Minimally invasive veneers

Galip Gürel[1]

The demand for aesthetic dentistry is increasing as more and more patients come to desire the perfect smile. Treatment planning, in advance, is the key to fulfilling the individual expectations of the patient and to ensuring a guided treatment plan with stress-free, repeatable procedures.

A reliable clinical concept should pre-visualise, step-by-step, a final aesthetic outcome that can be shared and discussed with the patient. Before the reconstruction starts, this communication process should produce a definitive aesthetic solution.

Finally, a two-step simulation of form, function and phonetics (using a 90% correct direct and a perfect indirect mock-up) helps to ensure a predictable outcome without time consuming redoing, reshaping or general failure.

All-ceramic restorations are the material of choice to simulate the natural tooth structure. During preparation, the natural tooth, particularly the enamel, should be seen as a precious commodity to avoid harming the patient without any reason.

In addition, being minimally invasive and preparing just the enamel for a restoration raises the success rate of veneers to 99%, because the bond strength to enamel is significantly higher.

The problem starts when the labial enamel gets lost. When the dentine is exposed, the tooth flexes 200% more, transferring stress to the rigid porcelain. As a result, the risk of adhesive failure and fractures is increased dramatically.

Case study

This patient, a 50-year-old male, presented to the practice because he did not like the aesthetic appearance of his dentition (Figure 1). In general, he complained about the yellowish colour and irregular position of the teeth in his upper and lower jaws.

Initial photo documentation illustrated several aesthetic problems. The incisal edges of the upper central incisors were at different levels (Figure 2). Due to that, the upper left central incisor was elongated and presented obvious signs of abrasion. The canines were also worn, leading to a loss of physiological guidance.

Due to the position of the upper lip, the smile line showed a harmonious gingival margin and a correct midline on the upper jaw, whereas the lower teeth presented severe overcrowding (Figure 3). Multiple gingival recessions presented generally in the aesthetic zone, except for the left upper incisors.

The central incisors – UR1, UL1 and UL2 – were rotated out of the dental arch. The overcrowded incisors in the lower jaw were generally over-erupted and exhibited tipping and migration. The patient had no functional problems. There was no divergence between the centric condylar position and the habitual intercuspation.

However, the lower teeth definitely needed orthodontic treatment. Functionally, the attrition on the incisal tips of the canines needed to be restored in order to recreate the natural canine guidance.

[1] Dr Galip Gürel, DDS, Private Practice, Istanbul, Turkey.

Figure 1: The patient's smile before treatment started

Figure 2: Close up of maxillary teeth – note different incisal levels

Figure 3: Close up of both maxillary and mandibular teeth – note overcrowding in lowers

Figure 4: Diagnostic mock-up in the mouth using Ecusphere Shape

Direct aesthetic simulation

A very important step in identifying the expectations of the patient and proving the clinical feasibility, is to simulate the aesthetic outcome directly in the mouth. In this case, Ecusphere Shape (DMG) was used, without any bonding procedure, to sculpt the first idea of an optimised aesthetic result.

The consistency of this composite material enables very fast modelling with the fingertip and a spatula.

First, the labial facade was contoured to visualise the aesthetic smile design. After light-curing, the functional incisor-palatal area was simulated with the imprint of the static and mobile occlusion.

In this case, establishing the anterior guidance was not essential at this stage, because in a second step, the arch in the lower jaw was to be harmonised by orthodontic treatment and then veneered.

Shaping (morphing) was performed from the upper right first premolar to the upper left first premolar to fill up the buccal corridor harmoniously (Figure 4). In a steady dialogue with the patient, subtractive fine adjustment took place with a sandpaper disc to remove excess parts of the direct mock-up and for fine tuning.

Ecusphere Flow (DMG) was applied to areas that needed a bit more additive recontouring, in order to finalise the aesthetic design. The aesthetic result was confirmed in cooperation with the patient.

After minimal changes, the first simulated outcome was finally satisfactory for the dentist and – even more importantly – for the patient. The intraoral simulation was documented by photography.

An impression was taken with the direct mock-up situation to give the technician as much detailed information as possible, and provide all the necessary references for the final wax-up.

Meanwhile, alignment of the teeth in the lower arch was commenced with orthodontics.

