

What is the best way to restore the worn dentition?

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Background

Tooth surface loss (TSL) can span from initial enamel loss, through cupping of the occlusal surfaces of posterior teeth, exposure of large areas of dentine on anterior teeth, fractures of unsupported enamel and on until much of the tooth tissue has been lost.¹⁻³ In a recent national survey it was found that 15% of adults showed moderate wear and 2% severe wear.⁴ Elsewhere it has been estimated that 17% of those aged 70 years will have severe tooth wear.⁵ The exact aetiology of wear in an individual case may or may not be ascertainable but the quality of life for a patient with TSL may be impeded to such an extent⁶ that they will require us to intervene not only preventively^{7,8} but also restoratively.

A number of materials and approaches have been used to restore the worn dentition. Composite is a versatile material and has expanded from its early role as an aesthetic anterior restorative material to one that is used for localised anterior and even whole-mouth rehabilitation.⁹⁻¹² But there are a number of other materials and approaches to restoring the worn dentition, particularly as larger areas of the occlusal surface become involved. These include using gold, ceramic and laboratory composites to make onlays^{13,14} and crowns,¹⁵ alone or in combination.¹⁶

The restoration of teeth with severe wear is clearly complex. Not only does one need to consider the longevity of the restoration but also the effect it may have on the opposing teeth and the effect on the pulp. Furthermore, some restorations may fail catastrophically, whilst others need only be smoothed or repaired. Thus in the ideal world we would expect to find evidence based guidelines¹⁷ or a systematic review¹⁸ of randomised controlled trials that would pull these data together and help us clinicians make evidence-based decisions with our patients about how to restore their teeth. In the absence of a systematic review

Table 1. Pubmed – final search 29/05/2011

	Terms	Hits
#1	"Tooth Attrition"[Mesh] OR "Tooth Wear"[Mesh] OR "Tooth Erosion"[Mesh] OR "tooth wear"[tiab] OR "tooth wear"[tiab] OR "tooth attrition"[tiab] OR "tooth erosion"[tiab] OR "dental wear"[tiab] OR "dental attrition"[tiab] OR "dental erosion"[tiab] OR "tooth surface loss"[tiab] OR "TSL"[tiab] OR "bruxism"[tiab]	5802
#2	Meta-Analysis[ptyp] OR "systematic literature"[tiab] OR (systematic[ti] AND review*[ti]) OR "systematic review*" [tiab] OR meta-analys*[tiab] OR "cochrane database syst rev"[Journal] OR "cochrane database of systematic reviews online"[Journal] OR "research synthesis"[tiab] OR "research integration"[tiab] OR "medline"[tiab] OR pubmed[tiab] OR psyclit[tiab] OR psycinfo[tiab] OR cinahl[tiab] OR "data synthesis"[tiab]	98403
#3	((randomized controlled trial[pt]) OR (controlled clinical trial[pt]) OR (randomized[tiab]) OR (placebo[tiab]) OR (drug therapy[sh]) OR (randomly[tiab]) OR (trial[tiab]) OR (groups[tiab])) NOT (animals[mh]) NOT humans[mh])	2,396,101
#4	#1 AND #2	48
#5	#1 AND #3	962

Table 2. Cochrane Library – final search 29/05/2011

	Term	Hits
#1	(tooth wear):ti,ab,kw	210
#2	(tooth OR dental) AND (attrition OR erosion):ti,ab,kw	191
#3	(tooth surface loss OR TSL):ti,ab,kw	124
#4	MeSH descriptor Tooth Wear explode all trees	188
#5	(#1 OR #2 OR #3 OR #4)	510

we would like to identify one or more randomised controlled trials that compare two restorative interventions (for example composite versus gold onlays on posterior teeth, or composite versus veneers on anterior teeth).

