

IN BRIEF

- Outlines the contemporary challenges to the delivery of quality teaching programmes in operative and restorative dentistry.
- Provides an insight into why the teaching of contemporary operative techniques, such as the placement of posterior composites, can 'lag behind' current trends in general dental practice.
- Presents a 'call-to-arms' for current teachers of operative and restorative dentistry, allowing support for the development and expansion of current teaching programmes in the area of posterior composites.

Challenges to teaching posterior composites in the United Kingdom and Ireland

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Recent surveys from general dental practice have found increased placement of direct composite resin restorations in occlusal (Class I) and occlusoproximal (Class II) cavities in permanent teeth by general dental practitioners. This has been matched, and possibly driven, at least in part, by the development of new composite resin materials and bonding technologies. Recent studies by the authors have found an increase in the teaching of Class I and Class II composite resin restorations in the UK, Ireland, the US, and Canada. The increased teaching in the UK and Ireland, however, was not as great as in North America, and several worrying trends were observed. The aim of this paper is to discuss these trends and related factors considered important to the necessary further development of the teaching of Class I and Class II direct composite resin restorations, let alone modern operative dentistry in general, in the UK and Ireland.

INTRODUCTION

Over the last 10 years, there has been a change in attitudes to the use of resin composite (composite) materials in the restoration of posterior teeth. A recent paper¹ highlighted conflicting views that were expressed in the latter half of the 1990s regarding indications for the placement of composite in posterior teeth, with a particular review² advocating the suitability of composite for placement in a range of extensive posterior cavities; while another review³ recommended restricting the use of composite in posterior teeth to the restoration

of small Class I and Class II cavities in premolar teeth, preferably those with limited occlusal function.

A survey of European dental schools in 1997⁴ found that '*...most schools taught the use of composite resin in selected posterior cavities, but there was considerable variation in the principles taught, and in the clinical experience gained by undergraduate students...*' A related investigation of North American dental schools⁵ found that most dental graduates of that time had '*...limited clinical experience of the placement of Class I and II composite restorations...*' Since then, the dental profession has witnessed the introduction of refined and enhanced forms of composites, an ever-increasing range of dentine adhesive systems, and new, alternative forms of associated technology such as LED light-activating units and novel matrix systems.¹ Some of these innovations, notably the introduction of LED light-activating units, have been supported by an appropriate evidence base;⁶ while others, such as transparent matrix bands and light-transmitting wedges,

have been found to be associated with less than ideal clinical outcomes.^{7,8}

Surveys of general dental practice have found the increased use of composites in the restoration of Class I and II cavities,^{1,9,10} with one-half of UK general dental practitioners placing composites in at least occlusal cavities in permanent molar teeth.⁹ Posterior composites may therefore be viewed as an established element of everyday clinical practice and, as such, the competences of practitioners should extend to this approach to the restoration of teeth.

The challenge for dental schools is to educate and train dentists who are competent to treat patients in a general practice setting, using modern materials and techniques to the best possible advantage of the patient. Dental school graduates who qualify in 2006 may well continue to practise dentistry until the late 2040s. Demands on these new dentists will include, amongst many others, the need to adopt minimally invasive procedures with composites and other tooth-coloured restorative systems

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being progressively used in preference to traditional restorative materials. To promote and facilitate the delivery of quality dental treatment, it is considered clear that new dental graduates should be competent to place posterior composite restorations. Educational guidelines published by both the General Dental Council and the Association for Dental Education in Europe are considered to support this view.^{11,12}

In light of developments in general practice, advances in dental materials technology, and contemporary educational guidelines, the authors investigated the current teaching of Class I and Class II composite restorations in dental schools in the UK,¹³ Ireland,¹³ the US,¹⁴ and Canada.¹⁵ While increases in this teaching were found in each of the four countries, the increase in the UK and Ireland was found to have 'lagged behind' that recorded for North America. In addition, some worrying trends were noted in relation to this teaching in the UK and Ireland. The aim of this paper is to stimulate debate, research, and reviews of curricula to address the issues stemming from the findings of the recent surveys.

TEACHING IN THE UK AND IRELAND

The survey of the UK and Ireland dental schools in 2004¹³ found:

- Thirty per cent of posterior restorations placed by undergraduate dental students were of composite. In contrast 37% and 50% of posterior restorations placed by US and Canadian dental students respectively, were composites^{14,15}
- One UK dental school did not teach either 2- or 3-surface Class II composite restorations; an additional five schools did not teach 3-surface Class II composite restorations
- Clinically important variations in the teaching of cavity design, contraindications to composite placement, indications for liners and bases, and matrix techniques
- A lack of an evidence-based approach in the teaching of certain principles and techniques that have been found to result in less than ideal clinical outcomes. For example, one-third of schools taught bevelling of the occlusal cavosurface margins, and six of the 15 schools taught the use of transparent matrix bands and

light-transmitting wedges

- Limited teaching of newer technologies that have an appropriate evidence-base, including LED light activation of composites.

