# **Ceramic veneers in general dental practice.** Part five: After care and dealing with failure

Philip Newsome and Siobhan Owen's final article of the series looks at the post-operative care of veneers and how to assess, and deal with failure.



Philip Newsome BChD PhD MBA FDS RCS (Ed) MRD RCS (Ed) is currently an Associate Professor at the Faculty of Dentistry of Hong Kong University and he is on the Specialist Prosthodontist Registers of both Hong Kong and the UK. He graduated from Leeds University Dental School in 1976. In 1986 he joined Hong Kong University where he is currently an Associate Professor. He holds the Fellowship in Dental Surgery and Membership in Restorative Dentistry from the Royal College of Surgeons of Edinburgh as well as an MBA, with Distinction, from the University of Warwick Business School and a PhD from The University of Bradford Management Centre. He has written four dental textbooks and he maintains a thriving private practice focusing primarily on aesthetic dentistry and is particularly interested in the current ethical debate over the use of porcelain veneers to 'transform' smiles.

Dr Siobhan Owen graduated from Dundee Dental School in 1990. Since gaining her BDS she has worked in NHS and Private practices. She is currently practice principle of a very successful six surgery private practice in the SW of England. She is Managing Director of Southern Cross Dental Laboratories UK Ltd and has a particular interest in modern crown and bridge design, especially in relation to the new generation of aesthetic all porcelain restorative systems.

# Patients' psychological response to veneers

There is a universal truth in dentistry that goes something like 'Anything you say before treatment is an explanation, anything you say after treatment is an excuse' and this advice applies nowhere more so than with ceramic veneers. Research conducted in Holland (Willemsen 1994) showed that dentists were able to influence patients during the treatment-planning phase of veneer treatment and so the management of patients' expectations and their response to aesthetic dentistry should begin well before the start of any tooth preparation. While, in most instances, well-conceived and executed aesthetic dentistry can and does transform people's lives (Davis 1998), care should be taken to identify those patients who have unrealistic expectations and such patients must be treated only with considerable caution. CS Lewis once wrote 'A man with an obsession is a man with very little sales resistance' and those patients who hold unreasonable expectations are easy to sell (the idea of cosmetic dentistry) to but can be extremely unforgiving if the result does not exactly match their anticipated outcome. To paraphrase another old saying 'Treat in haste, repent at leisure'.

That said, it is human nature, and quite reasonable, for anyone undergoing cosmetic dental treatment to expect that their appearance will improve as a result of that treatment, otherwise why have it done in the first place? Patients are not always aware though of the need to balance durability with aesthetics and care must be taken to explain the pros and cons of ceramic veneers and the patient's own responsibilities in ensuring their longevity (Figure 1). The prudent dentist will take time, and make the effort, to manage these expectations by means of such tools as diagnostic wax-ups, computer simulations and pre- and post-operative photographs (ideally of similar aesthetic work carried out by the dentist who will be performing the dental treatment). By so doing the patient should have a reasonable notion of the end result.

This idea of a service matching the needs and wishes of the person buying the service is at the heart of marketing theory and applies



Figure 1: This Chinese patient was provided with porcelain veneers on his two central incisors but was not told that he would have to relinquish his habit of biting on chicken bones. Not surprisingly, the veneers fractured as a result of such extreme loading

as much to dentistry as to any other service. Again, the foundations of successful treatment are laid very early on in the dentist-patient relationship and dentists must put themselves in the patient's shoes to fully understand what they are actually 'selling' as there is often a discrepancy between dentists and patients when assessing the need for cosmetic dentistry (Burgersdijk 1991). As Ashley Latter explains in 'Ethical Selling: Helping Patients to say 'YES' (Newsome 2007):

'In my experience dentists think that they understand what it is that they are selling but very easily fall into the trap of looking at things from their own point of view rather than that of the patient's. If we switch things round we will see that what dentists are in fact selling is not dentistry per se, not the technical wizadry, not the crowns bridges, veneers and dentures but rather the benefits that the patient gets from having that treatment done. Consumers buy for a whole host of reasons but essentially do so in order to meet their perceived needs, as a way of solving their problems, even if, at times, those needs appear quite superficial to others. As far as dental patients are concerned these problems can range from the purely functional: 'I can't eat properly' to the emotional and psychological: 'People find me unattractive because of my terrible teeth' or 'I know I will have more confidence if I get my discoloured,

### Clinical



Figures 2a, b and c: The veneer on this upper right central incisor has fractured very cleanly and the intact fragment has been rebonded back onto the tooth. It can be seen that the luting cement has remained on the tooth surface which suggests that the failure of the bond is at the resin/veneer interface. This is not considered to be a long-term solution and it is likely that a new veneer will have to be made



crooked teeth sorted out'. As with any other product or service, it is the dentist's ability to address these needs and aspirations which creates its value.'