The objective of this DEBT was to identify evidence-based guidelines, systematic reviews and / or randomised controlled trials that would assist me in answering my question, which is:

In patients with sufficient TSL to warrant restoration (for functional, comfort or aesthetic reasons) which of crowns (gold, ceramic or metal-ceramic), indirect onlays (gold, ceramic or composite) or direct (composite, resin-modified glass-ionomer) onlays result in the longest retention

(and causes least damage to the tooth on which it is placed and that opposing it) either alone or in combination?

Eligible reports would be evidence-based guidelines and systematic reviews addressing the restoration of wear, and randomised controlled trials (RCTs) comparing two interventions for the restoration of worn teeth with some measure of longevity or harm to the tooth or opposing tooth as outcomes.

Search strategy

Given the variable means of restoring the worn dentition (and therefore the large number of possible combinations that could be involved in an RCT) I chose to search using terms related to TSL only.

This would inevitably mean having a larger number of reports to wade through but would mean the risk of me missing a suitable report is minimised.

Table 1 shows my Pubmed search. Search #1 is the MeSH and keyword terms related to TSL. Search #2 is a filter for systematic reviews¹⁹ and search #3 a filter for randomised controlled trials.²⁰ Search #4 therefore should include systematic reviews involving TSL and search #5 should include all trials involving TSL.

In a similar fashion all the databases of the Cochrane Library²¹ were searched. However, because the library already sorts reports into systematic reviews and trials, there was no need to include filters.

Twelve of these were Cochrane Reviews, one was another systematic review, 496 were clinical trials and one was a methodology study.

The Pubmed and Cochrane Library results were merged in Endnote and duplicates removed. One thousand, three hundred and forty reports remained.

The National Guidelines Clearinghouse²² was searched using 'Tooth wear' and 'Dental wear' separately. There were 15 and 30 hits, respectively.

TRIPdatabase²³ was searched with the following string: "tooth surface loss" OR TSL OR (dental AND (attrition OR erosion)) OR ((dental OR tooth) AND wear).

This resulted in 663 hits. Two hundred and seventy two of these included Evidence-Based Synopses - 5, Systematic Reviews - 16, Guidelines - 55 and core or extended primary research - 196. The remaining were text books, patient information and other texts.

All the hits identified in these searches were screened by title and, where necessary for clarification, by linking through to the abstract or full text.

Results

Two guidelines were identified that addressed tooth sensitivity and erosion.^{24,25} Neither was able to quote evidence higher than expert opinion or observational stud-

ies in support of individual restorative measures for the replacement of tooth tissue. Neither was able to recommend one method of intervention over another.

I was unable to identify any systematic reviews that considered restoration of the worn dentition. One randomised controlled trial met the inclusion criteria that two interventions be compared in a randomised controlled trial.²⁶ In this split mouth trial 16 patients with severe tooth wear had two teeth randomly allocated to either a direct micro-filled composite or a developmental indirect composite onlay. Of the 32 restorations placed in total seven indirect and nine direct composites were still in place at the end of follow-up – that is 44% and 56% respectively. However, there was no statistical difference between these.

Whilst the authors of this study concluded that posterior composites are contraindicated because of this high failure rate, if restoration is required it is difficult to say that any other material would serve any better without a trial comparing composite to, say, gold onlay. The study doesn't demonstrate a difference between the direct and indirect failure rate but this may be due to the low sample size. With greater power and therefore precision this study may have demonstrated a statistically – and clinically significant – difference in favour of the direct composite, or it may not have. Using an online sample size calculator²⁷ assuming a 5% alpha and 20% beta error, I estimate that 780 restorations would need to be placed in order to demonstrate a statistical difference in success of 10% between the two materials (55% direct versus 45% indirect composite). The scale of the trial would need to be considerably larger.

Conclusion

Unfortunately, we are in a position of not knowing which restorative option is preferable in terms of longevity, preservation of vitality or minimisation of opposing tooth wear. Trials that compare interventions with small differences in outcome will need

to be large enough to demonstrate statistical significance. These would be worthwhile given the potential expense involved in restoring wear cases. At present, though, low level evidence from experts and observational studies, personal clinical experience and patient values are all that are left to guide us.

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