

ALTERNATIVES TO INDIRECT CERAMIC VENEERS

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Introduction

Thin ceramic veneers requiring minimal tooth preparation and bonded to enamel using colour-stable luting resins can provide excellent service for many patients. It is certainly not the intention of this paper to be 'anti-veneers' - rather, it is the authors' aim to urge practitioners to understand the strengths and weaknesses of these popular restorations and to consider all possible treatment options, so that when they are used their advantages are maximised.

Over the past decade, ceramic veneers have become increasingly popular as a means of improving dental aesthetics in a number of different clinical situations. They have, for example, been advocated as treatment for the following conditions:

The clinical and laboratory procedures associated with placing ceramic veneers have seen continuous refinement over the past few years. The recommended preparation technique has evolved to consider the depth of preparation, the degree and nature of incisal reduction, interproximal extension, cervical preparation etc. (Newsome et al 2008). Luting cements have also undergone considerable development bringing more manageable handling characteristics and the introduction of self-etching dental adhesive systems (albeit with reported reduced bond strengths (Toledano 2003)) try-in pastes (Della Bona 1994), and more recently greater colour stability since the latest generation amines used in light-cure materials are more resistant to oxidation and corresponding colour change (Lu 2004), the latter permitting the use of ultra-thin ceramic veneers (Toreskog 2005). There has also been an enormous amount of effort devoted to offering dentists a wide range of different ceramic systems aimed at reconciling aesthetics with strength and durability (Fons-Font 2006). The result of all of these advances is a popular treatment modality of which the public has been made especially aware through widespread publicity in such media as popular magazines, the internet and TV 'makeover' shows. With this popularity, though, has come a sense amongst some in the profession that the porcelain veneer is increasingly being used in situations where it is perhaps not the most appropriate treatment option. Every

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Table 1: Indications for veneers

1. Malocclusion e.g. crowding, spacing (hypodontia, peg laterals), anterior open bite, diastemata, malformed teeth.
2. Tooth discoloration e.g. ageing, loss of vitality, hypoplasia, tetracycline staining.
3. Incomplete or failed bleaching cases, that is, where some type of bleaching has been undertaken, but the results have been insufficient for the desired outcome.
4. Loss of tooth substance e.g. trauma, previous restorations, erosion, abrasion and attrition.
5. Combinations of all the above problems.

treatment modality has inherent limitations, the ceramic veneer is no different and consideration must be given to a number of factors:

Given these limitations, the voice of concern about the growing use of ceramic veneers in inappropriate situations is becoming ever louder within the dental profession (Christensen 2006):

'The current trend toward ceramic veneers for everybody is a negative phenomenon that needs careful observation and correction by the profession. I believe the profession could return to several more conservative and longer-lasting esthetic treatments.'

Perhaps the greatest concern is that the advent of dental adhesives has created the illusion that veneers bonded to dentine will be as successful as those bonded to enamel, thus encouraging dentists to use the technique in a wider range of clinical situations. Why is it that practitioners increasingly feel the need to extend veneer preparations into dentine and interproximally to the extent of breaking contacts with adjacent teeth? The main reasons would seem to be the ability of a thicker layer of porcelain to hide dark discolourations and mildly crowded teeth as well as greater ease of handling. Technicians also tend to find making thick ceramic veneers less challenging than very thin ones. As a result, tooth reduction into enamel alone can lead to bulky veneers and so in many cases the dentist will cut further into the tooth to prevent

Table 2: Limitations of porcelain veneers

1. Intrinsic weakness of porcelain
2. The need to remove unnecessary tooth structure
3. Minimal retention form
4. Need for appropriate and sufficient substrate for bonding
5. Technique sensitivity and the need for adequate operator training and ancillary support
6. Nature of restoration failures
7. Reliance on high levels of post-operative patient co-operation
8. Patient factors: such as parafunctional habits, poor oral hygiene, diet

overbuilding of the final restoration. Unfortunately, in spite of the considerable advances made in the field of dentine bonding, the longevity of a veneer continues to be a direct function of the amount of enamel substrate supporting it (Friedman 2001). There is an almost complete lack of clinical evidence to support the technique of bonding veneers to dentine as opposed to enamel. Swift (2006) observed that recent reports of 50% failure at six years and 34% fracture is disturbing when compared with 93% to 100% success rates of 15 years observation in the 1980s i.e. at a time when veneers were universally bonded almost entirely to enamel.

