



CLINICAL GUIDELINES FOR TREATING CARIES IN ADULTS FOLLOWING A MINIMAL INTERVENTION POLICY

Dental Science

Rajesh Gopal V	Professor and HOD, Department of Conservative Dentistry and Endodontics, Rajas Dental College and Hospital, Tirunelveli (Dist), Tamil Nadu. - Corresponding author
Anoop Samuel	Dr Samz Dental Arts, First Floor, Pandalam
Merin Elsa Varghese	Apharetta, USA

KEYWORDS:

Purpose and objectives

Minimal Intervention Policy can be used as a practical aid for dentists to apply the latest diagnostic and treatment efforts in their vital quest to maintain natural teeth and enhance occlusal and masticator functions, thus improving patients' quality of life. We are already on the frontline of a hyper-ageing society with all the concomitant challenges for society, healthcare and budget. A target of "80–20" should be set – meaning that at the age of 80 a person should still have at least 20 natural teeth – and this guideline uses evidence and consensus, along with the principles of minimal intervention (MI), and suggests clinical practice that will promote this aim [10].

Background to the development of the guideline

Dentistry has made remarkable advances recently, especially in cariology, and in improved dental materials and techniques. New methods of treatment of caries actively incorporating these advances have been developed, with a strong body of evidence in support of their success. Achievement of the important 80–20 goal would be greatly helped by increased use of these new treatments based on the concept of MI and diminished use of traditional drilling and filling treatment, which often involve removal of large amounts of healthy tooth structure. Nevertheless, MI treatment of caries has often been done without relying on the substantial body of evidence of best methods and practices. The result is that different, sometimes conflicting, treatments have been chosen, leading to considerable confusion amongst students and clinical interns in dental educational institutions, not to speak of confusion and fear on the part of patients receiving treatment.

Principal premises of the guideline

The guidelines:

- To offer the best patient-centered treatments of caries.
- To use a policy of minimal intervention MI.
- To set out the levels of clinical evidence wherever possible, and follow the grading system recommended by minds [2].
- To show the recommendations and guidance listed by grade that offer the best long-term prognoses in treatment of caries; the recommendations were made by the working group in the light of best available scientific evidence and their own experience, and more than 100 h of consensus discussions and consultations with general practitioners and experts.
- To seek maximum preservation of dental pulp subjacent to extremely deep caries.
- To suggest how to remineralise root surface caries, as frequently found in elderly patients and denture wearers.

Caries is common in all age groups, but recently there has been increasing risk amongst elderly people. Modern dentistry has greatly advanced in the use of new restorative material and techniques. This guideline sets out the evidence and the best recommendations for treating caries and thus aims to be an important aid in reaching the goal. The contents of the guideline should be updated on a regular basis and at intervals of no more than five years to match new evidence and knowledge and keep up with academic and clinical advances and the changing demands of society.

Clinical questions addressed in developing the Guideline

The guideline for treating caries should cover a wide range of areas including remineralising lesions, which had not produced cavities, removing infected dentine, sealing exposed dentine, and restoring defects. Nevertheless, remineralising treatment for root caries was included since it is an increasingly important concern foraged people. Restorative treatments after removing carious dentine were included as a sequential part of the treatments of caries.

Discussion

Members of the working group, devising the guideline used their combined more than 250 years of academic study and practical clinical experience of the treatment of caries to prepare a list of the most common clinical issues confronting dentists. They then used the principles of the Delphi Method, in 100 h of face to face discussions and more than a thousand exchanges to assess the scientific evidence and reach consensus on how best to address them. Based on this, the group devised recommendations and guidance offering the optimum course of treatment for each. Throughout the discussions, the working group sought to use the latest scientific evidence, modern materials and methods, keeping in mind the primary need for patient-centered care based on the MI concept.

