An Ultraconservative Method for the Treatment of Deep Carious Lesions—Step wise Excavation

M. Padmaja and Ramya Raghu

Department of Conservative Dentistry and Endodontics, Vishnu Dental College, Bhimavaram, AP, India
Department of Conservative Dentistry and Endodontics, Bangalore Institute of Dental Sciences and Hospital, Bangalore, India

Abstract: Deep dentinal lesion progress is often presented as the point of no return for the specific pulp involved. In these lesions, however, large variations and changes within the lesion environment may be detected. As the disease process is better studied and understood, more conservative treatments have come up in the treatment of deep carious lesions. One such is a step-wise excavation procedure, which is minimally invasive and reduces the risk of pulp exposure.

Key words: Stepwise excavation • Indirect pulp capping • Deep carious lesion

INTRODUCTION

Currently modern dentistry is in an era of minimal intervention for maximum preservation of tooth structure and function. Caries management has shifted its focus more towards prevention and control of the disease because of a better understanding of the basic disease process and advances in dental material science. The management of deep dentinal caries still poses a major challenge to the restorative dentist because there is no infallible way to predict the future development of the lesion.

The philosophy of deep caries management can be traced back to two thoughts: according to the first school of thought, G.V.Black (1908) proposed that it was better to expose the pulp of a tooth than to leave it covered only with softened dentin. The second school of thought, on the contrary, by Tomes suggested that a layer of discoloured dentin should be allowed to remain for the protection of pulp rather than running the risk of sacrificing the tooth. This subject even today has been dominated by much contradictory and controversial information.

Indirect Pulp Capping: This technique was proposed by Eidelmann et al in 1965. This is the most common but rather radical approach, which has the inherent risk of pulp exposure, necessitating the need for endodontic treatment and has the advantage of being a one-step procedure.

Step-wise Excavation: It is a two-step excavation procedure that has been advocated by Magnusson and Sundell (1977) and has been recently modified by Bjorndall (1997). This procedure is less invasive and aims at reducing the risk of pulp exposure. The main difference is that the indirect pulp capping procedure almost completely removes the affected dentin and re-entry is not made (one-step procedure), while the step-wise excavation procedure involves re-entry at varying intervals.

Procedure

Selection Criteria:
- Clinically detected deep carious lesion (Fig 1)
- 75% radiographic dentin involvement (Fig 2)
- No history of spontaneous pulpal pain
- Positive pulp vitality to all tests
- No radiographic evidence of periapical lesion

Steps

First Excavation: Under anesthesia and rubber dam isolation, access cavity is prepared using a high speed rotary bur with water coolant. Peripheral excavation of soft caries on the walls of the cavity is carried out initially
Fig. 1: Small occlusal enamel caries lesion and mild colour change seen in 36 (FDI)

Fig. 2: Preoperative IOPA showing deep carious lesion and normal periapical structures

Fig. 3: Access cavity followed by initial removal of soft carious dentin with excavator

Fig. 4: Recall after 6 weeks show dark, dry dentin with sharp sterile spoon excavator (Fig 3) followed by a central excavation that removes the outermost necrotic, infected demineralised dentin. Care should be taken not to excavate close to the pulp, thus reducing the risk of pulpal exposure. A temporary restoration of reinforced zinc oxide eugenol cement is placed.

Second Excavation: The restoration is re-entered under rubber dam isolation to perform the final excavation. Dentin will be drier, harder and darker at this stage compared to the previous visit (Fig 4).

Final permanent restoration is carried out with material of clinician’s choice (Fig 5, 6). Patients should be recalled at intervals of 6 weeks, 3 and 6 months for clinical and radiographic evaluation (Fig 7).

DISCUSSION

Reversing the radical trend of total excavation, now currently the primary aim is to eradicate only the highly infected, irreversibly demineralised and devitalised biomass.
This was supported by Massler (1964), who suggested that the frequency of pulp exposures in deep caries is often the result of too vigorous removal of affected dentin. He advocated gentle pre-operative treatment of the dentinal lesion to promote repair.\(^6\)

In step-wise excavation, after a period of 6 weeks, when cavities were re-entered, dentin in all teeth was found to be darker and drier. These findings imply that by removing some of the carious biomass and sealing the remaining caries from extensive substrate and oral bacteria, the caries left behind the first excavation had become less active.\(^5\)

The six-week time period provides time for the pulp-dentin complex to form a more regular tubular tertiary dentin formation. Clinically, the wet soft yellowish infected demineralised dentin is turned into a dry, dark brown making the demarcation between infected and affected dentin more obvious.\(^5\)

Why perform final excavation?

Studies have reported reduction in both Streptococcus mutans and lactobacillus counts of dentin samples following first excavation.\(^3\)

Following sealing caries into the tooth, the carious dentin becomes dry, harder and darker in colour.\(^7\) As a result, there is shrinkage of the tissue leaving a void beneath the restoration.\(^5\) The final excavation is done because it is more convenient to excavate the harder, darker caries than the soft yellow demineralised dentin.

CONCLUSION

Adoption of the step-wise excavation technique should result in a minimally inflamed pulp, superior tertiary dentin formation, less bacterial load and a more predictable pulp cap. These are produced not only by just protecting the pulp, but also as a consequence of a change in the cariogenic environment.

REFERENCES