

Treatment of the social six: smile makeovers in adults

A smile makeover can transform a dull or embarrassing smile. This article is an easy-to-read review of the options available for correcting some of the common cosmetic dental complaints in adult patients: crooked, missing and discoloured teeth

The appearance of the top front teeth, occasionally referred to as the 'social six', is of concern to a growing number of adult patients. There has been a gradual change in attitude towards dental self-appearance, with less acceptance of aesthetic or functional decline (*Figures 1a and 1b*).

In this article we will take a whirlwind look at the modern methods for treating the more common adult patient concerns and solutions regarding their top front teeth, namely:

1. Crooked or misshapen teeth
2. Missing teeth
3. Discoloured teeth.

Crooked teeth

Crooked teeth can be corrected using:

1. Orthodontics
2. Restorative treatment
3. A combination of orthodontics and restorative treatment.

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Orthodontics: how does it align crooked teeth?

There is no upper age limit to orthodontics, so long as the teeth and gums are healthy.

Traditional fixed braces consist of tooth attachments (usually metal brackets) connected by orthodontic archwires. During the early stages of treatment the archwires used are thin and very flexible. Before being inserted into the brackets, the archwire is in the shape of a perfect arch. The wire is distorted from this shape in order to be tied into the brackets. As these wires are very elastic they will try to regain their original shape. In doing so, they will act to pull along the teeth attached, thus the teeth are gradually aligned into a perfect arch shape.

These days, orthodontic appliances can be quite discrete. Traditional metal brackets can now be tooth-coloured and can even be bonded to the lingual aspects of the teeth (lingual orthodontics), and thus rendered completely invisible to onlookers.

Advances in CAD-CAM computer technology has led to the development of the Invisalign® technique. A digital scan of impressions of the top and bottom teeth can be used to generate 3D images of the teeth. A computer program is used to simulate the gradual alignment of the teeth, both individually and collectively as instructed by the treating clinician. Stereolithographic models are fabricated and are used to construct a series of 'invisible' plastic shields to fit over the teeth. Each one in the series moves the teeth a little closer

to its final destination. Good evidence is lacking regarding its efficacy (Lagravere and Flores-Mir, 2005) and this technique is best suited to the less complicated malocclusions. A similar aligner-based technique is Clearstep®, although this has a much smaller market-share.

Restorative treatment: using restorations to improve the appearance of crooked or misshapen teeth

Restorations can be used to improve the appearance of malaligned teeth. For each tooth the restoration can either be made directly at chairside (usually composite resin restorations) or indirectly by a dental technician from a laboratory impression (normally porcelain veneers).

Also, the restoration can be constructed either with or without tooth preparation.

The purpose of tooth preparation is to:

1. Improve retentiveness, strength and cleanliness of the restoration
2. Provide space for ideal restoration thickness
3. Allow for some thinning of the labio-lingual thickness of the tooth in order to improve perceived alignment of the teeth once the restoration is in place.

The major down side of tooth preparation is that healthy tooth substance is removed. If this is done excessively—as is the temptation to achieve a better aesthetic result (Brunton et al, 1997)—then the long-term restorative burden to the patient is dramatically increased and the life of the tooth could be compromised.

Indirect restorations: porcelain veneers

Veneers are false fingernails for the teeth, providing excellent aesthetics and are resistant to staining (Figures 2a, 2b, 2c and 2d). A prospective 10-year study reported that only 4% of the porcelain veneers followed needed to be replaced at the 10-year recall (Peumans et al, 2004).

The traditional material for constructing veneers is feldspathic porcelain and they usually require a conservative amount of tooth preparation. It is generally thought that a thickness of 0.5 mm is needed for adequate strength and aesthetic qualities of the veneer, although some of the newer veneer 'brands' claim that only 0.3 mm is required. Thinner veneers are less destructive to the teeth and can often be placed with no tooth preparation. However, historically they tend to be weaker with poorer aesthetics (Kois and McGowan, 2004).

Some dentists have invested in CAD-CAM technology (e.g. Cerec®, E4D®) and can make veneers without requiring the traditional lab work. This means that the veneers can be manufactured as the patient sits in the chair and can be cemented on the same day as the initial appointment. This method requires the dentist to be the 'artist' instead of the dental technician.

Direct restorations: composite resin restorations

Tooth-coloured materials applied judiciously can 'trick' the eye into seeing dental alignment. For example, by adding tooth-coloured material to an uneven incisal edge the smile line can be pleasantly affected.

Composite resin is the material of choice for small additions to teeth. These can be bonded to the teeth with no or little tooth preparation. The main disadvantage is the possible long-term burden of these restorations.

Also, without actually failing, the edges of a composite restoration—where it joins to the natural tooth—can easily



Figures 1a and 1b. A dental 'make-over'. An elderly patient with severe tooth surface loss. Teeth 15 to 23 restored with zirconia crowns



Figures 2a, 2b, 2c and 2d. The top images show a discoloured composite resin veneer on tooth 11, placed 15 years earlier. The images below show its replacement with a porcelain veneer. The adjacent tooth 21 is an implant supported single crown. Please note the asymmetrical gingival contour of teeth 11 and 21, but this can't be seen on wide smiling

pick up staining. This may render the restoration 'unaesthetic'.