Examination and diagnosis of primary caries and decision-making on interventions

Recent advances in clinical cariology have allowed clinicians to diagnose caries at an earlier stage, and to manage them without the need for surgical intervention. The proposals of ICDAS II (International Caries Detection and Assessment System) [41] focus on early and detailed diagnosis of caries, and recommend changes in the standard restorative treatment. Early diagnosis of coronal caries in permanent teeth is important, especially in patients aged 7–18 because of the frequent onset and rapid spread of lesions in maturing teeth. However, it is often difficult to recognize hidden caries on occlusal surfaces and initial proximal caries, so clinicians do not always agree about when and how to intervene surgically. The aim was to offer guidance and recommendations to aid better detection and subsequent decision-making about restorative treatment. Visual inspection, explorer probing, bitewing radiographs, electrical conductivity, fibre-optic trans-illumination (FOTI), and laser fluorescence are currently used for the diagnosis of dental caries.

Several studies review the validity and reliability of these methods for the detection of occlusal and/or proximal lesions with or without cavities. Visual inspection and explorer probing are effective for the detection of cavitated lesions with high sensitivity. The combined use of visual inspection and radiographs remains a valid approach for the detection of non-cavitated lesions. Trans-illumination using a dental chair-mounted light source is also effective for the detection of non-cavitated proximal lesions. In visual inspection, explorer probing and radiographs are most commonly used. Devices that use electrical conductivity and FOTI would be additionally helpful, but are not commercially available yet. Restorative treatment should give priority to a patient's aesthetic demand whenever one or more conditions are evident. Three surveys, one conducted in Brazil and two in Scandinavia showed that most clinicians decide to intervene surgically when the lesion reaches the middle or the outer third of the dentine as shown by

radiographs. Attempts to reach consensus on the questions of surgical interventions included considering common practice worldwide as well as the postoperative effectiveness, and patient's burden and satisfaction with caries treatment. The consensus was that lesions deeper than the outer third of dentine shown by radiographs should be promptly treated.

Extent of caries removal in cavities of intermediate depth

It is important to distinguish between caries-infected dentine, which must be removed, and dentine that is only affected by caries and should be preserved [45]. However; hitherto there have been no clear criteria for differentiation. To help distinguish between the two, recommendations for are hardness and color reliable diagnostic criteria in determining how much carious tissue should be removed? And In the removal of carious dentine, should caries detector dyes be used, were formulated. The recommendation for are hardness and color reliable diagnostic criteria in determining how much carious tissue should be removed? was based on the findings of two clinical studies that have demonstrated a close relationship between hardness and color of carious lesions and their microbial infection [12,13]. The microbial count in cases of hard carious dentine is significantly lower than that in cases of soft carious dentine, and a transparent layer that is free from microbial infection is observed when strongly discolored carious dentine is removed. Some dentists prefer not to remove even strongly discolored carious dentine if the carious dentine is hard. The working group did not reach a consensus on whether such carious dentine should be removed; half of the members advised the removal of such carious dentine whilst the other half did not. But there was agreement that based on the color chart, lesions colored C and D should not be removed (Figure-1).

The usefulness of a soon-excavator with a sharp cutting edge for selective removal of caries-infected dentine whilst preserving the caries-affected dentine [14-15]. One study demonstrated that the hardness of caries-infected dentine was less than 20 Knoop Hardness Numbers. It is important to use an excavator with a sharp edge, because another study showed that when a harp excavator was used, the hardness of the remaining dentine was [24]. The recommendation for in the removal of carious dentine, should caries detector dyes be used? is to use one of two caries detector dyes: 1% acid red in propylene glycol solution 13 or 1% acid red in polypropylene glycol solution [13]. One clinical study showed that after using the propylene glycol dye, dentine that was only palely stained was a decalcified layer with no microbial infection and should be left to prevent excessive removal of caries-affected or healthy dentine. Another study showed that when using the polypropylene glycol, the dye exclusively penetrated into caries-infected dentine alone. Thus, the staining indicated caries-infected dentine, which should be completely removed, leaving sclerotic dentine to be preserved. There are currently no objective diagnostic criteria superior to dyestaining tests to distinguish between infected dentine, that should be removed, and caries-affected dentine, that should be preserved. Shows stained dentine after using the dye containing 1% acid red in propylene glycol solution (Figure-2).

