Summary of: An *in vitro* study on the use of circumferential matrix bands in the placement of Class II amalgam restorations

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FULL PAPER DETAILS

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Objective To compare the effectiveness of a disposable metal matrix band system and the Siqveland matrix system in the restoration of a Class II preparation with amalgam. To assess the difference in amalgam overhang produced between the two systems *in vitro*. **Methods** A right maxillary first premolar with a Class II cavity preparation was duplicated in acrylic to produce a standardized cavity. Forty acrylic teeth were individually mounted in a hand-held model of an upper right quadrant and restored with amalgam by twenty dentists. Each dentist restored two replica teeth with amalgam; one using the Omni-matrix system and the other using the Siqveland matrix system. All 40 restored teeth were individually mounted on a standardised jig, viewed under a microscope, photographed and overhangs, if present, measured using Image ProPlus 4.0. A comparison of the overhangs produced by the two systems was analysed using a paired sample t-test.

Results An overhang was present in all cases. There was a significant difference in the size of the overhangs produced by the two different matrix systems (p-value 0.036). The Siqveland produced a larger overhang than the Omni-matrix system.

Conclusion A commonly used matrix band (Siqveland), when compared to a newer, disposable system (Omni-matrix), was found to result in consistently larger overhangs during the restoration of class II preparations with amalgam. As Omni-matrix is a disposable system, the potential for cross-contamination is removed and it can, therefore, be considered a suitable replacement for the non-disposable Siqveland matrix system.

EDITOR'S SUMMARY

Managing the interface between vital, biological tissues and inert materials has long been a problem, or a challenge, in clinical disciplines and none more so than in dentistry. The replacement of hard tissue destroyed by caries is a prime example since the resulting restoration must be as anatomically accurate as possible, while the material used must be inert and non-reactive to the soft tissues around it.

The use of a matrix band to achieve this difficult balance in the case of inter-proximal restorations is a familiar operation for us all but the humble and apparently straightforward band has a myriad of variants. Indeed history is littered with prototypes that have failed, eponymous contraptions that worked well in the hands of the inventor but no one else and commercially produced

hopefuls whose days numbered less than the pages of the catalogues of products in which they appeared.

So the choice of band from a clinically functional viewpoint might be said to be difficult enough without the need of further obstacles. The added problem of cross-infection control, especially when the band becomes contaminated with blood from the interstitial gingival tissue, as it so often does, has created an understandable but frustrating twist to the development of this essential instrument. This is especially so in the case of the Siqveland matrix since it forms one of the nation's most favoured choices in these situations.

Which is where this paper steps in as a useful illustration of how the research process can be brought to bear on a particular practical problem. While in the past the disinfection of a matrix band

was important, it is now an imperative, which has seen the evolution of a disposable variety, tested here for its suitability not only in respect of removing cross-infection risk but also in providing the necessary restorative requirements.

In the process, the researchers have developed an experimental protocol that will be useful in comparing other matrix bands, which, as with other research work is a not uncommon finding, that of an unlooked for direction or opportunity as a result of investigating a curiosity or unanswered question.

The full paper can be accessed from the *BDJ* website (www.bdj.co.uk), under 'Research' in the table of contents for Volume 204 issue 6.

Stephen Hancocks,
Editor-in-Chief

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IN BRIEF

- Highlights the prevalence of the problem of overhanging Class II restorations.
- Highlights to readers that only having one matrix system may not be advisable in a practitioner's ability to avoid the production of overhangs.
- A disposable matrix system can provide a solution to remove the potential for cross-contamination and reduce the size of amalgam overhangs produced.

COMMENT

The use of an appropriate matrix system is considered essential for the direct restoration of a Class II cavity, irrespective of the restorative material being used. The necessity for the genesis of good proximal contact areas and the prevention of overhangs at the cervical margins to prevent food packing and potential periodontal problems¹ respectively is well recognised. There are many matrix systems in contemporary clinical use but concern has been raised whether one commonly used matrix band (Siqueland) can be effectively disinfected.²

This *in vitro* study aimed to compare the effectiveness of two matrix band systems in preventing the formation of an overhang during the placement of a Class II amalgam restoration. Twenty qualified dentists each restored an MO cavity in an upper first premolar acrylic tooth using both a Siqueland matrix band and the Omni-matrix system on a standardised model. The restored teeth were then analysed by another researcher who was blind to the placement information, using a calibrated measuring system. Overhangs were found to be present in all cases but were statistically significantly larger ($p = 0.036$) in the Siqueland group.

Being an *in vitro* study there is always the potential for criticism whether the results can be extrapolated *in vivo*. The authors are to be commended for their efforts in developing an *in vitro* model. They chose arguably the most challenging surface in the mouth to restore due to its concave anatomy and

this study clearly illustrates the difficulty of placing and adapting two matrix systems to this surface. That said, one wonders whether overhangs would have been present had other surfaces been used and it does not necessarily follow that all commensurate restorations exhibit overhangs. As stated in the conclusion, further work would be desirable to examine other commercially available systems and potential variables.

Within the limitations of this study, it would appear that the Omni-matrix band can reduce the size of an overhang and is a suitable alternative to the Siqueland matrix band when dental amalgam is used. It has the added advantage of being disposable so any concerns over disinfection effectiveness are obviated.

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AUTHOR QUESTIONS AND ANSWERS

1. Why did you undertake this research?

The placement of Class II amalgam restorations still frequently occurs in general dental practice. Despite there being a large variation in matrix systems on the market the majority of dental practitioners still use the Siqueland matrix system. There is a vast amount of literature that identifies that the prevalence of overhangs is high. After reading the work by Bragg *et al.* in the *BDJ* which identified the problem of blood contamination of matrix bands, we wanted to look at an alternative matrix system that was disposable to compare its suitability as a possible replacement for the Siqueland that was similar in its method of placement. This study was also completed so that we could develop an *in vitro* model to test other matrix systems.

2. What would you like to do next in this area to follow on from this work?

With the model now developed and with so many different matrix systems on the market our plan is to compare and contrast these different systems. The method will be evolved to investigate not only the production of overhangs but also the restoration contour and contact points gained with the differing matrix systems. A further evolution will be to look at the influence of different wedge systems and the influence of the restorative material chosen. When investigating composite restorations the influence of placement technique on contour, contact point and overhang production will be considered for the various types of matrix systems.