Endodontic Buildups - A Case Series

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Abstract: Disinfection of the root canal space is one of the main principles of endodontic therapy. Very often the teeth that need root canal therapy are also those that have lost a substantial amount of tooth structure. Hence, placement of rubber dam for isolation becomes difficult if not impossible. Improper isolation is one of the important reasons for a compromised root canal therapy. Having an access cavity that is four walled goes a long way in helping the goals to succeed. This case series gives an over view of the commonly used techniques for pre-endodontic tooth build up to enhance the isolation during endodontic treatment.

Keywords: Composite resin, gutta percha, isolation, root canal treatment, rubber dam, silver amalgam.

1. INTRODUCTION

The aim of endodontic therapy is to clean and shape the root canal in order to obtain a three dimensional sealing of the endodontic space devoid of bacteria. It has been shown that, coronal leakage is far more likely a determinant of clinical endodontic success or failure than the apical leakage [1]. Hence, if the coronal portion of the tooth is not sealed, over a period of time, endodontic failure is inevitable.

Currently, rubber dam is the “Standard of Care” for isolation during endodontic treatment [2]. At times, teeth undergoing root canal therapy will have substantial loss of tooth structure and does not lend itself for the application of rubber dam. Hence, these teeth require pretreatment before the root canal therapy. The Pre-treatment triad consists of (a) removal of carious tooth structure, (b) removal of old defective restorations and (c) restoring contour of the tooth [3].

Performing a pre-endodontic build-up in a badly broken down tooth has various advantages. (A) Serves to prevent bacterial contamination from the carious tissues, saliva, blood and sulcular fluid. (B) Helps in stabilizing and easy positioning of the rubber dam thus, providing a clearer working field. (C) Forms a reservoir for holding the irrigating solutions during cleaning and shaping procedures. (D) Allows the intracanal medicaments to function to their optimum best by preventing its leakage into the oral cavity and ensuring that the root canal space remains in a medicated state in between appointments. (E) Re-establishes a steady contour, protects and stabilizes the tooth during the treatment and between appointments. Thus, helps in eliminating postoperative discomfort to the patient. (F) Prevents the growth of gingival overhangs into the access in between the appointments in subgingival cases, thereby reducing the need for periodontal therapy before the crown prep process. (G) It can be left in place as a permanent restoration and only the access needs to be filled with a material of choice.

Conservative restorative treatment can be done alone or in combination with periodontal, prosthetic or orthodontic treatments for reconstructing the tooth [4]. Various materials used for the reconstruction of badly mutilated teeth are, flowable composite, packable composite, self-cure or light-cure glass-ionomer cement and silver amalgam [5]. This case series gives an over view of the commonly used techniques for providing a provisional restoration for a badly mutilated teeth to enhance the isolation during endodontic treatment.

2. CASE REPORT 1 – CANAL PROJECTION TECHNIQUE

A 23year-old female patient reported to the Department of Conservative Dentistry and Endodontics, with a chief complain of discolored front teeth. Patient presented with a history of a restoration done two years back. The medical history was non-contributory. On clinical examination, caries was detected with a dislodged composite restoration with respect to right and left maxillary central incisors. Pulp sensibility testing was done using electric pulp tester (Parkell Electronics Division, Farmingdale, NY) in relation to both the maxillary central incisors and was found to be negative. Intra oral periapical radiograph revealed deep proximal caries extending to the incisal edges and involving the pulp. The tooth was non tender to percussion and the surrounding periodontium was

