

The concept of Progressive Smile Design

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The traditional approach to cosmetic dentistry has utilised techniques that aim to allow patients to visualise ideal smiles according to the principles of smile design. This may be with computer imaging or a wax-up, then direct try in. This article will discuss how a step-by-step progressive approach to smile design planning, starting with orthodontics, can produce dramatically different outcomes and in cases where ideal smile design parameters are still required, teeth can be set up in a more ideal position to minimise preparation.

Introduction

Cosmetic dentistry always faced a big challenge when treating misaligned teeth. Traditional treatments involved aggressive tooth preparation to create an ideal arch form before placing ceramic veneers. This was done to allow the space so that smile design parameters could be followed.¹

The main disadvantages of this were that excessive tooth structure loss could result in loss of vitality or the need to bond to dentine. There were also simply many patients who would not consider or could not afford this kind of treatment.

The concept of progressive smile design starting with alignment, bleaching and bonding, has offered an alternative to this kind of cosmetic dentistry. It also potentially throws the door open to many more patients by reducing fiscal and biological cost.

Patient discussion and the traditional approach

Historically, a large proportion of cosmetic dentistry which has been carried out has been based on presenting options to patients with visual and model aids. Typically a patient will ask to improve their smile. After a full consultation consisting of history taking, dental/soft tissue examination, radiographs and photography, a diagnosis is made of the complaint and the options are presented.

The patient's complaint commonly consist of a mixture of aesthetic issues that combine to produce an unattractive smile. Patients might be unhappy with one or a combination of issues depending on how dentally aware they are. This might be poor tooth length, colour, shape, texture, line angles, irregular contact points, embrasures, incisal edge outline or golden proportion.

Computer imaging is often used to show patients what is achievable. Imaging can be employed to show

very simply, minimal improvements such as whitening or bonding or in a more extreme way showing full smile makeovers.

When full smile makeovers are shown, the parameters of traditional smile design can often be met. The change is often more radical and as we know makes a larger perceptible difference to the whole smile. Undoubtedly for many patients this is often a more exciting attractive outcome as they start to appreciate and understand these parameters.

This can be reinforced with a wax-up, which can also be copied and translated into the mouth in some cases via the use of a trial smile.

Of course the wax up constructed on an articulator can ensure correct or potentially improved function as well as improved aesthetics. This method has been successful for a period of time, producing good results for many patients all over the world.

Progressive Smile Design

Progressive Smile Design offers a different approach which can potentially result in a more minimally invasive outcome and a treatment plan pathway led by the patient.

In the author's experience, by applying the principle of Progressive Smile Design, many patients have presented wanting dramatic smile makeovers, prepared to have 6-10 teeth treated irreversibly but actually left with ceramic restorations being carried out in only a handful of cases.

Clearly having previous case examples to show patients helps dramatically. The operator becomes less reliant on imaging, but this can be used in minor ways to show patients stepped improvements. If a full smile makeover is to be simulated, it is essential that all the stepped improvements are shown and the real treatment involved explained.

Focus should now be centred on the patient's alignment. If any mild, moderate or severe alignment issues exist, the patient needs to be made fully aware. Explaining to a patient how simple alignment can correct issues such as golden proportion, zenith height or connector length in one swoop can incentivise them to take this option seriously. The patient should then be informed of every option. This should not just be the operator's favourite option, or indeed orthodontics should not be presented in a way that the patient will be put off.

It is not uncommon to read in many clinical articles that the patient 'refused orthodontics'. The question has to be 'what orthodontics did they refuse? Fixed? Extraction based? Clear systems? Removable? 1-2 years of treatment?'

The variety and potential combination of orthodontic techniques are infinite. The danger here is that the choice of orthodontic technique is now so vast that clinicians are risking medico-legal consequences by not fully informing their patients. In my experience, very few patients refuse a removable appliance that could align their teeth within 6-10 weeks- or even a fixed appliance that might take 6 months and instead opt for aggressive tooth preparations.

Multiple smart systems now exist to cater for most patients. Ideally as alignment is carried out, the patient, who was especially after a dramatic change, should then be encouraged to bleach simultaneously. This can often be done if using removable appliances towards the end of the treatment and a thoughtful approach to bleaching.

In my experience, this makes a dramatic difference to the patient's perception. Within an Inman Aligner case I will often do this at week 8-9 when there is 20% of movement left to achieve. By using super sealed trays and correct instructions, patients have been extremely well motivated, because they are in a period of already following instructions. As a result I have found they tend to whiten better and this improvement also helps with motivation to finish their alignment.

Short acting 35-40 minute 6% hydrogen peroxide treatments work especially well in these situations. For patients uncertain of whether to take the next step to ceramic, this is a critical point. The most important issue here is that if they do, they lead the decision-making process and not the dentist. From a medico-legal position this is a much more comfortable stance.

Clearly if they do proceed with ceramics, now the teeth are actually straight, and preparation if any is needed, can be into enamel and not dentine. If the patient is very satisfied with the improvement by aligning and bleaching, then they will often start to ask about the incisal edge outline. It is wise at the consultation phase to carefully observe the lengths of the teeth and measure them.