Why is this the case when reported dentine bond strengths appear to match those achieved when bonding to enamel? Most longitudinal studies of dentine adhesives are performed using composite restorations directly-bonded onto non-carious Class V lesions where the strength and elastic modulus of the teeth are hardly affected (Peumans 2005). This is markedly different from bonding porcelain to dentine. Barghi (et al 2005) noted that removal of the facial enamel or selection of teeth without facial enamel for veneer restorations is an attempt to match up high elastic modulus porcelain with lower elastic modulus dentine. It is predicted that functional loading of the veneered tooth will transfer this energy to the interface resulting in de-bonding or cracking in the porcelain.

Bearing these various limitations in mind there follows a brief review of some of the more common clinical situations for which ceramic veneers are often prescribed.

Malocclusion

The greater the degree of tooth misalignment (or malocclusion), the greater the likelihood that dentine will be exposed and, even worse, that the pulp will become involved

Table 3: Treatment Alternatives to Ceramic Veneers

1. No treatment at all
2. Orthodontic therapy
3. Tooth whitening.
4. Microabrasion
5. Cosmetic contouring of teeth
6. Direct composite restorations
7. Composite Veneers (direct or indirect)
8. Full-coverage restorations

whenever veneers are used to correct alignment of teeth. Less troubling perhaps are those situations in which veneers can be bonded to teeth to produce a more regular smile but without any need for tooth tissue removal (Figures 1a and b). In almost every case where there is anything other than the most minimal degree of crowding then orthodontic therapy is the treatment of choice as it preserves the natural enamel of the teeth. In addition, the introduction of techniques such as Invisalign (Santa Clara, Calif) can help eliminate the aesthetic disadvantage of orthodontic therapy (Figures 2a and b). In some situations it will be possible to carry out cosmetic contouring in addition, perhaps, to some direct composite bonding.

Tooth discolouration - Bleaching

There are a wide variety of tooth discolorations that may be amenable to tooth bleaching. If the teeth are well positioned, with a large amount of existing enamel present and with little need for orthodontic treatment, bleaching treatment should be undertaken as the first part of the treatment plan. Bleaching teeth is the most conservative option to remove discolorations such as speckled or mottled enamel, white banding or spots, yellow, brown orange discolorations and tetracycline staining (Figures 3a and b). In such cases the result can often be enhanced by use of the microabrasion technique.



Figures 1a and b: This patient wanted to improve his smile but was not prepared to undergo orthodontic treatment. Porcelain veneers were placed on the two upper lateral incisors, direct composite on the left central along with some enamel re-contouring



Figures 2a and b: This patient had a large middle diastema: Treatment was undertaken involving Invisalign to upper and lower arches scaled by the orthodontist, once Invisalign was complete. The bleaching was undertaken using the Invisalign trays. Afterwards, bonding to 212 was carried out leading to an improved smile.

While bleaching is the first part of the treatment, the brown and orange markings will fade and the white spots become less noticeable as the background colour of the entire tooth lightens.

Microabrasion is a technique whereby a thin layer of enamel is simultaneously abraded and eroded to fade the white spot or lesion present using a concentration of 5 – 10% hydrochloric acid and compound is applied directly onto the surface of the teeth. This is normally applied directly onto the teeth and there is a specially formed application applied which abrades the surface of the tooth. Results can be unpredictable sometimes and it is best to start with a small white lesion at first. This is normally undertaken for young adults when the enamel is still immature. There is a dehydration factor which has to be considered and it is essential to undertake intermittent observation of the hydrated tooth before application of the microabrasion material followed by application – observation and re-application. This method will usually help to fade the lesion and in some cases the lesion can almost disappear.

Different tooth whitening techniques may need to be planned depending on the nature and depth of the discolouration. Sometimes more than one technique may need to be planned depending on how well the tooth responds to initial tooth whitening. Further treatments may need to be undertaken such as deep-bleaching and microabrasion. Also, treatment of the single vital yellow tooth will be different and need more prolonged bleaching treatment in combination with a higher strength of bleaching material (Figure 4a and b) (Greenwall LH Oct 2007).