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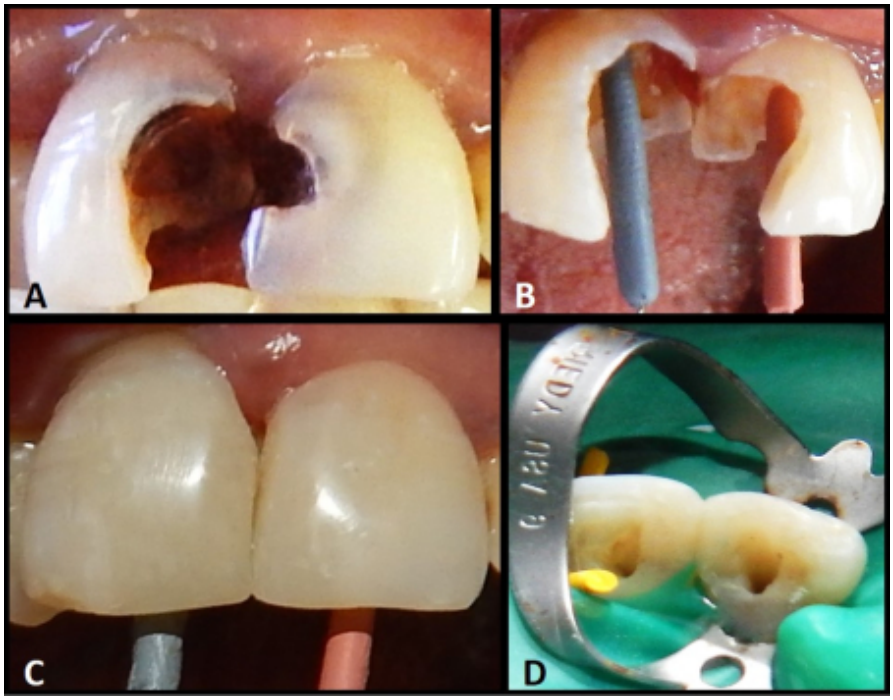

Figure 1: (**A**) Badly broken down maxillary right and left central incisors; (**B**) Caries excavated and access sealed with gutta percha point; (**C**) Pre-endodontic build up with composite resin; (**D**) Root canal treatment initiated after application of rubber dam.

normal, and oral hygiene was well maintained. A treatment plan of root canal therapy followed by post endodontic restoration was planned with respect to the right and left maxillary central incisors. Informed consent was obtained from the patient, following which the caries was removed, the canal orifice was located and enlarged using Protaper SX (Dentsply Maillefer, Ballaigues, Switzerland) file. A larger taper gutta percha cone, 30/06 (Dentsply Maillefer, Ballaigues, Switzerland) was coated with vaseline and then used to keep the canal orifice patent by inserting it 4mm into the canal. A heated plugger was used to adapt the cone to the orifice to prevent the flow of restorative material into the canal. The tooth was etched with 37% phosphoric acid (Eco Etch, Ivoclar Vivadent, Liechtenstein) for 15 seconds and washed with water. Bonding agent (Adper single Bond 2, 3M ESPE, St. Paul, Minnesota, US) was then applied as per the manufacturer's instructions and light cured for 20 seconds using LED light curing unit (Shengua Industry Co. Ltd., China). A mylar strip (Premier, US) was then adapted around the tooth to form the wall against which the restoration was carried out. Flowable composite (Flitek Z350XT flowable, 3M ESPE, St. Paul, Minnesota, US) was used to build up the core in incremental technique initially, followed by hybrid composite (Flitek Z250XT nano hybrid, 3M ESPE, St. Paul, Minnesota, US) to form the bulk of the restoration (Figure **3**). Once the core buildup was completed, the gutta percha was removed from the canal and the endodontic treatment was carried out under rubber dam isolation [6, 7] (Figure **1**). Similarly, buildup of the right maxillary second premolar was performed in the same patient (Figure **2**).

