

Alternatives to amalgam



The search for a like-for-like dental amalgam replacement

The Minamata Convention on Mercury is a global treaty, signed by the UK and over one hundred countries from all over the world in October 2013 with the intention of protecting human health and the environment from the adverse effects of mercury. It contains clauses which, for example, limit the use of mercury from all sources, with that including LED light bulbs, fluorescent tubes, fertilisers, thermometers and, of course, dental amalgam.

However, dentistry was the only area which ‘escaped’ with a ‘phase down’ in mercury use as opposed to a total ban. The agreement intimated that the mercury limitation would commence within four years, and Annex A part II dealing specifically with dentistry. The arrangements sealed within the Convention meant that the Convention would enter into force on 15th August 2017 in the ratifying countries, the implication of this being that, from 1st July 2018, amalgam use was banned in the UK for children under the age of 15 years and for pregnant or nursing women.

This piece was written in 2017, so, where does that leave us in 2025? It was widely thought that the date for a final phasing out of amalgam would be 2030, but late in 2023 the EU published a draft document, which has since been ratified, which “sets rules that put the EU firmly on the track to becoming the first mercury-free economy” by:

- Introducing a total phase-out of the use of dental amalgam from 1 January 2025 in light of viable mercury-free alternatives, thereby reducing human exposure and environmental burden;
- Prohibiting the manufacture and export of dental amalgam from the EU from 1 January 2025.

Several EU countries objected on the grounds that they could not afford the increased price of dentistry as a result of the change from amalgam restorations to resin composite, and these were granted a delay in the implementation of the changes for two years. Closer to home, however, the changes had profound implications for dentists who use amalgam extensively, for example in Northern Ireland, given that there, amalgam is more widely used than in other parts of the UK and they have to abide by (some) post-Brexit EU regulations. This would mean that it would not simply be illegal to import dental amalgam, but to use it at all (except in exceptional circumstances), in N Ireland.



Courtesy of Dr Chris O'Connor (Incidental Ltd).
Case shows amalgam replacement with
3M™ Filtek™ One Bulk Fill Restorative.

However, following extensive lobbying to the EU from the Secretary of State, the BDA and others, on 19 July 2024, the European Commission granted a derogation to Northern Ireland from the EU's new mercury regulations, which allowed Northern Irish dentists to continue using dental amalgam until 31 December 2034, or until the date agreed by the Minamata Convention, to which the UK is a signatory, whichever is earlier. The derogation was subject to a number of conditions, including showing progress in reducing the use of amalgam.

At the time of the agreement, the BDA stated: "Now, we urge authorities to commit to following-through on prevention initiatives, reforming dental services, and giving a greater focus to new treatment materials and techniques". All of which is eminently sensible.

What is the message now?

As a result, despite the fact that the UK is no longer in the EU, it is likely that supply chains will be disrupted and cost of amalgam will, almost certainly rise because it will have to be imported from countries outside the EU. The need to find an amalgam 'replacement' has therefore become urgent, with the ideal properties of an amalgam substitute including:

- Self adhesive
- 5mm depth of cure
- Low shrinkage stress
- Good physical properties including good wear resistance
- Quick and easy to place i.e. low cost

Nothing currently exists which possesses all of the ideal properties. but bulk fill restoratives such as Solventum Filtek™ One Bulk Fill Restorative may be used for all loadbearing situations in posterior teeth. Promising data also exists on a Self-Adhesive Bulk Fill composite material (SABF) in a four year Randomised Controlled Trial.¹ This could be considered to be the nearest equivalent to dental amalgam, but has not yet reached the commercial marketplace, although research is ongoing. Furthermore, a well-designed recent five year Randomised Controlled Trial in Egypt which included 156 restorations at five years, has provided promising results for glass ionomer (GIC) and glass hybrid (a form of GIC) materials in small class II restorations² citing 100% success for the resin composite (control) restorations in the study, and an Annual Failure Rate of 0.5% 3M™ Ketac™ Universal Aplicap™ Glass Ionomer Restorative (Solventum) and 1% glass ionomer materials made by two other manufacturers. When the reasons for restoration failure were assessed, along with the fracture of the class II glass ionomer restorations, the study concluded that "Although there were differences in surface lustre and colour match at 5 years, the three high-viscosity glass ionomer materials provided successful clinical performance in small to medium class II cavities".

This data provides reassurance that a true amalgam replacement, in the form of a material which does not require an intermediate bonding agent, might not be so far away. And, readers can be certain that the major manufacturers of dental materials will be working night and day to find the true like-for-like replacement for amalgam, given that the market for this is vast.

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References

- 1 Scholz KJ, Cieplik F, Ettenberger S, Hiller K-A, Buchalla W, Federlin M. Prospective randomized split-mouth study investigating class-II-Restorations with novel self-adhesive-bulk-fill and conventional bulk-fill composites: 4-year results. Abstract No 25: ORCA (Organisation for Caries Research) and European Federation for Conservative Dentistry Joint Meeting, July 2023.
- 2 Wafaie RA, Ali AA, El-Negoly SAE, Mahmoud SH. Five-year randomised clinical trial to evaluate the clinical performance of high-viscosity glass ionomer restorative systems in small class II restorations. *J Esthet Restor Dent*. 2022;1-18.