Composite resin restorations can also be used to make larger restorations or free-hand veneers (Figures 3a and 3b). These cover the labial surface of the tooth and have the advantage that they can be constructed immediately for instant patient gratification. This comes with the significant downside of shorter average lifespan and poorer potential aesthetics when compared with lab-made veneers. The main advantage of composite veneers would be their relative cost compared to lab or CAD-CAM made veneers.

How can veneers (or crowns) straighten crooked teeth?

If a tooth is set back relative to the other teeth: the labio-lingual width of the tooth can be increased by adding material to its labial surface, thereby artificially giving the appearance of alignment. The main disadvantage is that the crown can become too thick in relation to the root. This can create a 'step' between the root and the crown (known as the 'emergence angle') which can be unsightly and difficult to clean.

If a tooth is set forwards relative to the other teeth: The labio-lingual thickness of the



Figure 3a and 3b. Severe tooth wear due to parafunction. Teeth 12 to 22 and 32 to 42 had composite resin veneers placed due to financial constraints. The rest of the teeth were restored with porcelain fused to metal restorations

tooth can be reduced by removing relatively more tooth substance than the thickness of the restoration replacing it. The restoration will be thinner than the enamel removed, thus improving the alignment.

The main concern here is the damage done by the removal of excessive healthy tooth substance as mentioned previously. As well as damage to the actual tooth, the exposed dentine does not bond as strongly to the veneer and the tooth may now require a full coverage crown.

If a tooth is rotated: A combination of the aforementioned methods can 'derotate' a tooth.

Essentially, the teeth are aligned by the relative removal of labial enamel on the side protruding, and addition of restorative material to the side turned in. The main drawbacks of this are now the combined problems of tooth damage and increased emergence angle.

It should be noted that restorations can and should only be used to straighten teeth which are very mildly malaligned. There is concern that some clinicians are pushing-the-envelope with this technique and patients are not making fully informed decisions (Jacobson and Frank, 2008), which will result in future dissatisfaction.

Combined orthodontics and restorative treatment to align and improve smile aesthetics

The purpose of combined orthodontic and restorative treatment is to facilitate the greatest functional and aesthetic

gain for the least long-term restorative burden. Orthodontic treatment can move the teeth into a position that will make the restorative phase more predictable or will lessen the amount of invasive tooth structure removal.

Missing teeth

Fixed solutions for replacing missing teeth include:

1. Resin-bonded bridges (RBBs)
2. Conventional bridges
3. Implants
4. Orthodontics to close the space.

Resin bonded bridges (RBBs)

The 'false' tooth (known as the pontic) is attached to a 'wing', usually metal, which is bonded to the lingual side of the adjacent tooth. This is a relatively non-invasive technique as there is very minimal damage to this tooth. Should the restoration fail, at least little harm has been done to the remaining dentition.

Ideally the pontic is attached to just one adjacent tooth. For a RBB to be an option, the adjacent teeth need to have a sufficiently large area of healthy enamel for the wing to be securely bonded.

Although often an attractive option, RBBs tend to be less mechanically robust than conventional bridges—failing more often (albeit with less serious implications)—and the metal wings can have a 'shine-through' effect, making the enamel of the supporting tooth appear dark (Wyatt, 2007).

Conventional bridges

The most commonly used type of bridge, consisting of a pontic fused between two crowns that are anchored on neighbouring teeth or implants. The bridge can be fabricated from an all-ceramic material or traditional porcelain fused to metal.

The disadvantage of this type of bridge is that significant tooth structure is removed from the adjacent teeth to accommodate their load-bearing restorations. Also, the teeth supporting the bridge have a significantly decreased life-span when compared with similarly restored free-standing teeth (Goodacre et al, 2003).

Implants

Contrary to popular opinion, dental implants are not the all-curing panacea they were once thought to be. They can fail just like conventional treatments, although their survival rates do tend to be consistently better (Torabinejad et al, 2007). As no adjacent teeth are affected by the treatment, this option is seen as less invasive, and over the years, potentially more cost-effective.

Implants are made of titanium which fuses (osseointegrates) to the alveolar bone. Aesthetic and functional crowns can then be attached to this metalwork. There are many different implant systems available on the market.

Ideally 1.25–1.5 mm clearance is needed between the implant and adjacent teeth. Also, at least 1 mm of bone is needed both buccally and lingually (Leblebicioglu et al, 2007). Cone-beam CT imaging is the gold standard for ascertaining bone volume in potential implant sites.

There is debate and controversy about the best time to insert an implant following loss of a tooth and how soon after placement it can be functional. There are also various techniques available to generate more bone and/or space (including orthodontics) for implants, although this is beyond the scope of this article.

