The single incisor

In the next in our serious on Aesthetic Dentistry, Melbourne practitioner Geoffrey M. Knight charts a course for that most difficult of treatments, the unaesthetic single incisor.

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One of the challenges of aesthetic dentistry is to create a single incisor that blends undetected into a patient's smile. This is particularly true with a central incisor that not only has to be optically similar but also, dimensionally, a mirror image of its adjacent number.

The biological and financial costs of every dental procedure require thoughtful evaluation, especially where there is a range of available treatment options, each of which needs to be weighed to optimise the unique clinical situation.

A patient presenting with a sound, but unaesthetic, tooth has four options, assuming that extraction is not a viable alternative. These options are:

- To leave the tooth alone;
- To have the tooth crowned;
- To have an indirect porcelain laminate;
- To have a direct resin laminate.

The option of leaving the tooth alone is one that must be put to a patient, particularly if the flaw or defect causing the concern over appearance is minor. A realistic approach to this question is necessary so that an informed decision, based upon each patient's individual circumstances, may be reached. There are no fiscal or biological costs associated with such a procedure and it is certainly the most predictable of the four choices.

Single porcelain crowns

Modern porcelains enable clinicians to achieve superb aesthetics with a single crown, however such a procedure inflicts substantial biological and fiscal costs. Apart from the obvious mutilation of sound tooth structure required for preparation, such a tooth is predisposed to future endodontic and periodontal problems, a reduced resistance to caries and the potential for occlusal disharmony associated with increased wear on opposing teeth.

The predictability of a crown is based on its mechanical strength but this does not take account of possible tooth fracture or any of the problems mentioned above. Future treatment options are few, basically locking a patient into more of the same once cervical gingival recession or colour changes in surrounding teeth create further aesthetic problems.

Porcelain laminates

A porcelain laminate is a conservative alternative to a crown, although most clinicians prescribe some enamel removal from labial surfaces, and once these surfaces have been prepared an irreversible change has occurred. The amount of tooth removed is related to the severity of the aesthetic problem as indirect veneers may require spacers for luting cements to disguise discolouration of underlying tooth

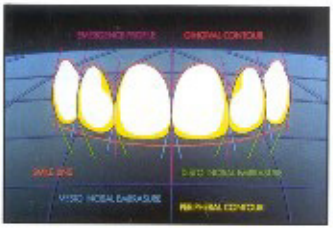

Figure 1

structure. Once cemented in place a porcelain veneer is an extremely strong and durable restoration to the extent that incorrect occlusal adjustment will

Figure 2

wear teeth in an opposing arch.

The predictability of these restorations is not dependent upon strength but on a preparation design that hides the tooth- laminate interface, as resin cements with low filler contents tend to wear at the margins creating defects that predispose to the growth of small unsightly yellow areas ('little yellow pumpkin flowers') after about 3 years.

Direct resin laminates

The direct resin laminate enables a clinician to solve an aesthetic problem without the burden of impressions, the construction of temporary restorations and laboratory costs. Along with zero, or minimal, tooth preparation, this technique is the most frugal biological and fiscal means of attending to an aesthetic flaw. The predictability of these laminates is dependent upon the clinician maintaining the same standards of excellence expected of a laboratory when constructing indirect alternatives. A comprehensive understanding of anterior occlusion is required as incorrect occlusal adjustment will result in a fracture of the veneer, although this must be the preferred alternative to causing wear of natural teeth in the opposing arch.

General principles

Irrespective of the technique employed, an understanding of anatomical form and the optical properties of tooth structure are necessary for the successful resolution of an aesthetic problem.

Anatomical form

Symmetry about the midline is an essential component of aesthetics. Each

central incisor needs to be a mirror image of the other to maximise the harmony of the smile. Apart from the obvious dimensions of height and width, it is important to consider the emergence profile of the distal and mesial borders and the emergence profile of the facial contours. Figure 1 shows the parameters around which symmetry should be achieved.

Figure 4

The facial emergence profile becomes particularly important when a minimum intervention technique is adopted and some masking is required to cover stained or hypoplastic enamel. The choice has to be made either to remove some stained enamel or veneer one or both adjacent teeth in order to maintain facial harmony.

Surface texturing is important to achieve a natural lifelike result when matching incisor teeth. For direct veneers it is valuable to use features of an adjacent tooth as a guide, when characteristics such as deep surface grooves, surface rippling and perikymata may be recreated for balance and harmony between a natural tooth and a veneer.