Pulp protection in deep caries

Technological innovations have led to improvements that allow adhesive composite restorations to achieve strong adhesion and good marginal sealing. These advances have demonstrated that the actual cause of pulpal irritation in restorations is micro leakage and subsequent bacterial infection [46,47]. Some studies have found that directly capped pulp with adhesives can help in healing with dentine-bridge formation. As the biological compatibility of modern adhesive systems is becoming widely understood, the clinical use of traditional liners and bases of adhesive restorations has been dramatically reduced [48,49]. Instead, adhesives are applied directly to dentine without any means of pulpal protection or indirect pulp capping. In spite of this, many clinicians still often place a lining or base when restoring deep caries with a resin composite because of concerns about pulpal irritation [16]. A clinical study of endodontic complications after composite restorations demonstrated that dentine and pulp protection by conditioning-and-sealing with adhesive resins is as effective as using a conventional calcium hydroxide [18,19] lining. Short- and long-term assessments of composite restorations that use self-etching adhesives found that the absence of conventional protective layers was not responsible for pulp complications, even in deep cavities. Therefore, the working group consensus was that a lining or base is not required in the restoration of deep caries with modern resin composite and reliable bonding systems.

Treatments of deep caries with high risk of pulp exposure

Research has shown that stepwise excavation can be effective in saving pulp in extremely deep caries in permanent teeth when there are no clinical symptoms showing irreversible pulpitis [20]. In addition, the amount of cariogenic bacteria was also reduced and softened dentine that was allowed to remain became harder as a consequence of remineralisation. Calcium Hydroxide and polycarboxylate cement combined with ataman in-fluoride preparation are suitable pulp capping agents since these materials have been found to reduce cariogenic bacteria and to promote remineralisation [25-28]. A lacuna in the various research articles is that they do not explain the methods and extent to which carious dentine is removed by stepwise excavation [24]. Some recent clinical studies have reported promising results that when carious dentine was left in deep cavities [50], the cavities were restored without reentry. However, the amount of dentine that can be safely left in the cavities was not discussed in these articles. The consensus of the working group on this issue is as follows: to remove completely peripheral carious dentine, to remove as much as possible of the caries adjacent to pulp; and to avoid pulp exposure [51-53].

Avoiding pulp exposure is important since studies suggest that the prognosis of direct pulp capping is difficult to predict [54-56]. In addition, caries-affected and caries-infected dentine has shown inferior adhesion with dentine bonding systems compared to sound dentine. Therefore, removing peripheral carious dentine and achieving strong marginal adhesion is essential for protecting vital pulp from bacterial invasion and other stimuli. For long-lasting restorations after deep caries removal, marginally sound dentine is critically important since it can much more reliably adhere to restorative materials [57-59].

Usefulness of direct resin composite restorations for posterior teeth

Resin composite restorations for posterior teeth have greatly advanced now days. However, metal inlay restorations remain popular because they are fully covered by public health insurance. The number of amalgam fillings has been drastically reduced since the early 1970s, not least because of public health concerns about Minamata disease, caused by mercury poisoning and leading to neurological damage. This encouraged dentistry to develop chemical-cured resin composites in place of amalgams. After the development of dentine bonding systems, the concept of conservative caries treatment was established by Fusayama [60], and it spread nationwide. Several studies have indicated that there are no significant differences between the clinical results of resin composite restorations and those of metal inlay restorations in posterior teeth [29,30]. However, cavity preparation for metal inlays is still based on G.V. Black's principle, which leads to sacrificing intact tooth and often results in irritation of pulpal tissue. In resin composite restorations, caries removal is performed on the basis of the MI concept. Tooth structure can be preserved and aesthetic restorations can also be performed. Therefore, if reliable bonding procedures and resin composite filling procedures can be performed, resin composite restorations are recommended for posterior teeth. They showed in the relationship between the extension of cavities on proximal surfaces and the level of difficulty of direct restoration. If reliable bonding procedures and resin composite filling procedures can be performed [61], resin composite restorations are recommended for proximal surfaces. Direct restoration is strongly recommended for small cavities with proximal contact; however, direct restorations are more difficult for large cavities involving a proximal ridge (Figure-3).