Typically with adults who have crowded teeth, there will be length variances due to differential tooth wear. Once the teeth are unwound, aligned and whitened, the patient's eyes will be drawn to the edges of their teeth which are likely to look more irregular. It is vital at consultation that the patient is made aware of this and potential quotes are given as part of the overall cost.

New composite materials are making the process of edge bonding easier and more predictable, meaning that stronger but equally aesthetic restorations can be placed with virtually no preparation required. The dentine shades are more opaque, meaning less bevelling is required to mask the join. Very acceptable results can be achieved

with no preparation and no anaesthetic.

After a retainer wire has been bonded or an Essix retainer created, a bleaching tray is then made over the teeth so the patient can carry out occasional maintenance whitening. The following patients all started out thinking they wanted multiple ceramic units.

Through the process of ABB and Progressive Smile Design, their outcomes were different, but were the most minimally invasive possible.

Case 1 Alignment, Bleaching & Bonding. (G)

This young lady planned to have veneers for a full smile makeover with the aim of achieving a perfect outcome. In her original alignment position, this would have involved significant tooth preparation on some teeth and potential loss of vitality. Her cosmetic dentist advised her to consider simple orthodontics to pre-align the teeth before carrying out the ceramic work. She chose the Inman Aligner because of its short treatment times and because wear time only needed to be 16-20 hours a day and this fitted in with her requirements. Arch evaluation using digital software revealed 1.4 mm of crowding.² IPR

was carried out progressively over three appointments to maintain the anatomy of her contact points. As her teeth started to align she decided to start whitening at week 8 for three weeks while the aligner was out of her mouth.

She could start to see the potential improvement in her smile. Her alignment was completed in 10 weeks. At this point it became clear to her that some simple edge bonding would dramatically improve the outline of her teeth. Edge bonding with Empress Direct was carried out to improve the width: length ratios and edge aesthetics. A wire retainer was fitted two weeks later.³



Figure 1: Before Smile



Figure 2: After alignment and bleaching (10 weeks)



Figure 3: After edge bonding



Figure 4: Before Occlusal view



Figure 5: Before close-up view



Figure 6: After close-up view



Figure 7: Before right side smile view



Figure 8: After right side smile view



Figure 9: Occlusal After alignment and bleaching



Figure 10: Portrait straight on

Discussion

The patient was delighted with her end result after alignment, bleaching and bonding, commenting that the appearance achieved far exceeded

what she had expected and looked more natural than she had expected veneers might. This more 'progressive' approach to smile design and execution is arguably far less risky

than the traditional approach where wax ups and computer software imaging show a patient their potential improvement. The problem with imaging is that patients do not get the

opportunity to see their smiles improve and can often make decisions allowing irreversible procedures to go ahead when they might easily be satisfied with simple alignment, bleaching and bonding.

Case 2 Alignment before Crown replacement. (H)

This patient hated her smile. She was prepared to have the lateral incisor extracted and also wanted to improve her whole smile. She was prepared to have multiple ceramic units to achieve the look she was after. This patient had several complex issues that were contributing towards her un-aesthetic smile. She had a poorly matching old PFM crown, an in-standing right lateral which was in cross-bite with mild anterior crowding, her upper right first premolar was also in cross-bite. She also had quite dark teeth. Her incisal edge outline as a result was also very irregular. All orthodontic treatment options were outlined and the patient chose a removable solution.

The patient began treatment with a double sectional (3D) expander with incorporated bite raising appliance. One component was designed to push the upper right premolar over the cross bite and the other component was designed simply to push the anterior teeth, especially the in-standing lateral, more anteriorly to create space. After five weeks a new space calculation was carried out to ensure that Inman Aligner treatment was suitable. Impressions were taken and the Inman Aligner was constructed.

The patient carried on wearing the expander but no longer activated it while the Aligner was being processed. One week later the Inman Aligner was fitted. It had an incorporated bite-raising appliance. Strategic progressive and anatomically respectful IPR was carried out to allow the lateral to come forward. Over 10 weeks the lateral tooth jumped the bite and the anteriors aligned and were retracted a little.

Over the last 2-3 weeks of alignment, tooth whitening was started which

was carried out simultaneously. At this point, the patient could now see her teeth aligning and whitening. It became apparent to her that now the whiter and straighter surfaces were actually quite aesthetic and that the main visual issues were that of the dark crown, and the irregular tooth outline. At this point, mock up composite tips were placed on the short laterals and the patient was immediately delighted with the appearance. We had affirmed at this point that no veneers would be necessary and we could simply edge bond the laterals and change the crown.

At the next appointment the PFM crown was removed and the prep and metal core assessed. A good seal existed so the surface was sandblasted and an opaquer was applied to the facial surface. The laterals were also built up with nano-hybrid composite Empress Direct. An impression was taken and a new temporary crown was placed. An E-max crown was constructed by Knight Dental Ceramics. This was fitted two weeks later. A wire retainer was bonded one week later.