Do not be surprised though if, at the time of cementation, the patient does not express the same sort of stage-managed outpourings of unreserved joy seen on any number of TV makeover shows. There are a number of reasons why patients in the real world often seem a little 'underwhelmed' when they see their new smile for the first time. Firstly, any change, however much expected and anticipated, is often an anti-climax, patients often comment that their teeth feel big or are somehow pushing the lips. Veneers, by their very nature, are bound to feel 'fuller' even cumbersome at first, even the thinnest most conservative veneers will feel big, a little strange, to the patient immediately after cementation. Secondly, these feelings are enhanced and reinforced at a physical level by the use of local anaesthetic and the almost inevitable feeling of being 'pushed and pulled' during the various stages in the bonding process. Meijering et al (1997) observed that every change in the dentition requires habituation and that when there is a change in position or shape it takes some time before the patient does not feel the restoration any more and will look at their dentition in total. Patients should be warned about the likelihood of such feelings and that it make take a few days to fully appreciate and really come to terms with their new smile. Much better to explain this beforehand than immediately after the veneers have been placed.

What little research that has been done on patient response to ceramic veneers fortunately paints a very positive picture. In a retrospective study of porcelain laminate veneers delivered by undergraduate dental students at Cork University Dental School, Murphy et al (2005) found that 97% of patients expressed high satisfaction with appearance and comfort with 90% of participants saying they would repeat the treatment if required. Similar findings occurred in other studies, for example Pippin (1995) and Dumfahrt (2000). More specifically, Meijering (1997) compared patient satisfaction with different types of veneer restoration (direct composite, indirect composite and porcelain) and found that porcelain veneers were rated highest.

#### **Post-operative instructions**

The patient should be given a written instruction sheet providing clear instructions on how to look after the newly-placed ceramic veneers and how to give them the best possible chance of long-term survival, for example:

Do...

- Use a soft toothbrush with rounded bristles, and floss as you do with natural teeth.
- Use a less abrasive toothbrush

• Use a properly-designed custom-made laminated mouthguard when involved in any contact sport

Don't...

• Use alcohol and mouthwashes containing alcohol during the first 48 hours as these have the potential to affect the resin bonding material.

• Avoid hard food, chewing on ice, eating ribs, biting hard sweets etc.

Some dentists recommend the patient to wear a soft nightguard to protect the veneers, especially if the patient demonstrates signs of bruxism. This does however, question the wisdom of placing veneers in patients with such parafunctional habits. Treatment using veneers in such cases should only be pursued after a complete and thorough evaluation of the occlusion has been conducted and the restoration design amended - perhaps by extending the ceramic further palatally than would normally be the case (Gurel 2003). Given this, it may make more sense and provide a more predictable long-term outcome to place full-coverage ceramic restorations from the outset.

#### Failure

What exactly constitutes veneer failure? This question is important as clearly some failures are more catastrophic than others i.e. some may require veneer replacement while others might not (Fradeani et al 2005).

#### 1) Debond

#### Total debond

The first step when this happens is to determine at which interface the failure has occurred (tooth/luting resin or veneer/luting resin) so as to prevent recurrence. Generally speaking, the failure is more likely to occur at the tooth/resin interface owing to the fact that composite bonds tend to react better to etched silanated porcelain than to the tooth surface (Highton 1979). Bond failure will be the result of one or more of a variety of different antecedent factors, for example:

• Inappropriate preparation – excessive and/or uneven tooth reduction will likely result in a large proportion of the veneer being bonded to a dentine substrate. It will also lead to a thick veneer and a possible failure of a solely lightcure luting resin to fully polymerise.

• Incorrect laboratory procedures for example in relation to sandblasting and etching of the fitting surface, use of too thick a die spacer etc.

- Placement over old restorations.
- Excessive occlusal loading.

## Clinical

• Interference of the bond with contaminants such as glove powder, saliva etc.

• Placement less than one week following tooth whitening.

• Failure to follow the manufacturer's instructions and recommendations.

• Use of out of date products – this is especially critical with newer generation bonding agents.

• Failure of the patient to follow post-operative instructions – e.g. placing excess loading on the veneer during eating; damaging parafunctional habits etc.

Where total debond occurs without any damage to the veneer or the underlying tooth it may be possible to recement the veneer following removal of any remaining luting cement from either the tooth or the veneer or both and re-etching of the ceramic fitting surface. However, if there are any cracks or marginal discrepancies then it will be necessary to take a new impression and remake the defective veneer – do not be tempted to use the existing cast as it is likely that there will have been some change in either the preparation or the tooth position in the meantime.

