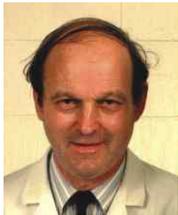


Glass ionomers come of age

These restoratives are now better, stronger and have a number of advantages, reports **Richard Billington**.



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Of the three main classes of filling materials used in modern dentistry one in particular, glass ionomer, has had a rough ride from the dental press and scientific papers. Consequently sales of glass ionomers for posterior fillings have never rivaled those of mercury amalgams or composite resins despite their many attributes. This might be about to change as glass ionomers with much higher strengths and durability have started to appear on the market.

Patients, dentists and Governments would like to phase out amalgams because of their mercury content. Appearance is another major disadvantage of amalgam, especially in today's aesthetic conscious world. Lacking adhesion, amalgams need undercut cavities requiring the removal of more sound enamel and dentine than is desirable for the future integrity of the tooth. However, amalgams are unlikely to be phased out in the near future because of their durability and economy of chair-time.

Composite resin restoratives have become very popular because they have a perceived absence of toxicity and they give aesthetic results. Unfortunately the resin content of a composite restorative shrinks when it cures. This means that after curing there is always a tensile stress at the interface with the tooth, which can lead to patients suffering pain or discomfort for some time after placement. Over time the stress often leads to cracking at the interfaces, allowing the ingress of bacteria and thus secondary caries. Composite fillings are more expensive than amalgam so, given a choice, many patients still opt for amalgam in posterior fillings. In a recent paper Sjögren and Halling (Long-term cost of direct class II molar restorations, *Swedish Dent J.* 2002; 26: 107-114) reported that



Packs of Amalgomer CR and Amalgomer.

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the long-term costs for composite are exponentially higher.

Factors widely reported in favour of glass ionomer cements include excellent biocompatibility, the cariostatic effect of sustained fluoride release, dimensional stability and chemical adhesion directly to tooth substance. The best modern GICs also have packable and carvable consistency and an aesthetic appearance vastly better than amalgam. These are significant advantages; dentists often comment that they like glass ionomers precisely because of these factors. GICs are also more economical and quicker and easier to place than composites, the latter feature making them highly appropriate for use in children and geriatrics. Research by Burke *et al* (*BDJ*, Vol 194; No.11 June 14, 2003) indicated that dentists perceive GICs as offering good value for money.

The criticisms often leveled at GICs are that they lack strength putting them at higher risk of fracture, that they wear faster and (less often heard nowadays) that they set slowly. However, a recent study carried out within the National Health Service (North west region, England - Milsom *et al*, *J Dent Res.* 2002;30:77-82) indicated that GIC was the most commonly used restorative in primary 1st and 2nd molars (69 per cent of all fillings). Nevertheless, these restorations sometimes required replacement. Other studies have indicated GIC fracture as the cause of failure (for example, Qvist *et al*, *J Dent Res.* 1997;76:1387).

In consequence, any improvement in the strength of GICs would be of great importance to the general dentist, particularly as Qvist *et al* reported a significant difference of caries in adjacent surfaces; amalgam 21



稀 Tooth 15 restored with Amalgomer CR including the lost palatal cusp.



稀 Amalgomer restorations, disto-occlusal tooth 14 and mesio-occlusal tooth 15. Note the good interproximal contact.

per cent, GIC 12 per cent. A presentation at IADR, Gothenburg in June 2003 described such an improved product, Amalgomer, produced by Advanced Healthcare Ltd.. Details are on the website, www.amalgomer.com

The manufacturers claim this material complies not only with the international standard for GICs but with the standard for amalgams. This is a good indication that the strength is indeed a significant improvement over earlier GICs. The compressive strength required at 24 hours for GICs is only 100MPa whereas the amalgam requirement is 300MPa. Exceeding this is a feat never before achieved by a GIC. But it is not only compressive strength which is improved; flexural strength, tensile strength and fracture toughness are also reportedly much higher than conventional GICs. These properties will also enhance their resistance to fracture.

The Young's modulus, again reported higher than conventional GICs, is close to that of dentine, meaning that under stress the material deforms similarly to the dentine so that the adhesive bond is less likely to fail. This new material is made using what Advanced Healthcare describes as Amalgomer Technology, a special process of micronisation and treatment of the main glass ionomer components, fluoroaluminosilicophosphate glass and polyalkenoic acids.

Amalgomer, from these reported properties, is suitable for restoration of primary dentition and also in adults as a highly aesthetic posterior restorative where radiopacity is not of prime importance. However the manufacturers recommend it primarily as an anterior restorative. A report by Steve Lucarotti in the Dental Practice Board's *Dental Review 2001-2002* entitled *Fillings – what are the risk factors for early re-intervention?* included statistical data on 31,657 restored adult teeth. This showed that GIC restorations in adult anterior teeth survived better with less incidence of need for re-intervention than composite fillings even with the GICs then available. Dentists using Amalgomer have reported to the manufacturers that it

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“In adult dentition fracture is not the only potential problem. Wear is of considerable importance.”

sets very rapidly to an extremely hard finish, giving immediate confidence in the restoration. Amalgomer is available in seven translucent Vita shades.

Where radiopacity is required and aesthetics of less importance, Advanced Healthcare have a second product. Using the same technology Amalgomer CR is, in addition, claimed to be the first true GIC to be launched with ceramic reinforcement. The ceramic not only provides radiopacity but enhances the one hour, 24-hour and one month compressive strengths by 31, 12 and 15 per cent. In common with some other GICs the compressive strength improves with time. The reported value at one month is 423MPa, higher than most posterior composites.

In adult dentition fracture is not the only potential problem. Wear is of considerable importance. The manufacturers report ACTA wear test results at the low value of 36µm/200,000 cycles. Of tests currently available, ACTA has been found to give the best correlation *within vivo* wear.

The resistance to acid erosion is also excellent; 0.9µm is reported where ISO 9917:1991 allows up to 50µm. The ceramic is very biocompatible so eliminating any potential problems with the heavy metals used in some older silver reinforced GICs.

Amalgomer CR comes in a universal shade and also in white 堯