For the majority of dentists, general practice has changed beyond recognition over the past decade. Minimal Invasive Dentistry, digital imaging and the computerisation of records, amongst many other changes, have altered the way dentists practise in their surgeries throughout the country.

But, although this is hardly ever mentioned, the greatest change that has occurred in the day-to-day running of a general practice has been the increasing use of composite filling materials in the restoration of posterior teeth.

Amalgam or Composite?

Dental amalgam has been the material of choice for restoring posterior teeth during the past 160 years. Despite repeated attempts to prove the dangers to the patient of using this material no significant link has been shown and, on July 28, 2009 the US Food and Drug Administration stated that unless the patient is allergic to mercury “the levels (of mercury) released by dental amalgam fillings are not high enough to cause harm in patients.”

So, if amalgam is considered safe for patients, the only reason for banning its use is due to the impact of dental amalgam on mercury in the environment, (although this is considered to be only 0.1 per cent of the worldwide burden and the result of a recent study indicating that over one-third of an American’s mercury exposure is from tuna) Even though there are many other sources of mercury in the environment, the continued action from pressure groups in Europe led to the European Union (EU) commissioning the BIO Intelligence Service (BIOS) to review the potential for reducing mercury pollution from dental amalgam and batteries, as next to chlor-alkali production for batteries (to be phased out by 2020), dental amalgam will be the largest mercury use in the EU.

In June this year, a joint DoH and DEFRA meeting issued a statement that the UK should support the EU strategy to reduce the environmental impact of mercury, and should, subject to certain exemptions, support a ban on the use of dental amalgam from 2016.

The exemptions, which would be reviewed after five years to identify if they were still required, would allow amalgam to be used under the following conditions:

1. Poor moisture control
2. Difficult cavity accessibility
3. Large cavities
4. Large interdental spaces to be bridged.
It is at this point that some readers may be thinking that the banning of amalgam is long overdue, but it must not be forgotten that amalgam, for all its faults, is a very forgiving material and even the EU is aware that there are situations in day-to-day practice when without its use the patient may be ill-served. Composite resin, on the other hand, is very much more ‘techniquesensitive’ and requires skill, experience and relatively expensive aids to enable satisfactory placement.

Why should we place posterior composite restorations?

After 2016, dentists in the EU will no longer be able to place amalgam restorations as a routine procedure. In the long term our patients may be better served by the placement of posterior composites as:

- The placement of posterior composites in Class II cavities is successful and predictable. Using composite and not amalgam increases the lifespan of the tooth.
- Composite is the ‘material of choice’ for initial posterior cavities. Amalgam should only be used in already heavily restored dentitions in older patients.

Why is composite resin better than amalgam at increasing the lifespan of a tooth?

- Less sound tooth needs removal during preparation
- Adhesive bonding means that non-retentive preparations can be used (Figs 1, 2, 3 & 4)
- Adhesive bonding improves the marginal seal and ingress of oral fluids and bacteria into the cavity, which is the commonest cause of pulpal damage and death
- It reinforces the remaining tooth structure
- It increases fracture resistance of the remaining tooth
- It can be used to repair or refurbish restorations without total replacement.

And not forgetting:

- It has an aesthetic tooth colour

However, composite is not ‘tooth-coloured amalgam’ and must be handled and placed differently.

Who will teach how to place composite restorations?

Older dentists had little teaching in the use of composite resin for posterior teeth at dental school. Only 13 years ago, Effective Health Care was able to report that composites are 1.7 to 3.5 times more expensive than amalgam with a five-year survival rate only half that of amalgam.

Over the past 10 years, techniques, materials and aids have improved so that Opdam’s study published in 2007 showed that survival rates for composite fillings at five and 10 years was greater than that for amalgam.

But although there has been a substantial increase in composite teaching at our dental schools over the past 10 years, recent research showed that erroneous techniques were still being taught. These included beveled enamel margins; causing a thin ‘flash’ which fractures later and the use of transparent matrix bands and wedges; based on the old idea that composite contracts towards the light.

So can lectures and ‘hands-on’ courses help teach dentists good practical techniques?

The majority of dentists attending a course on posterior composites are working for the NHS either fully or part-time. Unfortunately, too many courses are aimed at private practice, and a form of private practice that even a full-time UK private practitioner would not recognise. Experts from Europe describe how to place the perfect posterior restoration over a two-hour appointment and others spend a morning describing, in great detail, oc-
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There are always aspects of any lecture, no matter how esoteric, that can be applied to general practice, but what the participant really wants to learn are practical tips, which can be applied to their day-to-day work.