Bulk fill materials as an alternative to amalgam

Resin composite materials have excellent physical properties, when compared with amalgam¹, but traditional resin composites take longer to place². Bulk fill composites such as 3M™ Filtek™ One Bulk Fill Restorative address this concern with the ability to cure up to 5mm in one increment. Until the ‘magic’ material which is self adhesive and therefore does not need a bonding stage becomes available, bulk fill materials may well be the best alternative to amalgam in the short-medium term.

3M™ Filtek™ One Bulk Fill Restorative



Filtek One bulk fill restorative is a visible-light activated, restorative composite optimised to create fast and easy restorations. This material provides excellent strength¹ and low wear for durability² and improved aesthetics.³ The material can be placed and cured up to 5 mm deep, enabled by a stress-relieving resin system and optimised optical properties.⁴ Filtek One bulk fill restorative serves to enhance the lineup of restorative materials by improving the aesthetic properties of a bulk fill material to allow for broader use in both posterior and anterior restorations.

Features

- Fast and easy one-step placement
- Increased opacity for improved aesthetics³
- Stress relief to enable up to 5mm depth of cure^{4,6}
- Excellent adaptation⁵
- Excellent handling and sculptability⁷
- True nanotechnology for superior wear resistance and excellent polish retention^{2,8}
- High radiopacity⁹
- Available in 5 shades: A1, A2, A3, B1, C2
- Opacity falls within the range typical of universal composites¹⁰

References

- 1 Internal data. Strength. Claim 6841.
- 2 Internal data. Nanotechnology; durability, polishability and polish retention. Claim 6809.
- 3 Internal data. Increased opacity for improved aesthetics. Claim 6810.
- 4 New Bulk Fill Restorative with Robust 5mm Depth of Cure, Dr. Paul Hornick, *J Dent Res* Vol 96A, Abstract #0189, 2017.
- 5 Internal data. Easy adaption to cavity and margins. Claim 6763.

Indications for use

- Direct anterior and posterior restorations (including occlusal surfaces)
- Base/liner under direct restorations
- Core build-ups
- Splinting
- Indirect restorations including inlays, onlays and veneers
- Restorations of deciduous teeth
- Extended fissure sealing in molars and premolars
- Repair of defects in porcelain restorations, enamel and temporaries

- 6 Internal data. 5mm depth of cure. Claim 6822.
- 7 Internal data. Excellent adaption and ability to sculpt. Claim 6778.
- 8 Polish Retention and Wear of Several Bulk Fill Composite Materials, B.D. Craig *et. al.*, *Dental Materials*, Volume 33, Supplement 1, 2017, Page e22.
- 9 Internal data. High radiopacity. Claim 6871.
- 10 Opacity of a New Bulk Fill Equivalent to Universal Composites, Dr. Timothy Dunbar, *J Dent Res* Vol 96A, Abstract #0188, 2017.

Glass ionomers as an alternative to amalgam

Whilst bulk fill resin composites provide us with most of the desired properties for an amalgam replacement, there are some situations where a resin composite would not be suitable, such as clinical situations where: moisture control is difficult, rubber dam placement compromised, there is a known allergy to composite or partially erupted teeth. In these circumstances, a glass ionomer restorative may be the next best alternative. Glass ionomer restoratives offer self adhesive one step placement and aesthetics superior to amalgam, however wear resistance and longevity of the restoration are not comparable.

3M™ Ketac™ Universal Glass Ionomer Restorative



Ketac Universal glass ionomer restorative is a strong,¹¹ radiopaque¹² glass ionomer restorative which is available in both capsule or handmix format and is used as a bulk placed, vita shaded restorative. The ability of the material to bond chemically to enamel and dentin ensures gentle preparation which is a major advantage over conventional amalgam placement. In Class I and Class II restorations, amalgam often requires the use of a retentive cavity as adhesion to enamel and dentine does not occur. Ketac universal glass ionomer provides an excellent seal on the margins of fillings¹³ and can be applied without the need of a liner, cavity conditioner or final glaze for protection. Unlike amalgam, Ketac universal glass ionomer releases fluoride ions¹⁴ and is available in various shades corresponding to the VITA classical colour system.

Features

- No need for conditioner or coating
- Low stickiness for an easy placement¹⁵
- Available in 6 shades: White, A1, A2, A3, A3.5 and A4
- Long-term Class I and Class II with restrictions¹⁶
- Continuously releases fluoride for over 9 months¹⁴
- Self-adhesive
- Self-cure
- Radiopaque¹²

References

- ¹¹ Internal data. Higher compressive strength. Claim 6178.
¹² Internal data. Ketac Universal is radiopaque. Claim 06156.
¹³ Internal data. Adaption to cavity margins. Claim 6224.
¹⁴ Internal data. Fluoride release. Claim 6327.