Indirect aesthetic simulation

Using the essential information of the direct intraorally contoured mock-up, the technician was able to create the ideal aesthetic outcome with a wax-up (Figure 5).

The reconstruction of the aesthetic zone was copied from the direct mock-up by the technician, working from the upper right second premolar to the upper left second premolar to fill up the buccal corridor.

The canine guidance was optimised on the articulator to accomplish disclusion of the posteriors in dynamic occlusion with the newly-aligned lower teeth. This physiological guidance avoids uncontrolled forces in the molar region,

Figure 5: Laboratory wax-up on a model

enabling a long-lasting reconstruction. Three silicone impressions were taken from the idealised wax-up on the model:

1. Simulation and guidance: the first impression, with Honigum Putty (DMG), was taken to create an index, transferring the idealised aesthetic and functional outcome intraorally, with an indirect mock-up as an aesthetic pre-evaluative temporary (APT) and to establish minimally invasive preparation guidance. The index was cut back following the garland-shaped gingival line to ensure easy excess removal
2. Preparation control: the second impression was taken also with Honigum Putty (DMG) to establish a preparation index controlling the vestibular and incisal areas for the restorations during the procedure. The palatal part was cut out, including the incisal edges, to enable length control. The remaining vestibular index was sliced in several horizontal layers, showing step-by-step the amount of tooth substance that was to be removed
3. Provisional procedure: the third impression of the final wax-up was taken with a transparent silicone, for an index that was cut back horizontally in the cervical region for a two-stage provisional procedure with Luxatemp Fluorescence (DMG) and Ecusphere Shape (DMG). In most cases, the dentist can use the first silicone impression for the fabrication of the provisional restorations (Figure 6).

Figure 6: Silicone templates formed using the wax-up

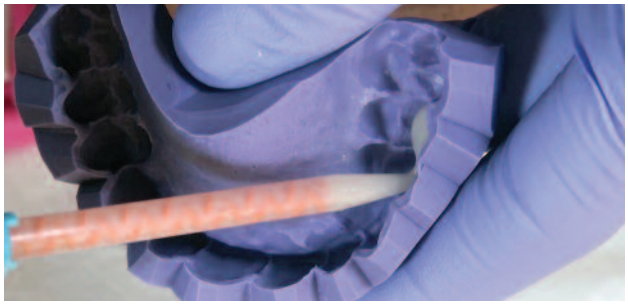

Figure 7: Syringing Luxatemp Fluorescence into the silicone index

Guided mock-up preparation

Luxatemp Fluorescence (DMG) was syringed into the first silicone index and inserted over the dental arch (Figure 7). The excess was removed in the gel phase along the gingival margin, guided by the garland-shaped cut-back. The idealised wax-up was then transferred to the aesthetic zone. This procedure takes place without anaesthesia to enable the patient to maintain full control of the lips.

In 2003, this simulation was named APT (aesthetic pre-evaluative temporary) by the author (Gürel, 2003). The APT provides a final opportunity to share the outcome with the

Figure 8: APT temporary mock-ups in situ

Figure 9: Notches prepared in vestibular surfaces, highlighted using a pencil

Figure 10: Incisal notches prepared on upper anterior teeth

Figure 11: Teeth after APT removed – pencil highlighted notches clearly visible

Figure 12: Reducing the vestibular surfaces with a diamond bur

Figure 13: Shade selection

patient in terms of aesthetics, function and phonetics, and, if needed, to discuss any changes before guided preparation through the mock-up takes place (Figure 8).

In order to be truly minimally invasive and 100% precise during the preparation, the APT has to stay in the mouth for predictable reduction of the enamel. To facilitate a solid guidance of the bur, initial preparation is performed through the APT.

In this case, a depth cutter was used to create three horizontal cuts in the cervical, central and incisal parts of the mock-up. The shorter premolars were provided with two horizontal cuts for the same procedure (Figure 9). The incisal edges were reduced with two vertical cuts of at least 1.5mm to create enough space for the technician in this delicate aesthetic area (Figure 10).

Utilising these depth marks, the complete incisal edge was reduced evenly with a butt-joint preparation, or remained untouched according to the additive nature of the APT.