#### Partial fracture/debond

Fracture can be the result of either a) a failure of adhesion (for reasons outlined above) and rather than the whole bond failing and the restoration debonding intact, it fractures leaving a portion still in place on the tooth or b) a cohesive fracture within the ceramic itself. Failure of this nature (Figure 2) may be the result of one or more of the precipitating factors outlined above. While it may be possible to repair the tooth in such situations, for example by the use of bonded composite, such repairs are the unlikely to provide a satisfactory long term solution (Figure 3). Thus, in most cases, replacement is advised. Sometimes the veneer cracks but does not debond and in such situations there may be no need to replace the veneer but rather keep it under review and advise the patient that replacement may be required in future.

#### 2) Inaccurate placement/seating

This results in a bonded veneer that is in an incorrect position. While it may be possible to adjust the veneer to create a satisfactory appearance this can only be done when the adjustment required is minimal. In most cases, the veneer will require replacement.

#### 3) Colour mismatch

Ceramic veneers can look slightly darker than adjacent natural teeth at the time of bonding due to the latter dehydrating and therefore appearing lighter. This will pass and the shade



Figures 3a and b: The veneer on this upper first premolar fractured and has been repaired using directly applied composite resin. The staining on the margin of the canine veneer has been removed using a Prophyjet.

match should be restored after a few hours. Permanent discrepancies may be between the veneer and the adjacent, unrestored teeth, or it may be that the shade of the whole anterior segment is incorrect. There is some leeway here with the use of different shades of luting cement but these can only change the shade of the overlying veneer up to a point. Colour change may also occur over time due to change due to oxidation of aromatic tertiary amines used in dual-cure resins.

#### 4) Poorly finished veneers

This can be the result of improper laboratory procedures or, more likely, inappropriate finishing techniques leaving a rough unglazed surface which in turn leads to plaque accumulation and gingival inflammation. As was discussed in Part Four, prevention is better than cure and the glazed surface should be left untouched wherever possible. Should finishing be required then careful polishing using a series of finishing grit diamonds followed by a 30-fluted carbide bur and polishing pastes using copious water spray appears to produce the best result. Fortunately, research studies point to the good periodontal health usually associated with ceramic veneers. For example, Murphy (2005) found there to be no statistically significant difference between veneered and control teeth in terms of Plaque, Gingival and Bleeding indices. The study found a complete absence of inflammation in 87% of veneered teeth.

#### 5) Marginal discolouration

When this is minor it may be possible to clean the affected margin and then re-seal the area using a flowable composite (Figure 4). This becomes increasingly difficult the greater the discolouration and when there is visible evidence of a crevice along the margin.

#### 6) Loss of marginal integrity

Once again, if this is only minor it may be fea-

sible to 'repair' the margin using flowable composite but as the deficiency becomes greater, to the extent that a probe can be inserted into the deficiency (which may also extend interproximally) then the need for replacement becomes more likely (Figure 5).

#### 7) Postoperative sensitivity

This may arise whenever the tooth preparation strays into dentine and clearly the greater the dentine exposure, the greater the risk of sensitivity. Firstly, care should be taken to seal any exposed dentinal tubules when freshly cut and secondly, the etching technique described in Part Four will go someway to reducing the occurrence of such sensitivity. However, as we have already said many times, veneers perform much better and with greater predictability the less the amount of dentine exposed. It has been suggested that excessive light-curing in one spot can cause heat rise in the pulp and therefore it is recommended to move the light around during curing to prevent this.

# 8) Failures not attributable to the veneer

There are a number of situations where the veneer is deemed to have failed when the real cause of failure lays elsewhere. For example, as a result of periodontal or endodontic failure of the tooth itself (Figure 6).

With all of the above types of failure the decision will have to made as to whether the veneer requires replacement. This has to be taken on a case by case basis and while some failures are clear cut and replacement is obvious in others there may be some leeway for adjustment, repairing, polishing and so on. While at first sight veneer replacement might appear simple it can present it's own challenges. For example, can the laboratory correctly match the shade of any adjacent veneers? Will the thickness and hence translucency of the veneer be the same

### Clinical



Figure 4: The marginal staining on these composite veneers is more severe than in Figure 3 and this, combined with the fact that the patient was unhappy with the dull appearance of these 10-year-old composite veneer restorations led to the decision to replace them with ceramic veneers

as other veneers? Will the shade of the luting cement be the same as before? For all these reasons, it is vital to ensure that patient files

#### References

Burgersdijk RC, Truin GJ, Kalsbeek H, van't Hof M, Mulder J. Objective and subjective need for cosmetic dentistry in the Dutch adult population. Community Dent Oral Epidemiol 1991; 19: 61-3.