**Some Practical Tips**

Imagine the scenario, one that occurs many times during the week: a patient attends with a fractured tooth and is booked in to a half-hour appointment. (Fig 5)

**How can we fill that tooth with composite resin cheaply, quickly and effectively?**

**Moisture control:**

Moisture control is essential, but a rubber dam is not mandatory!

Rubber dam is mandatory for root canal treatment and strongly advised in areas of difficult access and for certain procedures, such as the placement of posterior Resin Bonded Bridges. However, the financial cost of rubber dam precludes its use for routine restorative work in most NHS practices.

**Does this affect the longevity of the subsequent restoration?**

One study has shown that rubber dam incorrectly applied affected the proximal contact strengths of posterior composites leading to food impaction and periodontal problems. So rubber dam is no substitute for a good technique and it’s the quality of moisture control that is important, not how it is achieved. (Fig 6)

**Matrix techniques:**

On the advice of the Chief Dental Officer, all dentists should be using single-use, disposable matrix bands, as it is impossible to clean assembled conventional bands such as Siqveland adequately.

The use of disposable products such as Omni-Matrix (Ultradent) and AutoMatrix (Dentsply) provide affordable, well-fitting matrix bands that act as a mini-dam in keeping oral fluids out of the prepared cavity. The band must be shaped so that the correct contact area is produced on the proximate tooth to reduce the risk of food packing and drifting. A sectional matrix, such as Palodent (Dentsply) is excellent at producing a good contact, but care should be taken in older patients as the wide contact area produced by wear over time is not reproduced by most sectional systems.

**Bulk fillers:**

Returning to the original scenario, already five to ten minutes of the half-hour appointment has been used. To enable the rapid placement of a composite restoration a new generation of flowable composites has been developed to use as a liner or bulk filler, such as SDR (Dentsply), Venus Bulk Fill (Heraeus) and Tetric EvoCeram Bulk Fill (Ivoclar Vivadent). These generally overcome the problem of light-activated composites shrinking while curing, by means of a polymerisation modulator that reduces shrinkage stress and force at the tooth-restoration interface. This shrinkage stress is one of the causes of post-operative sensitivity almost immediately after placement of the restoration and one study from Dentsply has shown elimination of post-operative sensitivity when a bulk filler is used.

Although the manufacturers state that it is possible to bulk fill using these materials in 4mm increments, anecdotal evidence suggests the following protocol:

1. Place a 0.5 mm liner at first, as the base of a thicker layer may be further than the maximum depth of 4mms when a matrix band has been fitted or a deep cavity is present. The initial thin layer is self-leveling as it flows into the irregularities of the cavity floor and may increase marginal adaptation in the gingival margin area. It also acts to stabilise the matrix band, preventing slippage if little tooth is left supra-gingivally. (Fig 7)

2. Place a further layer of liner, or bulk fill if the cavity is deep, allowing a minimum of 2mm of conventional composite oclusally to improve wear resistance and appearance. Adaptation of the second layer of flowable or conventional composite is enhanced by the smooth surface left by the initial lining.
Good finishing techniques reduce the failure rate caused by secondary caries in composite restorations:

- Trim using a copious quantity of water as coolant, as over-heating the composite encourages rapid shrinkage causing failing margins in time
- Try not to use ‘coarse’ diamonds, as they can cause deep surface scratches and loss of filler particles
- Direct the bur from the tooth to the filling to reduce iatrogenic damage
- Remove ‘high-spots’ and contacts on the tooth-restoration junction
- Do not ‘over-carve’ the surface, as deep fissures can make cleaning more difficult in some cases and could predispose towards fracture
- Etch and wash the finished restoration and use the remaining bonding agent to re-seal the margins and repair surface micro-cracks 12 (Fig 8)

**Conclusion**

Posterior composite restorations are ‘technique sensitive’ and do require training and experience if a good restoration is to be placed in the limited time available in general practice.

Materials research is slowly improving the outcome of these restorations and part of a dentist’s Continuing Professional Development should be in engaging in these advances so that a long lasting, functional and aesthetically pleasing restoration can be provided in a realistic time-scale, to the benefit of the dental health of our patients and the financial health of our practices.

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