Indications for use

- Linings for single- and multiple-surface composite fillings
- Core build-up prior to crown placement
- Primary tooth fillings
- Stress-bearing Class I restorations with at least one additional support outside of the filling area
- Stress-bearing Class II restorations when the isthmus is less than half of the intercuspal distance and with at least one additional support outside of the filling area
- Cervical fillings
- Single- and multi-surface temporary fillings
- Fissure sealing

¹⁵ Internal data. Low stickiness to instruments allows easy placement. Claim 6232.

¹⁶ Internal data. Long term restricted stress bearing. Claim 6324.

Additional products
to complement
your procedure



3M™ Scotchbond™ Universal Plus Adhesive

Scotchbond Universal Plus Adhesive offers all the benefits of its predecessor and adds greater control and predictability. It provides gold standard adhesion to all dental substrates, bonds and seals caries-affected dentine to support minimally invasive dentistry and has virtually no post-op sensitivity.* It is also the first universal adhesive with dentine-like radiopacity.



3M™ Astringent Retraction Paste



Designed predominantly for gingival retraction prior to impression taking, Astringent retraction paste is also indicated for use during the preparation of Class II and V restorations. The paste is able to give good gingival control and haemostasis while making access and moisture control feasible. This was described in the published clinical article by Dr Dawett (Gingival Control, The Dentist, 98, March 2017).

3M astringent retraction paste contains 15% aluminium chloride. The paste is placed directly into the sulcus via a highly innovative, easy to use, hygienic unit-dose capsule. The capsules are compatible with most composite dispensers. Astringent retraction paste is indicated for the temporary retraction of the marginal gingiva to provide a dry sulcus when the periodontium is healthy.

*Internal data.

Ordering information

3M™ Filtek™ One Bulk Fill Restorative

Shade	Syringe	Capsule	
A1	4866A1	4867A1	Syringe shade refills include: 1 syringe 4g; Technique guide; Instructions for use.
A2	4866A2	4867A2	
A3	4866A3	4867A3	Capsule shade refills include: 20 capsules 0.2g; Technique guide; Instructions for use.
B1	4866B1	4867B1	
C2	4866C2	4867C2	

3M™ Ketac™ Universal Aplicap™ Restorative

Code	Product information
61085	50 capsules Shades White, A2, A3
61086	50 capsules Shade White
61087	50 capsules Shade A1
61088	50 capsules Shade A2
61089	50 capsules Shade A3
61095	50 capsules Shade A3.5
61096	50 capsules Shade A4
61097	Giant Pack A3 300 3M™ Aplicap™ Capsules
73040	3M™ Aplicap™ Activator
73050	3M™ Aplicap™ Applier
76300	3M™ Rotomix™ Capsule Mixing Unit

3M™ Ketac™ Universal Hand Mix Restorative

Code	Product information
61105	12.5g powder Shade White
61106	12.5g powder Shade A1
61107	12.5g powder Shade A2
61108	12.5g powder Shade A3
61109	12.5g powder Shade A3.5
61110	12.5g powder Shade A4
61111	8.5ml liquid
61104	Intro Kit A3 12.5g powder · 8.5ml liquid · spoon · mixing pad

3M™ Scotchbond™ Universal Plus Adhesive

Code	Product information
41293	Intro kit vial: 1 vial 5ml, 50 disposable brushes, 1 etchant syringe 3ml, 25 dispensing tips
41294	Refill vial – 1 x 5ml
41295	Refill vial – 3 x 5ml
41297	Intro kit unit dose: 50 unit doses, 1 etchant syringe 3ml, 25 dispensing tips
41298	Unit dose 100: 100 unit doses, 1 etchant syringe 3ml, 25 dispensing tips

3M™ Astrigent Retraction Paste

Code	Product information
56944	3M™ Astrigent Retraction Paste 25 Capsules Refill Pack
56945	3M™ Astrigent Retraction Paste 100 Capsules Value Pack

Note: The content of one unit-dose capsule is sufficient to treat up to three (3) teeth.
The capsules are for single use and must not be used on more than one patient.

A modern approach to composite dentistry

Solventum in partnership with Bioclear Matrix UK

Bioclear delivers cutting-edge, minimally invasive solutions for superior aesthetics, durability, and patient oral health.

Why choose Bioclear?

- Advanced techniques for outstanding composite restorations
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- Minimally invasive approach for better patient outcomes

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- Master black triangle closure and Class II contacts
- Practical experience with Bioclear and Solventum products

Solventum products you'll use:

Posterior:

- 3M™ Filtek™ One Bulk Fill Restorative
- 3M™ Filtek™ Bulk Fill Flowable Restorative

Anterior:

- 3M™ Filtek™ Supreme XTE Universal Restorative
- 3M™ Filtek™ Supreme Flowable Restorative

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- 3M™ Sof-Lex™ Finishing & Polishing System



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*Internal data.

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