Davis LG, Ashworth PD, Spriggs LS. Psychological effects of aesthetic dental treatment. J Dent 1998; 26: 547-554.

Dumfahrt H, Schaffer H. Porcelain laminate veneers. A retrospective evaluation after 1 to 10 years of service. Part II – Clinical results. Int J Prosthodont 2000; 13: 9-18.

Fradeani M, Redemagni M, Corrado M. Porcelain laminate veneers: 6- to 12-year clinical evaluation – a retrospective study. Int J Periodontics Restorative dent 2005; 25: 9-17.

Gurel G. The Science and Art of Porcelain laminate Veneers. 2003 Quintesence Publishing Co Ltd, London.

Highton RM, Caputo AA, Matyas J. The effectiveness of porcelain repair system. J Prosthet Dent 1979; 42: 292-294

Layton D, Walton T. An up to 16-year prospective study of 304 porcelain veneers. Int J Prosthodont 2007; 20: 389-396.

Meijering AC, Roeters FJM, Mulder J, Creugers NHJ. Patients' satisfaction with different types of veneer restorations. J Dent 1997; 25: 493-497.

Murphy E, Ziada HM, Allen PE Retrospective study on the performance of porcelain laminate veneers delivered by undergraduate dental students. Eur J Prosthodont Rest Dent 2005; 13: 38-43.

Newsome PRH, Latter A. Ethical Selling. Helping Patients to say 'Yes'. 2007. Stephen Hancocks Publications, London.

Pippin DJ, Mixson JM, Soldan-Els AP. Clinical evaluation of restored maxillary incisors: veneers vs. PFM crowns JADA 1995; 126: 1523-1529.

Walls AW. The use of adhesively retained all-porcelain veneers during the management of fractured and worn anterior teeth. Part 2: Clinical results after 5 years of follow-up. Br Dent J 1995; 178: 337-340.

Willemsen WL, Burgersdijk RC, Truin GJ, Mulder J. Cosmetic dental treatment in an adult Dutch population. Community Dent health 1994; 11: 156-60.



Figure 5: This veneer, one of eight placed to mask tetracycline staining does not fit closely at the margin leading to a poor appearance exacerbated by plaque accumulation. The fact that the margin is supragingival may negate the effect of this plaque in terms of inducing gingival inflammation but it does, however, result in an unsightly distinction between the rather opaque, white appearance of the veneer and the dark colour of the underlying tooth. Better to have well-fitting veneers that finish equi-gingivally and the insistence of excellent oral-hygiene before embarking on treatment

accurately record tooth preparation, ceramic and luting agent shades so that the operator is not left second guessing should replacement be necessary. As was mentioned earlier, an assessment of the cause of failure is important – old restorations should be replaced; if the preparation is mainly in dentine then consideration should be given to replacing the veneer with a full coverage dentine bonded crown; likewise if aesthetics are poor because the veneer is unable to mask a deeply discloured tooth then again consideration should be given to a full coverage restoration which allows deeper tooth preparation perhaps along with the use of a different, more opaque ceramic.

#### Conclusion

There is no doubt that ceramic veneers have helped transform the way we perform dentistry, allowing us the opportunity to improve the appearance of our patients' teeth in a radical and relatively conservative way. However, as veneers are used in ever more challenging clinical situations, the authors are concerned that too much is increasingly being asked of the technique. As we have discussed throughout this series this trend seems to be the result of an increasing and unfounded faith in the ability of modern dentine-bonding techniques to retain a rigid ceramic restoration to a relatively flexible dentine substrate. Layton (2007) reflected this concern of a growing number in the profession when observing that the survival rates of 'modern' veneers will be far lower than



Figure 6: There is nothing intrinsically wrong with this veneer other than the fact that it has been placed on a tooth with a very poor prognosis as a result of extreme, localised periodontal disease

those placed at a time when selection criteria restricted veneer use to cases with good tooth alignment, favourable occlusion and intraenamel preparations. A forewarning of this can be found in a prospective study carried out by Walls (1995) which used a patient population with a high likelihood of parafunctional habits along with a large amount of dentine substrate. Unsurprisingly the combined high risk factors resulted in a decreased survival rate.

We believe that veneers are not an alternative to orthodontic treatment in all but the most minor cases of tooth misalignment nor are they necessary in many cases where satisfactory results could quite easily be achieved using tooth whitening and micro-abrasion techniques. All that said, there is little doubt in our minds that veneers will continue to be used more and more and if this is the case then dentists must be fully aware of their limitations and of their technique sensitivity. They must also be aware of the different properties and handling characteristics of the various materials used since material selection has a highly significant impact on the ultimate outcome of treatment. Finally, patients must be informed of the pros and cons of ceramic veneers before embarking on what is for most people a highly significant financial and emotional investment.