The horizontal preparation lines were marked with a pencil. The residual mock-up (APT) was removed with a scaler. Surfaces that would need to be reduced during the preparation remained with the imprint of the pencil (Figure 11).

Consequently, selective preparation could be performed, focused on the marked areas, to guarantee an even, sufficient thickness of the all-ceramic restorations, leading to a harmonious dental arch.

After this targeted reduction of enamel with a coarse-tapered diamond bur, the vestibular preparations were

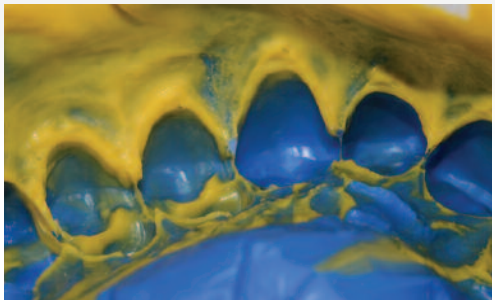

Figure 14: Honigum Pro impression – note high definition detail reproduction

Figure 15: Spot etching with phosphoric acid gel

extended evenly along the buccal surfaces from the incisal areas to the gingival areas, creating smooth chamfers in the enamel there (Figure 12).

The cervical margins consequently stayed in the enamel above the recessions. Establishing a reliable bond to the enamel was the main goal here.

The cervical preparations were extended into the interproximal areas. Here, the preparation margins were shaped with a light chamfer, remaining on the labial sides of the interproximal contact points, without loosening the proximal contact surfaces for stable conditions without any drifting. The preparation surfaces were smoothened with a polishing disc. The tooth shade was determined before the impression procedure took place (Figure 13).

Impression and provisionalisation

The impression was taken with the double mixing technique, using the precision a-silicone Honigum Pro heavy and light (DMG) without any retraction cord due to the supra-gingival preparations. Using Honigum Pro light allowed the finest details to be recorded (Figure 14). The high-precision impression material, with excellent flowability under pressure, was syringed over the preparations and stayed in situ until the impression tray containing Honigum Pro Heavy was inserted.

Provisionalisation was performed using the spot etch technique. Small areas were etched with phosphoric acid on the labial surfaces of the preparations (Figure 15). The etching gel was rinsed away with water spray.

After drying with air, the one-bottle adhesive Teco (DMG) was applied with a brush on the etched spots and light-cured. The adhesive spots enable intermittent adhesive bonding to the provisional composite material, Luxatemp Fluorescence (DMG), which was applied using the third transparent silicone index.

This index was cut back horizontally, 1mm coronal to the tips of the papilla, for second stage provisionalisation, avoiding harm to the gingiva during the removal of excess material. Luxatemp Fluorescence was applied to the index and inserted over the preparations to cover only the incisal thirds of the preparations' surfaces. Excess was removed easily in the gel phase.

Once the incisal thirds of the provisional restorations were fully polymerised, the cervical regions were individually and precisely shaped using the freehand placement technique. The composite Ecusphere Shape (DMG) was used for this finalisation, being adapted meticulously to the cervical margins with the help of a spatula.

Finishing was performed with a fine diamond bur and polishing discs without touching the soft tissues. To accomplish a smooth and shiny surface, Luxatemp Glaze & Bond (DMG) was applied with a brush avoiding any contact with plaque (Figure 16).

Veneer cementation

Pressable E.max veneers (Ivoclar Vivadent), layered with feldspathic porcelain, were fabricated from tooth UR5 to UL5 in the dental laboratory. The spot etch technique enabled easy removal of the provisional restorations with a scaler. The preparation surfaces were cleaned with Consepsis Scrub (Ultradent). The definitive placement of the final restorations was performed using the Vitique cementation system (DMG). With its try-in pastes in various shades, analogous to the adhesive cements, the Vitique system enables detailed simulation of the final result. Due to the thinness and translucency of the porcelain veneers, this step was given maximum attention.