PRINCIPAL CONCERNS

The principal concerns arising from the above findings include inconsistencies in teaching, a lack of an appropriate supporting evidence-base, and relative to North America, variable approach and overall relatively limited teaching (both clinical and didactic) of the use of composites to restore posterior teeth.

In raising these concerns, it is acknowledged that it would be undesirable, let alone practically impossible, for all dental schools in the UK and Ireland to provide identical teaching on a subject such as the use of composites in the restoration of posterior teeth. Indeed some variations in such teaching to take account of local circumstances, let alone complementarity to the learning and teaching philosophies and practices of different schools, is to be welcomed and encouraged. That said, all students graduating from dental schools in the UK and Ireland should share core competences underpinned, wherever possible, by an evidence-based approach to supporting competences. To realise this goal, the individuals responsible for curriculum design and content in each school must have all the necessary knowledge and understanding, or at least work closely with colleagues who have up-to-date familiarity with best evidence across the relevant subject areas, together with opportunity to form consensus views with their counterparts in schools at home and abroad. With most curricula for undergraduate dental degree programmes being over-crowded, decisions to introduce new competences invariably have to be accompanied by decisions as to what to leave out of existing teaching. Such decisions are often fraught, but must be taken in the interests of best serving the needs of the patients of future graduates.

But the issues arising from the recent surveys of the teaching of posterior composites are not considered to be solely the result of variations in the adoption of best available evidence and teachers having insufficient time and opportunity to develop consensus views. Many other factors may also be influencing the situation. These factors are considered to include:

- Outdated practice arrangements
- Financial constraints
- Time constraints
- Academic priorities
- Unresolved dilemmas.

Outdated practice arrangements

At the time of surveying the dental schools (2004/2005), NHS/General Dental Services (GDS) Regulations did not encourage best practice in the use of composites in the restoration of posterior teeth. Under new NHS/GDS contract arrangements, it is hoped that this situation will change, with practitioners being encouraged to adopt a more evidence-based approach to NHS oral healthcare provision, not least in respect of the use of composites in the restoration of posterior teeth.

In the course of our investigations we received anecdotal evidence from a number of schools that existing GDS regulations were frustrating plans to expand the teaching of posterior composite restorations.¹³ While these schools indicated that they would like to teach more Class I and Class II composite restorations, with a concomitant reduction in the teaching of amalgam restorations, it was felt that this would cause difficulties for new graduates who, if not expected to use more amalgam than would otherwise be the case, would inherit a legacy of large numbers of amalgam restorations to monitor, maintain, and replace. The sooner this legacy is limited by composites being used to best possible advantage in the restoration of posterior teeth, the sooner dental school curricula may be more evidence-based in this aspect of conservative dentistry.

Financial constraints

It is an accepted fact that the materials, instruments, devices and equipment required to support adequate educational experience in the use of composites in the restoration of posterior teeth are costly, with the cost consequence of shifting to the use of composite rather than amalgam being considerable.¹⁷ In general, it is suggested that the funding of dental education has not kept pace with the escalating cost of dentistry of increasing sophistication and complexity – the increasing cost of equipment and consumables having greatly exceeded the typical inflation-linked increase in dental school budgets over at

least the last 10 years. During this time manufacturers and suppliers of dental materials, instruments and equipment have typically increased the support they have traditionally extended to dental schools, and thereby allow students – their future customers – opportunity to gain experience with new materials and concepts. Reliance on increasing sponsorship to support educational programmes is not good practice, let alone a high-risk strategy. Dental education is expensive and set to get more costly with further technological advances becoming part of the competences new graduates must acquire to be fit for the purpose on entering clinical practice.

Time constraints

Dental school curricula and guidance on dental education need to constantly evolve and be refined to be sufficient for intended purposes. It is understood that this is happening across the UK and Ireland, albeit that the updating of the General Dental Council's guidance, *The first five years*,¹¹ tends to be a 'start-stop' process. The lead time for change can, however, be protracted, and change is invariably costly, in terms of staff time and any necessary restructuring, re-equipping, reprogramming, etc. These are issues of considerable concern when most, if not all dental schools in the UK and Ireland are hard pressed with major difficulties in, for example, the recruitment and retention of clinical academic staff.¹⁶ Fortunately, dental schools have been innovative and imaginative in recent times, finding creative solutions to substantial human resource and budgetary challenges. The extent to which this efficiency saving in staff time and resources can continue without real cause for concern is uncertain.

