a determinant of clinical success or failure than apical leakage [1]. Studies confirm that a sound coronal seal is of paramount importance to the overall success of root canal treatment [2,3]. Regardless of the obturation method the best rule is: a properly cleaned, shaped, and obturated tooth should be permanently restored as soon as possible [4].

Isolation is a necessity for a good prognosis of endodontically treated cases and rubber dam placement serves as one of the best isolation techniques. Rubber dam has been known to serve various advantages such as protection of patient against aspiration of instrument, prevents laceration of soft tissue from rotary or hand instrument, improves accessibility and visibility, retraction of soft tissue to some extent, and also precludes cross infection [5]. However, a badly mutilated tooth poses various difficulties in the placement of a rubber dam clamp and thus preventing proper isolation, also, a forceful clamp placement on an already weakened tooth may lead to a structural breakdown and hamper further treatment.

A bonded core placed prior to disinfection and obturation of the canal system of the tooth can greatly diminish the leakage potential both during and after endodontic therapy. Pre-endodontic build-up of the coronal tooth structure following caries removal and identification of the canal orifices can facilitate the endodontic process by providing a strong core and coronal seal [6]. It is a great challenge to an endodontist to maintain root canal patency while isolating grossly destructed tooth with open pulp chamber, without blocking the root canals with restorative material. This can be effectively achieved by canal projectors suggested by Glickmann and Pileggi [7] in which tapered plastic sleeve is used to maintain the canal patency.

Due to limited worldwide availability of the original canal projection system, alternatives, such as hypodermic needles [8] as sleeves, greater taper gutta-percha [9] have been tried successfully.

Technique

Tooth to be treated is isolated using rubber dam. In case the condition of the tooth poses a risk of fracture during clamp placement, split dam technique is advisable. Complete caries excavation is done and all canal orifices are identified and explored with a stainless steel hand file. Canals should be taken to a size 20 (minimum) and the orifice enlarged with Gates Glidden drill in a slow speed handpick. The widening of the orifice will facilitate placement of the canal projector/hypodermic needles/greater taper gutta-percha and prevent flow of adhesive into the canal causing possible blockage. Etchant gel is applied to the exposed dentin and enamel. Rinsing and drying is accomplished after 30 s. A canal projector/hypodermic needles is placed onto a hand file that fits each canal and slide up the file so that 5 mm to 8 mm of file protrudes beyond the tip (Figure 1). While using greater tapered gutta-percha, a suitable size is selected and placed into the orifices such that each gutta-percha point extends at least 4 mm into the root canal. The hand file is then reintroduced into the canal and using cotton pliers the projector/needle is pushed down the file till it fits snugly into the orifice. A dentin adhesive is then applied deep into the coronal portion,

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Figure 1: Grossly decayed tooth.

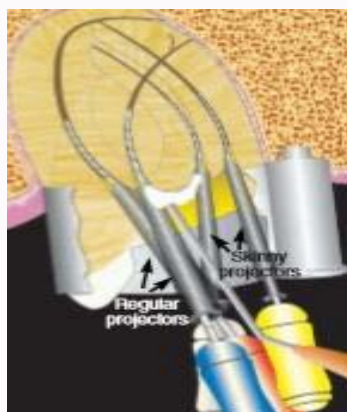


Figure 2: Projectors placed in canals.

flooding the pulp floor and cured for 30 s. The buildup is then done using composite resin. Matrix bands may be placed as per the requirement. The hand files are turned counterclockwise to disengage them from the projector/needle and are withdrawn from the canal, leaving the projector/needle in the tooth. The projector/needle is left in each canal so that debris during coronal adjustment of the height does not enter the orifice and lead to canal blockage. Any matrix that had been placed is removed at this time and using a coarse wide diamond in a high-speed handpiece, the occlusal height is reduced. A hand file larger than the one originally placed in the projector/needle is threaded clockwise into each projector/needle and a gentle tug removes the projector/needle from the tooth. Following final curing, the gutta-percha projectors can be removed by slight watch wind motion. If there is any difficulty in removal of gutta-percha projector, a heated H file or a gutta-percha solvent may be used effectively to remove it. The result is a solid coronal structure with straight line access into each canal with maximum structural reinforcement.