3. CASE REPORT 2 - COMPOSITE COLLAR OR MODIFIED DOUGHNUT TECHNIQUE

A 35 year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a complaint of food lodgment and pain in his left lower back tooth. He gave a history of pain which stated spontaneously and aggravated at night on lying down since one day. His medical history was non-contributory. On clinical examination, there was caries involving the mesial aspect of the left mandibular first molar. Pulp sensibility testing was done using electric pulp tester (Parkell Electronics Division, Farmingdale, NY) on his left mandibular first molar which gave a hyper response. Intra oral periapical radiograph showed caries involving the mesial pulp horn. The tooth was non tender to percussion and the oral hygiene was well maintained. A treatment plan of root canal therapy followed by post endodontic restoration was planned with respect to left mandibular first molar. Informed consent was obtained from the patient, following which the caries was excavated, and the pulp chamber was exposed. Pulp tissue was excavated and then the pulp chamber was blocked with a softened

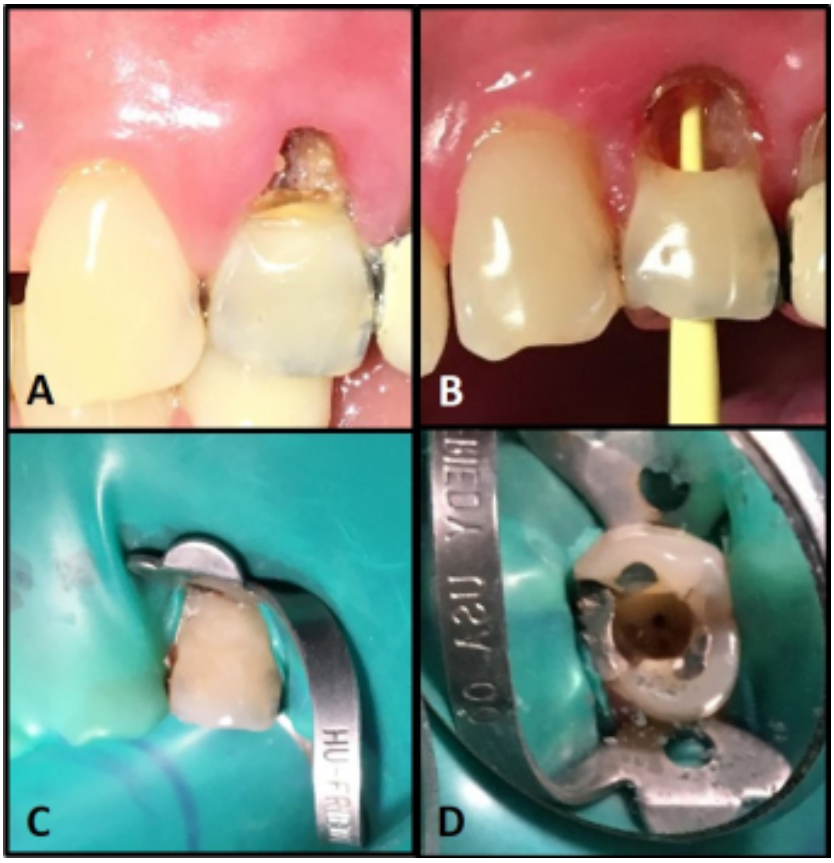

Figure 2: (**A**) Badly broken down maxillary left first premolar, (**B**) Caries excavated and gutta percha point placed in the root canal to maintain the patency, (**C**) Pre-endodontic composite build up, (**D**) Root canal treatment initiated under rubber dam isolation.

gutta percha point (Dentsply, US), to prevent the composite resin from flowing into the chamber. A gingival retraction cord (Ultrapak, Ultradent Products, Inc., US) was placed around the tooth to provide hemostasis and better visualization of the tooth margins. Single-step self-etching adhesive (Adper Easy Bond Self-Etch Adhesive, 3M ESPE, St. Paul, Minnesota, US) was applied on to the tooth margins and flowable light-cured composite (Flitek Z350XT flowable, 3M ESPE, St. Paul, Minnesota, US) material was used in incremental technique for the free hand tooth buildup. The tooth build up was then contoured using a doughnut-shaped (Horico Dental, Berlin, Germany) and needle-shaped diamond bur (Horico Dental, Berlin, Germany) following which the rubber dam application was done (Figure **6**). Gutta percha point was then removed from the pulp chamber using a heated instrument and the root canal treatment was completed [8] (Figure **3**).