Regarding the specific issue of the need to increase the teaching of composites in the restoration of posterior teeth, there are considerable time and opportunity pressures.¹⁷ In this respect, the recent paper by Roeters *et al.* reporting the replacement of amalgam by primarily composite in the teaching of the restoration of posterior teeth at the School of Dentistry at the University of Nijmegen, is especially relevant.¹⁸ This group found that the change from the use of amalgam to composite in the restoration of posterior teeth took place incrementally over an extended period of time. Initially,

lack of enthusiasm amongst teachers was noted, but this diminished with the realisation of various benefits. These authors report that amongst the positive consequences of the change to posterior composites was the view of their graduates that: '*the tooth itself is more important than the restorative material*'.

Academic priorities

While all dental schools in the UK and Ireland are required to ensure that their undergraduate dental degree programmes remain 'sufficient' as determined by the GDC and the Irish Dental Council respectively, the academic priority, at least in the UK, is to achieve a high rating in the forthcoming 2008 Research Assessment Exercise (RAE). A recent survey carried out by the British Medical Association reported that 40% of medical clinical academics feel that the RAE has had a negative impact on their careers.¹⁹ It is not unreasonable to assume that similar views exist amongst clinical academic dentists. Given the need to best prepare for the RAE, and the need to contingency plan in the event of a disappointing RAE profile, dental schools in the UK are presently focussing resources and energies on research, and the recent unprecedented expansion in dental student numbers. Given such pressures, the will and capacity to consider changes to curricula in, for example, conservative dentistry, is not surprisingly somewhat limited. Change, where it is underway, is believed to be proceeding slower than would otherwise be the case, possibly helping to explain the observed differences between teaching in the UK and North America.

Further research issues include the limited research funding available to support educational research in dentistry, translational research in dental biomaterials science, and in particular practice-based research. Collectively these factors are considered to have a negative impact on the development of teaching of the use of composites in posterior teeth, let alone educational developments in many other aspects of dentistry.

Unresolved dilemmas

In certain aspects of modern conservative dentistry, there is insufficient evidence to support the use of one technique over another. In the field of posterior composites, one of the most

important ongoing dilemmas is how to best manage operatively exposed dentine in other than shallow cavities. While there is clear consensus amongst UK and Irish dental schools regarding the management of shallow and deep cavities, two-thirds of schools teach the use of a glass-ionomer cement base in moderately deep cavities, while one-half teach a 'total etch' approach.¹³ This diversity was also common to the surveys of the US and Canadian schools.^{14,15} In such circumstances, the dilemma facing the teacher is two-fold: one, what to teach and secondly, if students are taught a technique which evidence subsequently discredits, this may lead to confusion amongst practitioners. Regrettably, the response to such difficulties in some schools would appear to be 'let's wait and see how things develop before making any changes', with the result that necessary developments in the curriculum are delayed. A way out of this 'catch 22' may be found in better understanding the approaches and techniques with which practitioners achieve the most favourable long-term clinical outcomes – a potent reason for much needed practice-based research.

CONCLUDING COMMENTS

A traditional criticism of dental school curricula is that they 'lag behind' the 'real world' of dental practice.¹⁷ While recent surveys^{9,10} demonstrate that almost one-half of dental practitioners place composite in Class I and Class II cavities in permanent molar teeth, less than one-third of posterior restorations placed by dental students in the UK and Ireland are of composite resin.¹³ In contrast, almost two-fifths and one-half of posterior restorations placed in US¹⁴ and Canadian¹⁵ schools, respectively, are composite. Contemporary opinion suggests that the use of amalgam in general dental practice will diminish over the coming years.¹ In light of this it is disappointing that teaching of the restoration of posterior teeth with composites in the UK and Ireland remains relatively limited and suffers from inconsistencies.

As discussed in this paper, challenges in respect of the teaching of composites in the restoration of posterior teeth have arisen for many varied reasons. Some of these reasons have far reaching consequences for dental education, and in turn for dentistry in the UK and Ireland.

Indeed issues raised in this paper could be viewed as being symptomatic of dental education in the UK and Ireland being under pressure. If this is the case, it is a matter of great regret that dental education in the UK and Ireland, which is highly regarded around the world, is suffering important restraints.

It is worth repeating that dental students graduating this year will continue to practise dentistry until the late 2040s. Should they graduate incompetent in the use of certain materials or techniques, such as Class I and II composite restorations, there is a danger that they may remain incompetent in these areas for some time, potentially exposing patients to unnecessary risk.³ It is important that dental school curricula evolve to promote delivery of optimal dental care by their graduates in their subsequent practices. Encouraging initiatives, including the focus of the 2005 annual conference of the British Association of the Teachers of Conservative Dentistry, and elements of ConsEuro 2006, being the teaching posterior composites, is welcomed. But more needs to be done by all those with responsi-

bilities for dental education if the undergraduate dental degree programmes in the UK and Ireland are to be modern and to continue to be held in high regard internationally.

Finally, this paper has concentrated on the teaching of the use of composites to restore posterior teeth to undergraduate dental students. The situation in respect of this teaching to dental therapists remains to be investigated.

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