Comparing various techniques

The PEIGS canal projectors are easy to adapt, and are reusable but not easily available. Hypodermic needles provide a cheaper version of the projectors and are easily available but the parallel needles do not perfectly adapt to the conical roots thus, we require custom made needles to attain perfection in the technique. Greater taper gutta-percha may be an economical option and are readily available in the clinics and they do not bond to the coronals placed resin to form a monoblock [10], but there may be a possibility of getting mechanically retained to the resin material thus, creating difficulties during removal (Figure 2).



Figure 3: Complete pre endodontic build up using canal projectors.

Advantages

There are numerous advantages of this technique:

Isolation: The current techniques employed to manage severely broken down teeth include the use of special clamps with specific designs, example, S-G (Silker Glickman) clamp, surgical exposure of the cervical tooth structure to facilitate clamp placement, use of orthodontic bands, preformed copper bands. However, none of these techniques could satisfactorily compensate for the lost tooth structure. Canal projection replaces the lost tooth structure and renders a good isolation for the tooth.

Elongation of canals: The canal projection process elongates the “hydraulic chamber” of each canal from the access cavity floor to the occlusal surface, offering advantages during the hydraulic condensation of obturation materials.

Perforation repair: Early repair of perforation defects can have a significant effect on success of perforation treatment. As such, performing perforation repair before completion of endodontic therapy is often preferable. After confirmation that the MTA has set, canal projection offers a means of fortifying the repair by overlaying it with a bonded resin or glass ionomer before proceeding with endodontic therapy [11].

Irregular floors and walls: Misdirected access cavities, divots in walls, misdirected post preparations and ledges, and so on can be “corrected” by essentially reconstructing the walls and floor around “internal matrix barriers” via canal projection.

Cracks: On posterior teeth in particular, the period between initiation of endodontic therapy and placement of a restoration that provides cuspal protection can introduce the risk of coronal-radicular fracture, also, in case of anterior teeth especially with deeply extending class 5, class 3 lesion the longer the time period, the greater the risk. Bonded coronal buildup has been shown to reduce this risk [12,13].

Overgrowth: When coronal or radicular defects extend to axial walls at or beyond the gingival level, tissue in growth leads to contamination during endodontic therapy and subsequent restorative procedures. Pre-endodontic buildup, as with canal projection, eliminates this complexity.

Blind exploration: Once all canals have been located, straight-line access created, and the canals projected to the occlusal surface of the buildup, the resultant projected orifices will lie clearly visible on the surface of the projection buildup, no longer obscured by prominent marginal ridges and other visual obstructions.

Irrigation hazard: The built chamber acts as a reservoir for

irrigants during instrumentation within the canals and also prevents any hazards caused by the leakage of irrigants.

Individualization of canals: In multicanal teeth, as the projectors pass through the buildup material to the occlusal surface, they can be oriented such that they are slightly separated from each other before the buildup material polymerizes. This can simplify management of canals that lie in close proximity to each other on the chamber floor [14].

Esthetics: In case of grossly decayed anterior teeth, after the complete excavation of caries, the tooth becomes esthetically unpleasant. A coronal build up on the same day not only repairs the appearance but also encourages the patient psychologically for the following appointments (Figure 3).

Limitations

All the techniques mentioned above can definitely work well with the canals with regular cross sections but in case of variation like, c-shaped canals, taurodontism, it is not applicable. Thus we need further studies and researches for dealing with such anomalies.

Conclusion

Endodontic success is a multifactorial issue. Like a jigsaw puzzle, the full picture can only be seen when all the pieces are fit together. How the canals are instrumented is as important as what is used to obturate the canal system. The literature suggests that the prognosis of root canal-treated teeth can be improved by sealing the canal and minimizing the leakage of oral fluids and bacteria into the peri radicular areas as soon as possible after the completion of root canal therapy.

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