Orthodontics—to close spaces left by missing teeth

Orthodontic treatment can sometimes

be considered to close gaps, but this is not as easy as one might imagine. Closing space orthodontically depends upon the particular malocclusion. This is because closing space of one missing tooth will invariably lead to some retraction of the front teeth and a shift of the dental midline. In many cases this could lead to a reverse overjet as well as an asymmetrical appearance, which would not please the patient.

As mentioned previously, orthodontic treatment can be used in conjunction with restorative treatment to maximize the cosmetic and functional gain while minimizing the long-term restorative burden. For example, uprighting a tooth prior to the construction of a fixed-fixed bridge will make it a lot easier to construct without removing large amounts of tooth substance; or re-shuffling the remaining teeth can shorten an edentulous span thereby lessening the stress on the eventual bridge.

The use of temporary anchorage devices (TADs) in orthodontics has expanded the situations in which the orthodontist can assist the restoring dentist in this manner (Cope, 2005). TADs provide absolute anchorage for tooth movements and are useful when there are multiple missing teeth or if teeth need to be moved in difficult directions.

Discoloured teeth

Teeth in aging patients are commonly described as 'tombstones' in comic literature. This is undoubtedly in part reference to their darkened appearance. Teeth can be discoloured due to internal or external staining. External staining can sometimes be dealt with using physical cleaning only—scaling and polishing. Internal staining can be treated by bleaching alone or in combination with restorations such as porcelain veneers.

Bleaching works through the action of hydrogen peroxide applied either directly or via chemical reaction from carbamide peroxide or sodium perborate. Hydrogen peroxide is an oxidising agent that produces reactive

molecules which enter between the enamel prisms and break up the long, dark coloured molecules into smaller, less coloured ones. Hence the optical change in appearance. It is thought the bleaching solution reaches into superficial dentine.

There are three main types of dental bleaching available:

1. Home bleaching
2. Assisted bleaching
3. Power bleaching.

Home bleaching

For home bleaching (first described by Hayward and Heymann, 1989), a bleaching gel and a custom made delivery tray are required. Most systems now use around 10% carbamide peroxide; although some use higher carbamide peroxide, others low dose hydrogen peroxide and some use sodium perborate.

Custom trays containing the active bleaching compound are worn for up to several hours per day over a period of about one to two weeks. This usually lightens the teeth by about 7 shades on the Vita scale.

The advantages of home bleaching are that it is more economical than power bleaching or assisted bleaching and the patients can bleach at their own convenience. Often orthodontic retainers can be used as trays for the bleaching product.

The disadvantages are that custom trays are required, many patients want instant results and that compliance is required.

Assisted bleaching

Assisted bleaching is really just a booster to concurrent home bleaching; done in the dental chair with a higher concentration of bleaching material. The advantages are that results can be achieved faster and that less patient compliance is required.

Power bleaching

Power bleaching uses high concentrations of hydrogen peroxide—

around 30–50%—and is performed in the dental chair. The hydrogen peroxide gel is applied to a thickness of 1–2 mm and usually needs activation: chemical (i.e. mixing) or light (and note, not a heat light).

It is essential to protect the gingivae: either a rubber dam or a light-cured resin shield with cheek/tongue retractors. If a rubber dam is used, the gel can be applied to lingual surfaces as well for theoretically enhanced results. Normally there are 3 applications of 10–20 minutes in one sitting. It may involve two or more sittings, separated by at least 7 days.

It should be noted that a great deal of the instant effect can be attributed to tooth dehydration and will rebound once the tooth rehydrates—the patient needs to be warned about this.

The advantages of power bleaching are that you get the 'wow' effect from a dramatic change in a short space of time and patient compliance is not an issue.

The disadvantages of power bleaching are increased chairside time, extra materials (rubber dam or resin shield), and tooth colour 'rebound' following tooth rehydration which can result in patient disappointment.

Dentine hypersensitivity and bleaching

Transient dentine sensitivity is common to all bleaching products and is the main side-effect, affecting 10–60% (Tan, 1999). The evidence is mixed as to which bleaching method causes the greatest degree of sensitivity; however, it is generally recommended to use the lowest concentration of active hydrogen peroxide to achieve a good clinical result.

Conclusion

A pleasing smile can be achieved through orthodontics, restorative treatment, bleaching or various combinations of all three. The use of veneers to artificially align teeth is an increasingly common technique, although it should be reserved for only very mild malalignment. Orthodontics is usually the first choice

KEY POINTS

- **The conservative way to straighten mildly malaligned teeth is orthodontic treatment.**
- **Mildly malaligned teeth can be 'straightened' by the placement of veneers following tooth preparation.**
- **Proper informed consent is very important if a patient chooses to forgo a conservative treatment in favour of an invasive one.**
- **Fixed options for replacing missing teeth include resin-bonded bridges, conventional bridges or implants.**

for treatment. Often a combination of orthodontics and restorations can be optimal. Bleaching improves the appearance of darkened teeth and this can be a stand-alone procedure or in conjunction with restorative techniques such as veneers. DN

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