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## Minimal intervention caries management: A case report

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### Abstract

Over the course of years, there has been a paradigm shift from the conventional GV Black concept of Extension for prevention to prevention of extension. Prime importance is now being given for the conservation of the tooth structure and pulpal vitality with modified concepts of caries excavation based on consistency of the dentin. This case report highlights modern time selective removal of carious dentin and its subsequent composite restoration.

**Keywords:** Deep caries, selective caries removal, minimal intervention

### Introduction

In the era of modern dentistry there has been a drastic change in the field of restorative dentistry and priority has been given to minimal intervention that has revolutionized the protocol of caries management along with the advancement in diagnostic aids and restorative material minimal removal of caries is possible to preserve the vitality of the tooth.

Conventional method of caries management involves removing all the infected caries to prevent the progress of caries as it was considered as an infectious disease, but in the current scenario only partial removal of caries with the preservation of affected dentin or Ultraconservative removal of caries is preferred to preserve the pulp vitality<sup>[1]</sup>. According to ESE (European Society of endodontology) deep caries is defined as - Caries reaching the inner quarter of dentine, but with a zone of hard or firm dentine between the caries and the pulp, which is radiographically detectable when located on an interproximal or occlusal surface. There is a risk of pulp exposure during operative treatment<sup>[2]</sup>.

Deep caries management is a challenging task on a day-to-day basis in dental practice due to the impending risk of pulpal exposure during caries excavation which ultimately leads to endodontic treatment, but with a change in the understanding of caries and its management, newer approaches that involves "Selective removal" and "Stepwise removal" of caries removal has been introduced.

### Caries removal strategies

Various methods have been employed for caries management with the primary objective to stop the progression of caries and maintain pulp vitality.

#### A) Complete caries removal.

Also known as "Non selective excavation of caries" which includes total excavation of carious tissue that is contaminated with micro-organisms and the demineralized tissue driving to higher chances of pulpal exposure. With high risk of inadvertent pulpal exposure, the treatment alternative are pulpotomy and direct pulp capping<sup>[3, 4]</sup>.

**Direct pulp capping:** - It is defined as dressing up of an exposed pulp with the objective of maintaining pulp vitality. Historically, it involves the placement of a medicament or material against a direct pulpal exposure<sup>[5, 6]</sup>. Direct pulp capping are of two types class I -traumatic injury or an iatrogenic exposure and class II -deep carious lesion<sup>2</sup>. Its outcome mainly depends upon the clinical techniques and the specialized capabilities of the dental clinician and most

critically, the absence of microorganisms and their byproducts which aids in healing and improves the repairing of the pulp dentin complex. The prognosis is also influenced by additional factors such as bacterial contamination [7, 8] the size of exposure [9, 10] the control of bleeding [11, 12] and the choice of suitable pulp capping material.

Excavation of a part of coronal portion of the exposed pulp tissue may also be ideal in carious exposures to help physical evacuation of the biofilm and superficial inflamed pulp tissue that will moreover comprise microorganisms which is known as Pulpotomy [13].

### B. Selective removal of caries

It is the most preferred method of caries removal which is of two types

**Selective removal to firm dentine** it is the most common preferred line of treatment in shallow to deep caries management, where the caries is extended 1/3 to 1/4 of the dentine and caries excavation is done till there is a resistance to hand excavator leaving behind the leathery dentine. While the peripheral dentin (cavity margins) are left hard (scratchy) after removal [14].

**Selective removal to soft dentin** is recommended in deep cavitated lesions where caries is extending 1/3 to 1/4 dentin and with the risk of pulp exposure. Soft carious tissue is left over the pulp to keep away from exposure and "stress" to the pulp, thereby promoting pulpal health, at the same time peripheral tooth and dentine are prepared to hard dentine, to achieve a fluid tight seal and placement of a long-lasting restoration. Selective removal to soft dentine reduces the chance of pulpal exposure considerably as compared with nonselective removal to hard or selective removal to firm dentin [14].

**C. Stepwise caries removal** Is advocated in tooth with reversible pulpitis, provided radiographic evaluation suggests caries has advanced no deeper than the pulpal quarter with a zone of dentine isolating the carious lesion from the pulp chamber.

It is two step caries excavation method where in first step is that soft carious tissue is left over the pulp while peripheral dentine is prepared to hard dentine to allow tertiary dentine formation here there is remineralization of demineralized dentin and even there is reduction of viable bacteria temporary restoration is placed for 6-12 month and patient is recalled.

In second step there is Selective removal to soft dentine. Since the second step entails more risks of pulpal exposure than Selective removal to soft dentin there by increasing treatment costs, and burdens the patient thus, there is growing controversy on whether Stepwise removal should be used [14].