Optical properties

The perception and recreation of colour can be broken down into several components.

- Hue is the actual wavelength of light that distinguishes parts of the visible spectrum.
- Chroma is the intensity of the hue

Figure 3

in a colour. As the chroma increases the colour becomes saturated, it is similar to adding drops of dye into a glass of clear water. The more drops the higher the chroma becomes.

- Value is the degree of white or black (brightness) incorporated into a hue. The more white in a hue the higher the value. Many opaquers use intense white pigments that will

Figure 5

reduce the saturation (chroma) of a hue as the brightness increases.

As the enamel thins towards the cervical margin the dentine colours start to shine through. In natural teeth, shades in this region appear darker and more saturated than other areas on the tooth surface. Similarly, as the enamel thickness increases towards the incisal third and proximal regions, the chroma reduces and the value increases, due to the increasing thickness of the opalescent enamel.

Ageing causes enamel to become translucent, causing the yellow tone of the dentine to shine through. It is for this reason that lightly opaquing out mature enamel has a rejuvenating effect when incorporated into a laminate veneer.

Tinting to create areas of enamel hypoplasia and craze lines become routine with experience. It is useful to remember that there is a tendency to overdo such aesthetic modifications which may then detract from the completed result.

Case study

A case study demonstrates how composite resins may be used successfully to create a veneer that blends comfortably into a patient's smile. A young woman presented with a discoloured right central incisor, Figure 2. Anatomically the left central incisor was positioned slightly lingually and the gingival margin of the discoloured tooth was a little short of that of the left central incisor.

The surface texture of the right central incisor did not appear difficult to reproduce. However the discolouration of this tooth presented a major clinical problem as the cervical third was heavily stained. The central third exhibited a lower value and possibly a browner hue than the adjacent teeth and the incisal third had an unusual area of increased value, similar to the left central incisor, which presented an inherent problem for good reproduction.

Internal bleaching may have been an alternative option in this situation, however the procedure is often unpredictable and there have been reports in the literature of internal resorption associated with this technique. Gingival recontouring was suggested but declined by the patient.

When placing direct veneers the decision to remove tooth structure is taken as the last option and is not an automatic component of treatment. In this case it was decided that the intensity of the cervical staining was such that a small amount of cervical enamel should be removed to enable placement of sufficient opaquer to mask the stain.

The adjacent gingival tissues were treated with a small amount of Trichloroacetic acid to control gingival exudate and about 1mm of the cervical enamel was removed with a course, cone shaped, diamond bur (Figure 3).

The remaining tooth surface was cleaned with a pumice and water slurry and after etching with 37 per cent phosphoric acid for 20 seconds, the surface was flushed with water and dried with oil free air. After applying enamel bond the cervical area was covered with a thin layer of opaque resin (P50 Y shade)[3] and cured (Figure 4).

After recoating the surface with enamel bond, a thin layer of microfill resin (Durafil VS Shade A 10)[4] was placed over the cervical and middle sections of the tooth and cured (Figure 5). This was judged to be sufficient to lighten the hue and increase the value in line with the adjacent central incisor.

Figure 6

In order to preserve the unusual enamel defects in the incisal third a thin layer of incisal resin, (Silux Plus Incisal shade)[3] was placed over this region and interproximally with the aid of mylar strips (Figure 6).

Anatomical contouring was carried out with 12 bladed carbide burs and abrasive discs. Surface texturing was achieved with a high speed carborundum stone and polishing was completed with rubber polishing discs and fine polishing wheels (Figure 7). A week later the patient returned for a final assessment and polish of the veneer (Figure 8).

The improvement is demonstrated by comparing the young lady's smile before placing the veneer, Figure 9, with the aesthetically enhanced lipstick smile afterwards (Figure 10).

Figure 7

Figure 8

Figure 10

The final word for such procedures is 'persistence.' Direct laminate veneers challenge both the academic and artistic skills of dentistry. Acceptance of the fact that an unsuccessful outcome is a learning experience, reduces frustration levels and will eventually lead to a high level of competence in this rewarding field.

Figure 9

[3]3M Dental Products Division, St. Paul, Minn., USA.
[4]Heraeus Kulzer GmbH, Friedrichsdorf, Germany.

Products are identified as a guide to readers based upon the author's experience. It is acknowledged that similar materials are available for the technique described.

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