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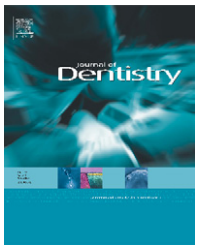

Re-intervention in glass ionomer restorations: What comes next?

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ABSTRACT

Aim: The aim of this study is to report the subsequent treatment provided, over the 11 years' data available, when a re-intervention was considered clinically necessary on a glass ionomer (GI) restoration.

Methods: A detailed sample of treatment records of patients has been established at the Dental Practice Division of the NHS Business Services Authority, consisting of records containing directly placed restorations for adult patients from January 1991. This database contains the records of over half a million restorations. For each direct restoration placed, the subsequent history of that tooth was consulted, for the period up to December 2001, and the restorations divided into three groups: amalgam, composite and GI, the latter being subdivided into anterior teeth, premolars, and molars.

Results: Data on 164,036 directly placed restorations were analyzed. Results indicated that, for amalgam and composite restorations, the subsequent treatment was likely to be another restoration in the same material. For GI (24,947 restorations), only one third of restorations, overall, were followed by another GI. In anterior teeth, GI restorations were more often followed by composite than by GI, this trend increasing with increasing time interval since restoration. For premolar teeth, the GI restoration was most likely to be followed by another GI within 4 years, with an increasing trend towards re-intervention by an amalgam or composite in older restorations. For molar teeth, GI restorations were more likely to be followed by an amalgam restoration.

Conclusion: For GI restorations, on re-intervention, there is variation in the next restoration material used according to tooth position and time interval to re-intervention. GI restorations in anterior and molar teeth are not likely to be followed by another GI restoration.

1. Introduction

1.1. Glass ionomer materials

Glass ionomer cements were developed in the early 1970s, being formed of a fluoro-alumino-silicate (FAS) glass, mixed with a polyacrylic acid.[1] Their popularity increased through the 1980s, and in 2004, these materials were used in the placement of over 1.9 million restorations in the NHS in England and Wales, mainly in Class V non-load-bearing cavities.[2] Principal advantages of glass ionomer materials include their adhesion to tooth substance, and release of fluoride, although the effect of this on progress of caries around the restoration is by no means clear cut.[3] Disadvan-

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tages of conventional glass ionomer (GI) materials included poor tensile and flexural strengths, moisture sensitivity, and poor aesthetics.[4] In attempts to overcome these disadvantages, variants of GI materials have been developed more recently, including resin-modified and reinforced GI materials.

Resin-modified glass ionomer (RMGI) materials, introduced in the early 1980s,[5] have been developed from conventional GI by the addition of *circa* 5% resin (for example hydroxyethyl methacrylate (HEMA)) to the structure. These had the advantage of being capable of ''command set'', but may still be considered as glass ionomers since they polymerise with an acid/base reaction without light curing. RMGI materials addressed many of the deficiencies of the early materials since their tensile and flexural strengths were improved, their resistance to early aqueous attack was reduced[5] and the appearance of restorations formed in these materials was improved. However, the overall aesthetics and polishability of RMGI was not comparable to resin composite dental materials, and resistance to abrasive wear has been found to be less than for conventional GI materials.[6,7]

A more recently developed generation of GI materials have been termed fast-setting, high-strength, or reinforced glass ionomers. This group includes Chemflex (Dentsply, Weybridge, UK), Ketac-Molar Easymix (3M ESPE, Seefeld, Germany) and Fuji IX (GC, Tokyo, Japan). Improved early physical properties and resistance to dissolution (when compared with conventional glass ionomers) have been claimed by manufacturers,[8,9] this improvement being due, in part, to a reduction in the size of the glass particles in the matrix, which, in turn, allowed a faster speed of reaction between the glass and the polyacrylic acid.

The overall number of restorations formed in GI materials within the National Health Service in England and Wales (this having been considered to comprise the majority of treatment carried out[10]) is known from Dental Practice Board data (*vide infra*). However, the proportion of each type of GI used in dental practice is difficult to determine. It could be conjectured that conventional GI materials were principally used at the commencement of this study in 1991, while newer variants may have replaced these during the timescale of the study.

1.2. *The Dental Practice Board*

UK dental treatment has been available from 1948 within the General Dental Services (GDS) in England and Wales. The GDS has been administered, since that time, by the Dental Practice Board (DPB) in Eastbourne, Sussex, which became known as the NHS Business Services Authority (Dental Services Division) in April 2006.

A detailed sample of treatment records of patients has been established, consisting of records containing directly placed restorations for adult patients from January 1991. This database contains the records of over half a million restorations.[11] Results of previously published work have indicated that, for directly placed restorations, the best survival times, to re-intervention, are of Class I amalgam restorations (56% of which are still present, without intervention, at 11 years and the worst are those of glass ionomer restorations, with only 33% of such restorations being present without intervention, at 11 years.[12] Further analysis of the data has indicated that *circa* 60% of resin composite restorations have re-intervention by another resin composite restoration and that over half of amalgam restorations have re-intervention by another amalgam restoration.[12] However, when teeth with glass ionomer restorations have a re-intervention, the re-intervention is predominantly by restoration in a different material.

This study therefore reports the subsequent treatment provided, over the 11 years' data available, when a re-intervention was considered clinically necessary on a GI restoration.

2. Methods

A detailed sample of treatment records of patients has been established at the Dental Practice Division of the NHS Business Services Authority, consisting of records containing directly placed restorations for adult patients from January 1991.[11] This database contains the records of over half a million restorations. For each direct restoration placed, the subsequent history of that tooth was consulted, for the period up to December 2001, and the restorations divided into three groups: amalgam, composite and GI, the latter being subdivided into anterior teeth, premolars, and molars. The subsequent treatment instituted was recorded and analyzed by treatment group, tooth type, and interval since placement of the restoration. This paper concentrates on the analysis of those teeth which were restored with glass ionomer.

3. Results

Data on 164,036 directly placed restorations were analyzed. Results indicated that, for amalgam and composite restorations, the subsequent treatment was likely to be another restoration in the same material.[12] For GI (24,947 restorations), only one third of restorations, overall, were followed by another GI (Fig. 1). In anterior teeth (Fig. 2), GI restorations were more often followed by composite than by GI, this trend increasing with increasing time interval since restoration. For premolar teeth (Fig. 3), the GI restoration was most likely to be followed by another GI within 4 years, with an increasing trend towards re-intervention by an amalgam or composite in older restorations. For molar teeth, GI restorations were more likely to be followed by an amalgam restoration (Fig. 4).

4. Discussion

Glass ionomer materials may be considered to have, as their principal advantage, reliable adhesion to tooth, which may reduce the need for the clinician to cut sound tooth substance to create retention for the restoration. However, their physical characteristics, in terms of fracture toughness and tensile strength, are less robust than, for example, resin composite or amalgam.[4] As a result, GI materials are not generally indicated for load-bearing situations and are employed principally in Class V and Class III cavities. In the present study, none of the GI restorations will have been placed in load-bearing cavities, since such restorations are precluded within the GDS Regulations.