4. CASE REPORT 3 – DOUGHNUT TECHNIQUE

A 42 year-old female patient reported to the Department of Conservative Dentistry and Endodontics with a complaint of broken left upper front tooth. On clinical examination, a fractured maxillary first premolar was present. Intraoral periapical radiograph showed the presence of a periradicular radiolucency indicative of a periapical abscess. Pulp sensibility testing was done using electric pulp tester (Parkell Electronics Division, Farmingdale, NY) which gave a negative response. The medical history of the patient was non-contributory. The patient was motivated to save the tooth and the treatment plan of root canal treatment and postendodontic restoration of fibre post and full crown was formulated. Informed consent was obtained from the patient, after which, caries was excavated and the exposed pulp chamber was blocked using a cotton pellet. A retraction cord (Ultrapak, Ultradent Products, Inc., US) soaked with 15.5% ferric sulphate (Astringedent, Ultradent Products, Inc., US) was placed in the sulcus to retract the soft tissues for better visualization and enable the bonding procedures. Then the tooth margins were etched using 37% phosphoric acid etching gel and single-step adhesive agent (Adper Easy Bond 2, 3M ESPE, St. Paul, Minnesota, US) was applied and light cured for 20 seconds. Flowable light-cured composite (Flitek Z350XT flowable, 3M ESPE, St. Paul, Minnesota, US) material was then used in

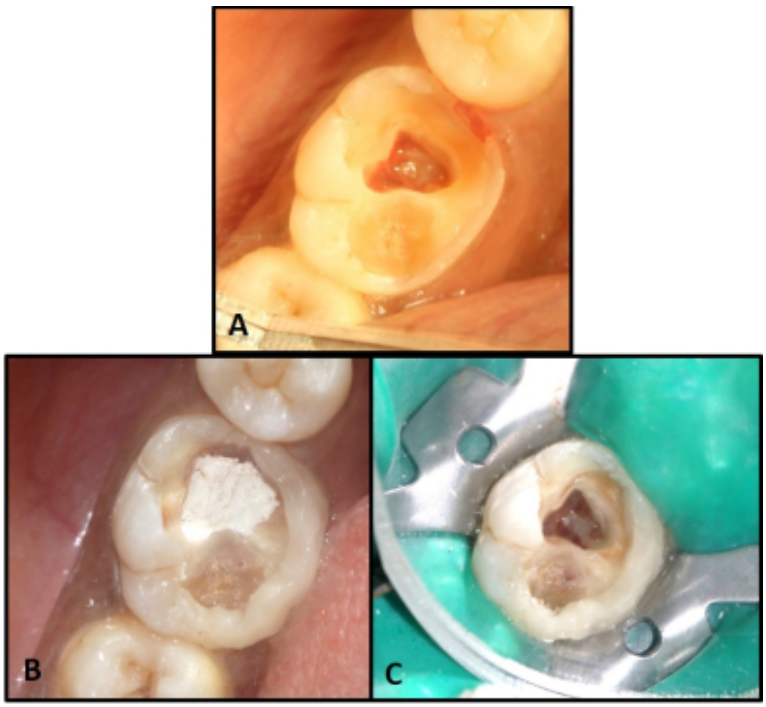

Figure 3: (**A**) Badly broken down mandibular left first molar after caries excavation; (**B**) Free hand pre-endodontic composite buildup; (**C**) Access cavity re-entered after application of rubber dam.