### Case report- 1

A 32 year old female patient reported to the Department of Conservative dentistry and Endodontics with a chief complaint of pain on eating on the lower right back tooth region since 15 days. On clinical examination, a class II caries lesion was seen on 46. Pulp sensibility test showed similar response to adjacent and contralateral tooth. On radiographic examination, a disto-occlusal radiolucency was seen extending upto the inner dentinal 1/4th with close proximity

to the pulp. A diagnosis of reversible pulpitis was made and a treatment plan of partial caries excavation and composite restoration was made.

Following oral prophylaxis, local anesthesia was given and rubber dam isolation was done. Caries was excavated using a slow speed bur, leaving a layer of leathery-to-soft dentin on the pulpal surface and a layer of hard dentin on the proximal walls. Cavity involvement was confirmed radiographically. A layer of RMGIC was applied on the pulpal surface as an indirect pulp capping agent along with its minimal, yet beneficial fluoride release. Acid etching and bonding agent application was done and the final restoration was completed by composite restoration and finishing and polishing was done.



Fig 1: Pre-operative radiograph



Fig 2: Pre-operative



Fig 3: Rubber Dam isolation

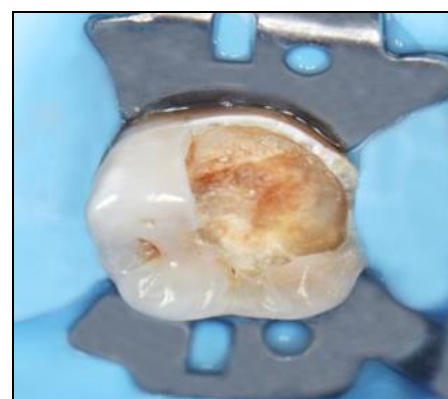
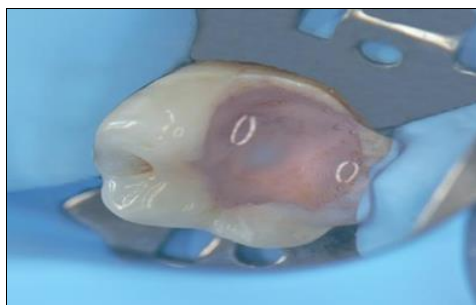


Fig 4: Caries Excavation



**Fig 5:** RMGIC application



**Fig 6:** Etchant application



**Fig 7:** Post-operative radiograph



**Fig 8:** Post composite restoration



**Fig 9:** Post-operative radiograph

**Ways to recover and overcome challenges**

Deep carious lesions can be difficult to restore in clinical practice, because this can easily lead to pulp exposure and subsequent endodontic treatment. According to reports, teeth

treated with endodontics are more prone to fractures. Due to the weakening of tooth structure.

A restoration will be beneficial in preventing the carious lesion from progressing, in addition to facilitating plaque control, will also restore the chewing function, mechanical strength, and anatomy of teeth, thereby preventing unwanted tooth movement, and they can improve the aesthetics. Finally, a restoration will shield the pulp, especially in deep cavities where the pulp has not yet been affected and has ability to deposit tertiary or reparative dentin [15, 16].

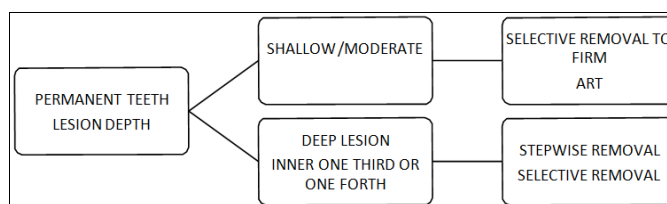
**Restoring deep dentin carious lesions may hold several challenges:**

The presence of dentinal tubules per surface area and organisation of dentinal tubules that are wider near the pulpal than near the DEJ is related with a high risk of pulpal trauma through either the carious lesion itself or the application of the restorative material, which mostly depends on RDT.

Cariou lesions are fast developing, especially in deep lesions without sclerotic dentin. Because the bacterial metabolites in a dentinal carious lesion may already cause a subclinical inflammation, it is critical that the restorative therapy does not cause further pulp damage and does not compromise tooth structure [17].

**Main requirements for an adequate restoration**

- The restoration should seal the lesion. If there is leakage or cracks, cariogenic bacteria their byproduct and nutrients may seep via cracks and resulting in secondary caries. To provide an adequate seal, the cavity borders should terminate in sound dentin and enamel, as effective adhesion can only be accomplished on healthy tooth surface
- To prevent early failure and subsequent replacements, the repair should be as long-lasting as feasible. The mechanical strength of the restorative biomaterial, the residual tooth structure, and restorative variables that may prevent subsequent caries, such as sealing ability, surface smoothness, and buffering capacity, will determine the longevity of a restoration [15, 18].



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