Merits of repair-repairing and refurbishing

Systematic searches of the literature revealed only a few studies on the effectiveness of defective resin composite restoration repair. These studies found that repair, sealant and replacement significantly improved marginal adaptations compared with cases that were not re-treated [32,33]. Repair and replacement gave superior results in marginal staining when compared with the no-treatment results. However, secondary caries, a primary reason for re-treating, were not included. In addition, there was no consistency in dealing with Brav-rated restorations, which are clinically acceptable and do not need to be treated. In addition, the quality of the statistical analysis used in the studies raised questions. The insufficient data for sample sizes for each treatment and the follow-up periods mean that the data may not be reliable. Despite these flaws, the working group upgraded the recommendations since repair is consistent with the principle of minimal intervention, and may help to preserve tooth structure and extend the longevity of restored teeth.

Treatment options for root surface caries

Root surface caries are becoming an increasingly common clinical problem, especially as population's age. The prevalence of root surface caries amongst non-institutionalized people over the age of 60 years in Western countries has been reported to be more than 50%. Restoration of root surface caries can be problematic in many cases because of proximity to the gingiva, which makes complete isolation and access for the placement of restorative materials too difficult. Considering these limitations for root restorations, there has been increasing interest in the management of root caries with minimal removal of the tooth structure. Daily use of mouth rinse and toothpaste that contains fluoride has been shown to be effective in promoting remineralisation of carious lesions without surgical intervention [34-39]. This treatment is cost-effective, less stressful to the patient, and applicable even for people who need home-care. Monitoring the lesions in combination with regular caries risk assessment can ensure the continued benefit of such a non-surgical approach. One problem is that success depends upon the compliance of patients. Simple single-visit methods to stop the development of root surface caries in the long-term are advantageous. The clinical effectiveness of the application of antimicrobial varnishes or adhesive should be further investigated. Restorative options for decayed lesions on root surfaces include fillings with resin composites or glass-ionomer cements. Since resin composite restorations of coronal caries using recently developed dentine adhesives have shown clinical success, this option can be considered as the first choice for root surface caries when isolation is feasible [29-31, 63-64]. Use of self-etching adhesives with simple manipulations, which can prevent contamination of the cavity, may also improve prognoses. Whilst one recent clinical study found no significant differences between resin composite and glass-ionomer cement restorations in terms of marginal integrity or secondary caries after one year, the long-term clinical results have not been determined [40]. Controlled clinical trials should be conducted to evaluate the usefulness of these two materials for restorations of root surfaces in cases when moisture control is difficult. Similar trials should assess the benefits of fluoride release from glass-ionomer cements in high caries-risk patients.

Closing remarks

The aim of this guideline is to aid decision-making by dentists and all professionals who deal with dental caries. It has been developed by a committee, all of whose members have many years of clinical practice in treating common and complicated cases of initial and advanced caries and who have learned from studying the literature and from discussing how they would diagnose and treat caries in various clinical situations. The guideline thus offers a foundation of recommendations and guidance for making decisions and treatment, but it cannot be a substitute for the judgment of experienced professionals in the actual clinical situation.

Figure-1: Color samples of carious dentine

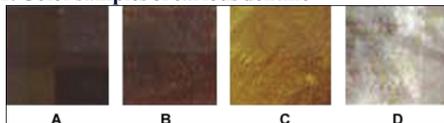


Figure-2: The expert working group agreed by consensus that removal of carious dentine was effectively indicated by the color after staining using a dye containing 1% acid red propylene glycol.

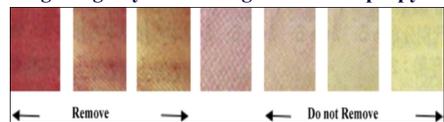
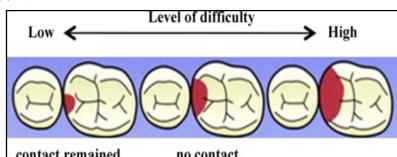


Figure-3: Level of difficulty in resin composite restorations is relation to cavity forms. For small cavities localized on proximal surfaces, direct restoration is simple. However, for relatively large cavities involving a proximal ridge, the direct restoration may be more difficult



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