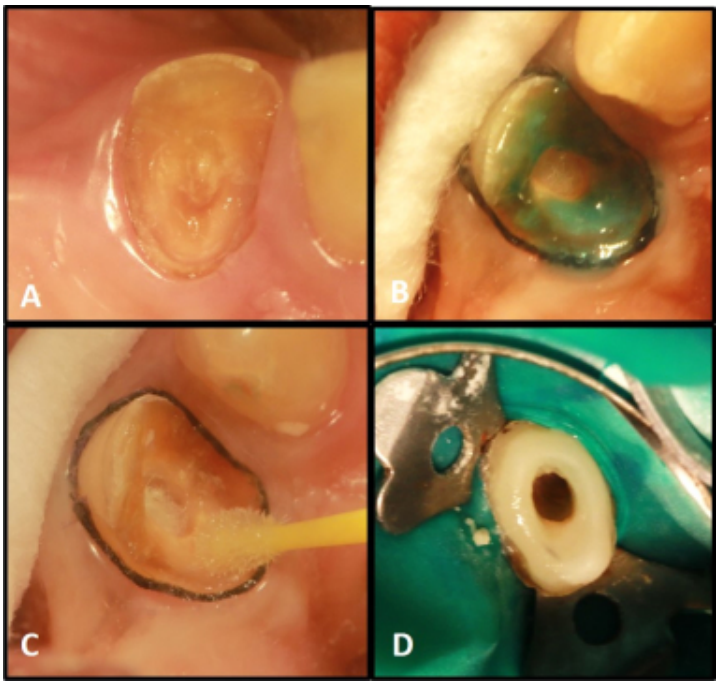

Figure 4: (**A**) Badly broken down maxillary left first premolar; (**B**) Caries excavated, pulp chamber blocked with cotton pellet, retraction cord placed and etchtant gel applied; (**C**) Single step adhesive applied; (**D**) Pre-endodontic build up with flow able composite under rubber dam isolation.

incremental technique for the free hand tooth buildup. After building the walls, they were finished using a diamond point (Horico Dental, Berlin, Germany) and polishers (Horico Dental, Berlin, Germany). The final endodontic cavity was made and the endodontic treatment was initiated (Figure **4**).

5. CASE REPORT 4 – MATRIX BAND ASSISTED TECHNIQUE

A 19 year-old male patient report to the Department of Conservative Dentistry and Endodontics with a complaint of broken lower right back tooth. On clinical examination, a grossly decayed right mandibular first

molar was present. On pulp sensibility testing with an electric pulp tester (Parkell Electronics Division, Farmingdale, NY), it showed a negative response. Intra oral periapical radiograph showed deep caries involving the pulp along with periapical changes. The tooth was non tender to percussion. The medical history of the patient was non-contributory. A treatment plan of root canal therapy was planned with respect to the right mandibular first molar. Informed consent was obtained from the patient, following which the caries was excavated. After complete caries excavation, only one intact wall of the tooth was remaining with an exposed pulp chamber. Application of rubber dam was not possible, as the amount of tooth structure remaining was compromised. Hence, as a provisional restoration of the walls, an orthodontic band (3M ESPE, St. Paul, Minnesota, US) was contoured, adapted, soldered and cemented around the tooth using zinc polycarboxylate cement (Dentsply Maillefer, Ballaigues, Switzerland). The pulp chamber and canal orifices were blocked with a cotton pellet and Cavit (Cavit W, 3M ESPE, St. Paul, Minnesota, US) was placed above to prevent the flow of bonding agent and composite resin into the pulp chamber and orifices. Single-step self-etching adhesive (Adper Easy Bond Self-Etch Adhesive, 3M ESPE, St. Paul, Minnesota, US) was applied on the area to be restored, and packable composite (Flitek Z250XT nano hybrid, 3M ESPE, St. Paul, Minnesota, US) was adapted in incremental technique and cured (Figure **5**). On completing of the restoration, rubber dam was applied and root canal treatment was performed.

