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Review Article

Over-reduction in tooth preparation

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ABSTRACT

The treatment of carious lesions is the primary objective of tooth preparation and carious tissue excision. All carious lesions were previously treated invasively, or with cutting or drilling, and restoratively, or with the installation of restorative material following preparation and the elimination of carious lesion. Over-reduction simplifies laboratory work and provides for the best aesthetics and durability of the restoration, however there are clear drawbacks, including injury to the dental pulp and lessens retaining abilities and remaining resilience of the tooth. It is crucial to select the most practical entry route, which might be the labial, lingual, or purely proximal technique, in the event that a caries disease is situated on the proximal surface without compromising the enamel on the labial or lingual sides. It is not mandatory to expand the tooth preparation towards to the occlusal grooves when the disease is contained to the proximal surface since doing so will needlessly damage the tooth and make it more brittle. Whenever it is feasible, the proximal approach should be used since this encourages the maximal conservation of the quality remnant tooth structure. The decayed tissue must be eliminated while retaining the greatest amount of the natural tooth structure left upon obtaining entry to the area. The only tooth preparation required is the minimally invasive excision of carious tissue.

Keywords: Operative dentistry, Minimally invasive dentistry, Tooth preparation

INTRODUCTION

According to the definition of tooth preparation given by the American Dental Association (ADA), it is "the biomechanical treatment of the carious lesion and other lesions on tooth hard tissues, in a way that the remaining tooth structure can receive a restoration that protects it, is resistant to the occlusal stress, and prevents the disease recurrence.[1] Notably, the phase of removing decayed tissue will not be included in preparing teeth carried out for factors other than decay, such as erosive tooth wear, abrasion, abfraction, attrition, or other undecayed hard tissue flaws.[2]

The treatment of carious lesions is the primary objective of tooth preparation and carious tissue excision. All carious lesions were previously treated invasively, or with cutting or drilling, and restoratively, or with the installation of restorative material following preparation and the elimination of carious lesion. The fact that conventional

therapies for controlling caries concentrate on non-restorative treatments and only use invasive/ restorative methods if necessary or for cosmetic or functional reasons is highly relevant. Notably, the preparation of a particular cavity form while preparing teeth has lost some relevance for several advanced materials as these materials are utilized defect-oriented and that the activity of preparing tooth and restoring cavities are also not rigidly detached from one another but instead are connected. The preparation, even so, was discovered to be the basis for the superstructure, the restorative substance; if the base falls apart, the superstructure will quickly give way to the stress that the tooth will experience.[2] This is still true for substances like amalgam (or ceramics, or indirect metal restorations). Following a study by Healey and Philips, poor tooth preparations were the cause of 56% of amalgam treatment failures that necessitated replacement.[3] This finding highlights the significance of this step in the restorative therapy process. In contrast, it must be remembered that preparing teeth is an irreversible operative treatment in which errors cause irreparable tissue damage.[4]

METHODS

This study is based on a comprehensive literature search conducted on 23 November 2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about over-reduction in tooth preparation. There were no restrictions on date, language, participant age, or type of publication.

DISCUSSION

A new operative conservative paradigm, often known as "minimally invasive dentistry," aims to maximize the lifetime maintenance of healthy dental components.[1] It has changed as a result of accurate interpretation of the important phases involved in the carious condition continuum and the considerable uncertainty.

Over-reduction of tooth structure

Over-reduction simplifies laboratory work and provides for the best aesthetics and durability of the restoration, however, there are clear drawbacks, including injury to the dental pulp and lessens retaining abilities and remaining resilience of the tooth. In order to avoid pulpal harm, several practitioners are reluctant to adequately prepare teeth for crowns. In the first, most intense stages of the tooth preparation technique, a lot of water spray should be employed. Insufficient water spray is being utilized when a scum-like whitish deposit begins to build up on the tooth being treated. The dental assistant should use additional water spray to cleanse the working area and maintain the pulpal vitality.

