noted that liners placed in block-out undercuts in preparations for indirect restorations do serve a function, but do not need to restore the cavity to minimum depth.

DETERMINING THE BEST PRACTICE

Several factors should be considered when trying to determine the best practice relative to the use of liners. First, liners and bases are traditionally associated with the use of amalgam, where they were needed to provide thermal insulation between the amalgam and the vital dentin. The use of resin composites provides sufficient insulation, so liners are not needed when these newer materials are used.

Second, liners were used to obtain predictable adhesion to remaining tooth tissues, but the current dentin bonding systems used with resin-based composite restorations are sufficient in this regard. The liner actually limits the surface area available for bonding and reduces the thickness of the resin composite, which has a negative effect on the physical and biomechanical properties of the restoration.

Third, applying a dentin bonding agent seals the restoration and protects the pulp from both stimuli and bacterial ingress. Liners simply aren't needed to perform these functions.

Reliance on the current evidence rather than on tradition when considering issues such as the use of liners for restorations is not yet a widespread phenomenon among dental practitioners. The use of liners should be guided by prioritizing the need being met and is most likely going to be limited to deep cavities that are being restored with a posterior composite.

Clinical Significance

The evidence does not support the placement of a liner under posterior composites except when it will serve a therapeutic pulpal effect in deep cavities. It would be helpful to have current clinically relevant data supporting the indications for liners and to ensure that the information is shared in ways that will influence clinicians' decision-making processes and operative approaches. This includes reaching out to dental schools to ensure that they are presenting liner use in the context of the best available evidence.

Blum IR, Wilson NHF: Clinical dentistry: An end to linings under posterior composites? *J Am Dent Assoc* 149:209-213, 2018

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Placing and restoring direct restorations

BACKGROUND

The prevalence of caries remains high, even in the light of advances in prevention, oral health education, and oral hygiene practices, along with the availability of improved treatment options. In many countries, most adults have at least 1 restoration and are subject to repeated dental maintenance interventions, including the replacement of the restoration. All restorations eventually suffer deterioration and degradation and will need to be repaired or replaced. A review was done covering studies performed between 1981 and 1998 that reported replacements accounted for 56% of the restorations dentists placed. Because many changes have occurred in the approaches to tooth restorations since then, an update was completed that surveyed the literature since 1998 to determine if the patterns of restoration placement and replacement have changed.

METHODS

The 1981-1998 review included studies in which dentists completed a proforma when any patient came for a new or replacement restoration. It included 12 papers that detailed the placement of 32,697 restorations, of which 44% were initial restorations and 56% were replacements. The post-1998 review covered 25 studies, of which 12 were in the previous review, and documented an additional 54,023 restoration placements, with 41.9% being initial restorations and 58.1% being replacements. The total numbers were 86,720 restorations, with 37,016 being new and 49,704 being replacements. The comparison of the 2 reviews included materials used and reasons for initial or replacement restorations being done.

RESULTS

Materials

Since 1981, 40.9% of the restorations were done using amalgam, 44% composites, 13.4% glass-ionomers/resin-modified glass ionomer/compomers, and 1.7% 'other' materials. Between the 2 reviews, fewer restorations were done in amalgam, a fall from 56.7% of the restorations to 31.2%. Resin composite restorations increased from 36.7% to 48.5% over the same period. Amalgam was the material of choice in the earlier review, followed by composite. In the later review, the 2 were reversed. Amalgam

remained the primary choice most notably in Nigeria, Jordan, and the United Kingdom, whereas composite was selected most often in Australia, Iceland, and Scandinavia.

Reasons for Initial Placement

The original review listed primary caries and non-carious defects as the most common reasons for initially placing a restoration. For primary caries, amalgam was used 55% to 100% of the time and resin composite 38% to 100% of the time. For non-carious defects, amalgam was selected 0 to 13% of the time, whereas resin composite was selected 0 to 59.1% of the time. Just 4 papers reported the use of glass-ionomer/modified glass-ionomer. It was most often selected to manage non-carious defects, followed by primary caries.

For the later review, primary caries prompted placement of an initial restoration in 48.8% to 100% of cases. Non-carious defects were the reason for placement in 0 to 29.9% of cases.

Reasons for Replacement

The original review cited the reason for replacing amalgam restorations as secondary caries in 25% to 67% of cases and as bulk/marginal fracture in 15% to 45% of cases. Resin composite restorations were replaced for secondary caries in 20% to 44% of cases, for bulk/marginal discoloration in 13% to 37% of cases, and for poor anatomic form in 0 to 40% of cases.

In the post-1998 review, just 9 of the 13 new papers gave reasons for replacing different restorations. Amalgam restorations were replaced for secondary caries in 28.5% to 57% of cases, for bulk/marginal fracture in 11.5% to 29% of cases, and for tooth fracture for 0 to 24% of cases. Resin composite restorations were replaced for secondary caries in 29% to 59% of cases, for bulk/marginal fracture in 9.1% to 38% of cases, and for bulk/marginal discoloration in 0 to 18.2% of cases.

DISCUSSION

Restoration replacement procedures continue to form the major part of the routine work of dentists. Secondary caries remains the primary cause for replacement. The use of amalgam has declined significantly, while the use of resin composite has increased.

Clinical Significance

The continuing reliance on replacement rather than repair of restorations is a concern because replacement continues the downward spiral of a tooth by progressively eliminating tooth structure. Repair is more likely to conserve tooth structure and the longevity of the tooth and its restoration. Research is needed to determine how the outcomes of repair compare to the outcomes of replacement with the hope that an evidence-based decision can be made to support repair and relegate replacement to the category of a last resort.

Eltahlah D, Lynch CD, Chadwick BL, et al: An update on the reasons for placement and replacement of direct restorations. *J Dent* 72:1-7, 2018

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Survival of amalgam restorations

BACKGROUND

Survival of restorations is an important consideration that dentists should be aware of so that they can share the information with the patient before a course of treatment is begun. In addition to the patient and dentist, third-party payers, epidemiologists, government agencies, and other interested parties may value such information because it has an impact on the decision to invest in a restoration. Amalgam restorations were common in the past and still are done, although concerns are leading to an abandonment of amalgam as a restoration material. The survival of amalgam restorations overall and with respect to various patient, dentist, and clinical factors was evaluated in the light of the time to reintervention and the time to extraction of the teeth that were restored.

METHODS

The data on 25 million courses of treatment over the course of 15 years and including 3 million dental patients were released to the research community by the United Kingdom Data Service. The information came from the payment claims submitted by General Dental Services (GDS) dentists to the Dental Practice Board (DPB) in Eastbourne, Sussex, UK, and allowed the analysis of recorded intervals between the time an amalgam restoration was placed and any reintervention or extraction of the restored tooth was done. A total of 7,292,564 amalgam restorations were