Bleaching the non-vital discoloured tooth will depend on how much existing enamel is present and whether the tooth is clinically completely asymptomatic and free from any periapical pathology according to radiography (Figure 5a and b).

Loss of tooth substance, masking old restorations

The problem of dentine exposure and the resulting adverse effect on the long-term survival of a veneer restoration becomes especially apparent when enamel has already been lost as a result of existing restorations, trauma, tooth wear, abrasion or erosion. Unlike the previous clinical situations discussed so far there is often little doubt that some form of restoration is required, the question is whether or not a veneer is the most appropriate. If considerable dentine is exposed or if there is inadequate tooth structure remaining then full-



Figures 3a and b: This patient had Tetracycline Staining Type I. The treatment involved extensive bleaching over an eight-week period



Figures 4a and b: This patient had a non vital upper left central tooth which was traumatized in a sporting injury. An attempt was made to bleach the tooth but this was insufficient. Bleaching of the non vital tooth was undertaken using 20% carbamide peroxide sealed into the tooth first for a period of two weeks. This was followed by bleaching of all the upper then the lower teeth



Figures 5a and b: Preparative Assessment. This patient had a dark yellow/brown staining to the teeth. The treatment undertaken consisted of advanced extensive bleaching and cosmetic casting and bonding



Figures 6a, b, c and d: This patient had experienced tooth erosion over a number of years resulting in considerable loss of tooth enamel. Given that retention of any veneer placed in this situation would likely be unsatisfactory, combined with the high risk of porcelain fracture, full coverage dentine-bonded, upper and lower porcelain crowns were placed following the use of a Dahl appliance to create sufficient inter-occlusal clearance

coverage restorations are superior choices. All-ceramic dentine-bonded crowns depend less on bonding for retention as they possess a degree of intrinsic retention form (Figures 6a, b, c and d). In the case of discoloured non-vital teeth, if there is sufficient tooth structure remaining then, as already discussed, the tooth can most likely be bleached. However if there is insufficient enamel and the tooth is undermined with a large composite restoration, it may be better to place a post and crown on this tooth.

Composite bonding

Bonding composite resin onto the anterior surfaces of the teeth is a conservative alternative to porcelain veneers. It can be used in many ways. The first option is to use it as a diagnostic treatment for the patient to assess proposed changes. The bonding can be undertaken as an interim treatment for patients to view. Bonding can also be used for younger patients to mark out large white lesions that are not amenable to bleaching and this can be beneficial to mark the unsightly stain. Using the advanced composite layering technique incorporating dentine and enamel shading excellent results can be achieved. From the previous discussion it can be seen that there exists a continuum of possible therapies ranging from the least to the most invasive with veneers positioned towards the latter despite their 'billing' as a conservative procedure. Patients should be informed of the implications and likely outcome of each treatment option given before commencing the treatment.

Only when use of one or more of the least invasive options has been ruled out should veneers be considered. At that point the decision should be taken between veneers and full-coverage restorations. This decision will be based on such factors as:

Degree and nature of discolouration

The darker the tooth the more likely the need for a full coverage restoration to allow for sufficient tooth reduction (most likely into dentine) thus permitting an adequate thickness of porcelain to mask the darker colour. This scenario is especially common in tetracycline-discoloured teeth where the tooth colour actually gets darker the deeper into the tooth one prepares. Conversely, where the discolouration is more superficial in nature then ceramic veneers are likely to be appropriate.

Size and extent of existing restorations and tooth tissue loss

The more extensive these are the greater the requirement for full coverage. The greater the degree of tooth wear, again, the more likely the need for full coverage. Similarly, the more time veneers have been replaced the more likely that full-coverage restorations will be indicated. In those instances where ceramic veneers are used to mask old restorations, it is important that such existing fillings be replaced and the veneers bonded within the two week period following replacement to maximise bond strengths between the two restorations (Walls 2002).

In conclusion, the veneer is an excellent restoration when

used wisely. It has the ability to transform the appearance of a tooth but the operator must be aware that alternatives do exist and may provide a much more appropriate treatment option.

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