Excess taper on the tooth preparation

The two cements that are currently most commonly utilized have at least partial true bind to prepared teeth surfaces: resin-modified glass ionomer and bonded resin. The majority of dentists favor preparing teeth that taper no more than 10 or 15 degrees from the tooth's long axis and that extend at least 4 millimeters from the. margin of the gingiva to the occlusal or incisal surface. It seems obvious that the preparations ought to be more parallel when cements like zinc phosphate are employed, which do not adhere to surfaces of the teeth.[5]

Excess gingival extension

Margin placement should be somewhat subgingivally or occasionally supragingivally for esthetic approval and decay control, depending on the situation. The crown must be lengthened and given enough time to recover adequately before appointments for preparing teeth if cavities or previous inserted restorative material would necessitate tooth preparations to be put too far subgingivally.

Before, the goals of removing carious material were to eliminate every piece of bacterially infected, decalcified material without making any distinctions between the various types of carious material (hardness, wetness, shade).[5] This is done irrespective of the anticipated since it was thought to be best to remove everything, even at the price of the tooth pulp, even though doing so presented a higher danger of pulpal exposure, particularly when carried out on larger decays (approximating the pulp).[6]

It is crucial to select the most practical entry route, which might be the labial, lingual, or purely proximal technique, in the event that a caries disease is situated on the proximal surface without compromising the enamel on the labial or lingual sides. It is not mandatory to expand the tooth preparation towards to the occlusal grooves when the disease is contained to the proximal surface since doing so will needlessly damage the tooth and make it more brittle.[7] Whenever it is feasible, the proximal approach should be used since this encourages the maximal conservation of the quality remnant tooth structure. The decayed tissue must be eliminated while retaining the greatest amount of the natural tooth structure left upon obtaining entry to the area. The only tooth preparation required is the minimally invasive excision of carious tissue. The diseased tissue's size, form, and position, as well as the length of extension required to gain entry to the walls, all influence the final dimensions. A lingual entry approach can be used to preserve the labial enamel, even if it has been compromised, to ensure good aesthetic results and prevent the composite from being exposed to visible areas in the case of a carious lesion or other defect that is limited to the proximal area of the tooth where it is not possible to carry

out a dental detachment. Unnecessarily weakening the tooth, incorrect entrance expands the lingual outline to stress points like the marginal ridges. The preparation must have the most conservative contour feasible, sometimes smaller than the preparation's internal dimensions. The contact region, extending to the facial surface, or below gingival margin should not be included in the treatment until it is absolutely required to eliminate the decayed lesion.

Consequences of over-reduction

Proximal surfaces

A gingival papilla is frequently mechanically removed from an embrasure as a result of an overcontoured proximal surface of a restoration. When gingiva becomes rolled, red, and inflammatory, a periodontal pocket may develop. This pathologic gingival design should be avoided because it is associated to incorrectly established proximal surface convexity.[8] A chronic food trap develops as a result of mechanic impingement of the gingival papillae and susceptible gingival col during the installation of a proximally overcontoured restoration. It is more challenging for a patient to easily clean the area found to be in breach of proximal contours leading to creation of a pathological gingiva.

A very thin defensive epithelium layer covers the gingival col region.[9] The col is subject to attack even when healthy. It is simple to damage the col's epithelial layer. The connective tissue is minimally attacked by the pathogenic toxins and enzymes, which leads to pathosis. A restoration should have a buccolingually and occlusoapically flat or slightly concave proximal shape. The patient can easily cleanse the tissues in this setting since it supports tissue integrity and has the lowest microbial retention rate. In a fixed partial denture, these same distinctive proximal contouring should be created adjacent to the gingiva at a solder connection to minimize tissue irritation and incursion into the embrasure.[10]