6. CASE REPORT 5- AMALGAM BUILD-UP

A 25 year-old female patient reported to the Department of Conservative Dentistry and Endodontics with a complaint of pain in her lower left back tooth. She gave a history of dull continuous pain since two days. On clinical examination, caries on the distal aspect of left mandibular second molar was seen. Pulp sensibility testing on left mandibular second molar with electric pulp tester (Parkell Electronics Division, Farmingdale, NY) gave a delayed response. Intra oral radiograph showed a radiolucency involving the distal pulp horn. The tooth was non tender to percussion and her medical history was non-contributory. Informed consent was obtained from the patient, following which the caries was excavated, access cavity preparation was performed using Endo-Access bur (Dentsply Maillefer, Ballaigues, Switzerland), pulp chamber was exposed and the pulp tissue was extirpated using barbed broach (Dentsply Maillefer, Ballaigues, Switzerland). Bleeding from the pulp chamber was controlled and tofflemeire matrix retainer (Dentsply

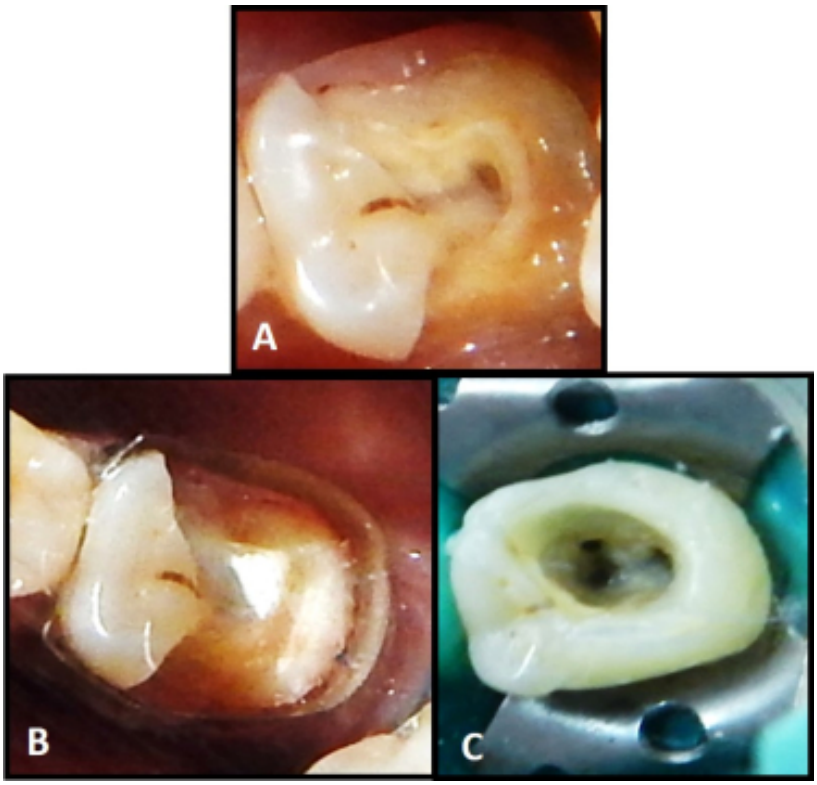

Figure 5: (**A**) Caries excavated and pulp chamber exposed; (**B**) Orthodontic band adapted around badly broken down tooth with pulp chamber blocked with Cavit; (**C**) Pre-endodontic build up completed using composite resin under rubber dam isolation.

Maillefer, Ballaigues, Switzerland) was placed around the tooth. The canal orifices were blocked using softened gutta percha point and a heated plugger was used to adapt it to the walls. Amalgam (Dental Products of India, Mumbai, India) was then condensed into the pulp chamber. Once the amalgam core had set, rubber dam was placed, the access cavity was reopened, the gutta percha was removed and the root canal therapy was completed [9] (Figure **6**).

7. DISCUSSION

One of the fundamental biological principles of root canal therapy is to control the infection from the endodontic space during the entire treatment. This can be achieved by removal of all the caries and faulty restorations, restoration of the walls of the pulp cavity and application of rubber dam.

During the course of multi-visit endodontic treatment, a proper endodontic temporization become mandatory, so as to seal the pulp-canal system adequately. By having a good seal of the access cavity, we can prevent the ingress of oral fluids and subsequent contamination of the root canal system and also prevent leakage of intracanal medicaments into the oral cavity [10].