The restorations were tried-in using the glycerine gel try-in

Figure 16: Temporaries after Luxatemp Glaze has been applied

Figure 17: Veneers in situ using the appropriate shade of Vitique try-in paste

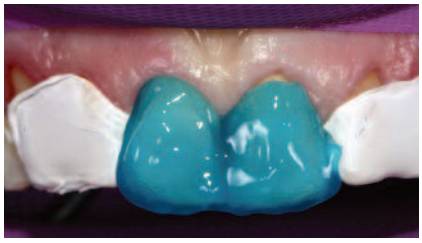

Figure 18: Acid etching the teeth prior to permanent cementation with Vitique

Figure 19: Applying Vitique to the fitting surface of a veneer

Figure 20: The veneers in situ

Figure 21: Close-up of the veneers in situ

Figure 22: The patient's smile after treatment was completed

pastes from the Vitique cementation kit (DMG), simulating the final outcome perfectly (Figure 17). When the fit and shade results were satisfactory for the clinician and the patient, final adhesive seating could be performed completely predictably. The cores were cleaned again with water spray and then the veneers were luted in situ.

The veneers were etched with 5% hydrofluoric acid and silanised with the two-bottle system, Vitique Silane (DMG), to enhance the bond strength. The preparations were conditioned for 20 seconds with 37% phosphoric acid, for adhesive bonding with Teco (DMG). The one-bottle-adhesive was blown into a thin layer for five seconds.

First, the upper central incisors were treated simultaneously to ensure symmetrical positioning. Neighbouring teeth were protected with Teflon tape (Figure 18). Using the special veneer tip, an even and flat strip of Vitique (DMG) cement was applied to the acid-etched veneer from the incisal to the cervical region (Figure 19). The veneers were manually placed gently with the thumb and forefinger, from incisal to cervical.

Once the restorations were finally seated (Figure 20), initial light-curing for only one to two seconds per veneer was performed from all sides. The excess of the cured gelatinous luting cement could now be removed easily with a scaler. The situation subsequently underwent final light-curing for 40 seconds per veneer from each side. Final adjustments in the marginal areas were carried out with a rubber polisher. Subsequently, the whole veneering procedure was repeated in the lower jaw, optimising the aesthetic outcome and establishing a final anterior guidance.

Conclusion

Even dentists who have the manual skills may not have the courage to do aesthetic veneers.

They are afraid of aesthetic failures, due to the high cost of treatment and high expectations from the patient. In the minds of these clinicians, the aesthetic zone presents an unpredictable risk.

With the two-step direct and indirect mock-up technique, the aesthetic outcome can be discussed and finally established step-by-step with the patient.

When the mock-up simulation convinces both the dentist and the patient, it offers a reliable minimally invasive guide line for a satisfying aesthetic outcome.

A subsequent preparation, limited to the enamel, ensures long-lasting adhesive cementation of the restoration.

Because of this, the recessions were consequently not involved in the preparations in order to achieve optimal bonding.

In this case, the smile line did not show these areas and the patient didn't want to go through microsurgical recontouring. In other cases, a free mucosal graft can help to optimise the pink aesthetics.

New physiological anterior guidance was established with the veneers to avoid uncontrolled forces. In addition, the stomatognathic system and the restorations were protected with a Mago splint at night.

Although the active communication and cooperation of the dentist with the patient creates additional work initially, it leads to a predictable and prompt outcome without unexpected time- and money-consuming redoing, needless stress and frustration (Figures 21 and 22).

This minimally invasive concept has only advantages for the patient and the dentist, thereby changing the face of aesthetic dentistry.

References

Aykor A, Ozel E (2009) Five-year clinical evaluation of 300 teeth restored with porcelain laminate veneers using total-etch and a modified self-etch adhesive system. Oper Dent 34: 516-523

Gürel G (2003) Predictable, precise, and re-peatable tooth preparation for porcelain laminate veneers. Pract Proced Aesthet Dent 15:17-24

Gürel G (2007) Porcelain laminate veneers: Minimal tooth preparation by design. Dent Clin North Am 51: 419-431

Piemjai M, Arksornnukit M (2007) Compressive fracture resistance of porcelain laminates bonded to enamel or dentin with four adhesive systems. J Prosthodont 16: 457-464

Magne P, Belser UC (2004) Novel porcelain laminate preparation approach driven by diagnostic mock-up. J Esthet Restor Dent 16: 7-16

Reprinted with permission by ADT October 2016