Proximal integrity

The periodontal integrity is destroyed by the vigorous passage of food into the embrasure zones via plunger cusps.[10] The proximal retention of food, which promotes microbial activity and tissue degradation, is more significant. Food retention is made possible by the lack of tight proximal contact and the uneven widths of the marginal ridges. In order to maintain arch stability, one should: build distinct marginal ridges; equalize the elevations of neighboring marginal ridges; remodel plunger-type cusps; design occlusal contouring to enable food to exit from the embrasure; and develop proximal contacts. In order to create an embrasure that is deeper and broader lingually than buccally proximal connections must be buccal to the buccolingual centers of the teeth.[11,12] The proximal contact locations should be in the occlusal third of the neighboring teeth when viewed from the facial or lingual perspective. Sometimes, the middle third of the crown is an appropriate location for a proximal contact among the distal surfaces of the maxillary first and second molars, both from an occlusal perspective and a buccal aspect. But the restoration should not touch the interproximal gingiva or the embrasure.

Lost proximal contact or diastema

An extremely modest loss of proximal touch is more concerning than a diastema.[13] In comparison to a proximal portion of a diastema, a region of small loss of proximal contact has a higher tendency for food accumulation. One can frequently adopt the arch integrity that is already present and avoid creating an unattractive, food- and plaque-retaining repair in order to close a diastema if there is no sign of mobility or trauma in the teeth next to the gap. The masticatory mucosa, which is well keratinized, easier to cleanse, and less prone to disintegration than the col region connected to a little loss of proximal connection, is tough like the soft tissues of a diastema zone.

Attached gingiva

What constitutes "sufficient" connected gingiva is highly debatable. Any degree of attached gingiva would be sufficient as long as it is connected if the facial aspect of the first bicuspid tooth is not to be repaired. Any modest amount of bonding is sufficient if a restoration is to be put with the margin over the gingival tissue as long as it is not impeded during the operative treatment. If the restoration's border must be positioned on the sulcular gingiva, 2 mm or more of cervically connected gingiva should be accomplished. Until there is a clear sign for positioning subgingivally, restorative margins must be kept supragingival.

To disguise the margin cosmetically, increase crown length for retaining the restoration, rebuild a cervical restoration, or repair regions of radicular decay or root sensitivity are a few other possibilities.[14,15] Completing restorations above the gingiva protects the mucosa from damage during operative treatment and avoids the surface accumulation of plaque in the sulcular regions, as happens with restorations located subgingivally.[16]

Analysis of existing restorations

In daily life, choosing if to preserve or a current restoration is a difficult procedure. An unwanted destruction of tooth structure, along with the possibility of unintentional pulpal exposure, would inevitably arise from unnecessary treatment, such as the arbitrary or early replacing of a current restoration. Re-dentistry, or replacing restorations, is said to be the dentist's primary responsibility.[17] The patient's health risks must always be the primary consideration in the diagnostic procedure and decision-making process that leads to restorative replacement or not.[18]

The adhesion to the tooth structure of composite restorations over amalgam is a significant advantage. Giving the tooth preparation any particular geometric form becomes unneeded as a result. When an amalgam restorative treatment is done, the restoration component and the residual tooth structure act as two separate structures that are in close contact and engage mechanically at the interface. The loads placed over an adhesive treatment, in contrast hand, cause internal stress that is passed across the junction to the residual tooth structure, making the two behave virtually as a single entity. This strengthens the existing tooth structure by restoring it.[19] In order to preserve as much of the good tooth structure as possible, the preparation is limited to the excision of dental decay.[19]

CONCLUSION

There are many factors determining the achievement of longevity for the tooth" Conserve tissue that is still calcified and remineralizable. Establish a good seal by securing the peripheral restoration to healthy dentin and/or enamel. This will stop the lesions and kill any microorganisms that are still present. Steer clear of pain, discomfort, and dental phobia. By conserving residual dentin (reducing needless pulpal irritation/insult) and minimizing pulpal exposure, you can preserve pulpal integrity. Improve the restoration's lifetime by eliminating sufficient weak dentin to make room for a sturdy repair with adequate mass and toughness. Poorly prepared teeth preparations constitute the majority of amalgam treatment failures which consequently necessitate replacement. The practitioner must be cognizant of the fact that preparing teeth is an irreversible operative treatment in which errors cause irreparable tissue damage.

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