In the canal projection technique presented in this manuscript, greater tapered gutta-percha points were used instead of the conventional Projector Endodontic Instrument Guidance System (PEIGS) because, gutta percha is easily available, economical, and yet an equally effective alternative without any extra learning curve [11]. This gives an esthetic result while at the same time providing individualized access to the canals. Composite collar/modified doughnut or doughnut technique are stable and rapid techniques in which the build-up of the lost cusps or proximal areas are carried out by free hand build up using packable or flowable composites in order to form the walls of the access cavity. The matrix band assisted technique, in which orthodontic band was used, can be helpful in restoring inaccessible teeth. This band can either be removed or kept in place until the root canal therapy is completed to help in preservation and reinforcement of the remaining tooth structure. However, it can't be retained in esthetic areas and also can cause harm to the soft tissues if retained for long time. While using this technique, either composite resin or amalgam can be used for the restoration of the missing toot structure.

The amalgam build technique up is a non-sensitive method and has high strength. However, once the amalgam has completely set, reentering of the access cavity is required. Hence, root canal therapy cannot be

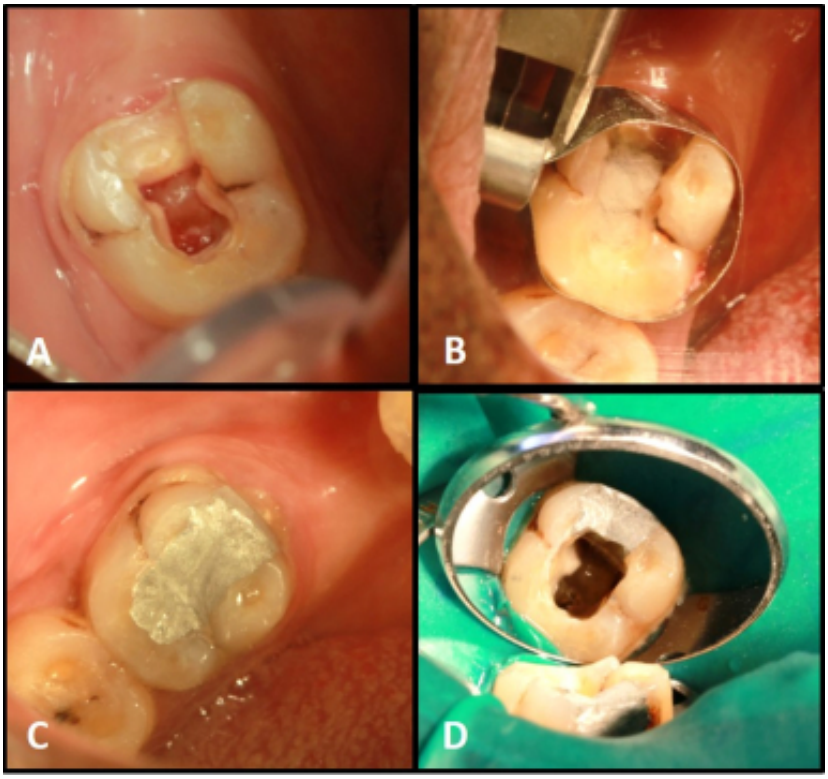

Figure 6: (**A**) Badly broken down mandibular second molar; (**B**) Pulp tissue extripated form pulp chamber and blocked with gutta percha; (**C**) Amalgam build up done; (**D**) Access cavity re-entered.

initiated immediately after the build up and an additional appointment is required.

In endodontic treatment, multiple variables can affect the outcome of a case. The aim of restorative techniques of endodontic pretreatment is to restore the previously mutilated dental anatomy, to a state that makes endodontic therapy easier and gives better post-endodontic coronal seal. In general, an optimal pre-endodontic build up technique is based on the ease and economy of time and work with which a procedure is completed. However, when pre-endodontic build up is indicated, it should not be seen as a laborious task by the clinicians, but rather an effort to ensure success and avoid discomfort for the patient.

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