Figure 11: Before Smile



Figure 12: After alignment and bleaching



Figure 13: After one crown and edge bonding



Figure 14: Occlusal before



Figure 15: After Occlusal with fixed retainer



Figure 16: Before close side view



Figure 17: After close side view

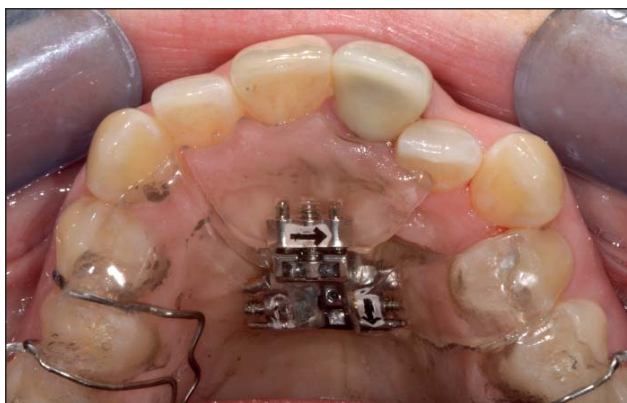


Figure 18: 3d expander in place



Figure 19: Before side smile view



Figure 20: After side smile view

Discussion

The patient was delighted with her final outcome. She was also delighted that this had been done with virtually no tooth reduction and as she described, “we had made her own teeth look more beautiful”. She had also been in control of the treatment and at any time she could stop, review and make a decision in her own time.

Case 3 Pre-Alignment before veneers. (K)

This patient presented complaining that he felt his teeth were dark, short and crooked. On examination several key problems existed. Firstly his anterior teeth were badly misaligned. They were also dark, having had years of staining and this had been compounded by occlusal trauma that had worn the edges of his teeth badly, allowing absorption of stain through the tips. The misalignment and occlusal wear also meant that his teeth were actually quite different lengths. Several options were available and outlined, including full class I set-up via a

specialist orthodontist, short-term sectional orthodontics and clear braces.

He chose to use an Inman Aligner with combined expander, based on his desire to have a removable option that was not going to exhaust his budget, as he desired restorative treatment afterwards. The Aligner was used over 12 weeks by the patient and only worn 16-18 hours a day. The patient turned the midline expander once a week and some progressive, anatomically respectful IPR was carried out. By week 12 the patient's teeth were whiter and straighter. The patient was then held in retention on a temporary Essix retainer.

However at this point we needed to reassess the patient's perception of the aesthetics. After alignment we offered the patient the option to simply use edge bonding on the upper teeth, but he expressed a wish to still have veneers to give a fuller look. Upper edge bonding was simulated by adding composite in a mock up fashion. He viewed the result but still felt his teeth looked

flat and wanted them to appear fuller. So at this point a purely additive ‘wax-up’ was made and a direct preview was placed in the mouth from a silicone stent taken from the wax up. The patient was happy with the proposed tooth length and dimensions.

One week later the upper teeth were prepared through a new preview. Minimal preparations could be used because the teeth were in the right position so the preparations could be truly in enamel. Temporaries were placed immediately based on the silicone stent of the ‘wax-up’.

Aesthetics, function and phonetics were checked, rechecked and modified over a four-week period. Guidance corrections were made *in situ* on the temporaries and the lower composite edge bonding completed. Once the patient was happy and fully comfortable, an accurate silicone rubber impression was given to the technician and he then had an exact copy to follow for the final veneers.



Figure 21: Before front smile view



Figure 22: After alignment and ceramic veneers



Figure 23: Before close view



Figure 24: Close view after alignment and bleaching



Figure 25: Close view after Alignment and Emax veneers



Figure 26: Before occlusal



Figure 27: Occlusal after alignment



Figure 28: After veneers and retainer



Figure 29: Before side smile



Figure 30: Side smile after alignment and bleaching



Figure 31: After veneers



Figure 32: Before retracted



Figure 33: After align- and bleach retracted



Figure 34: After upper veneers and lower edge bonding

On the fitting appointment, the temporary veneers were removed and the finals tried in. The patient was happy and the veneers were then bonded.

A new impression was taken to make a wire retainer. In the meantime the patient wore a temporary Essix retainer made on a cast of the veneers on a solid model. One week later a wire retainer made by the orthodontic lab was bonded to the back of the upper six anterior teeth. Because the preps were minimal the veneers were only on the facial surface so bonding to the back of the teeth was easy.

Discussion

As cosmetic dentists, we have a duty to ensure our patients are offered

and understand all treatment options.

We also need to consider that the patient's decision making is a dynamic and fluid process that can change depending on how they perceive their smile in different states. With this in mind, as dentists we also need to consider several questions:

- *What is aesthetic to us, and what is aesthetic to our patients?*
- *Should smile design be progressive and staged?*
- *Do patients want 'Perfect Smile Design' or do they want their own teeth to look better?*
- *And how important is Smile Design?*

Conclusion

These cases show what is possible when simple orthodontics is offered or combined and sequenced with whitening, bonding and ceramic techniques. The objective is to simplify the treatment and lower the risks to make the results more predictable and importantly to involve the patient along the way with decision-making. The smile design is performed *progressively* not *instantaneously*. It allows the patient to see the improvements in their alignment and whitening before a final decision on ceramics is made.

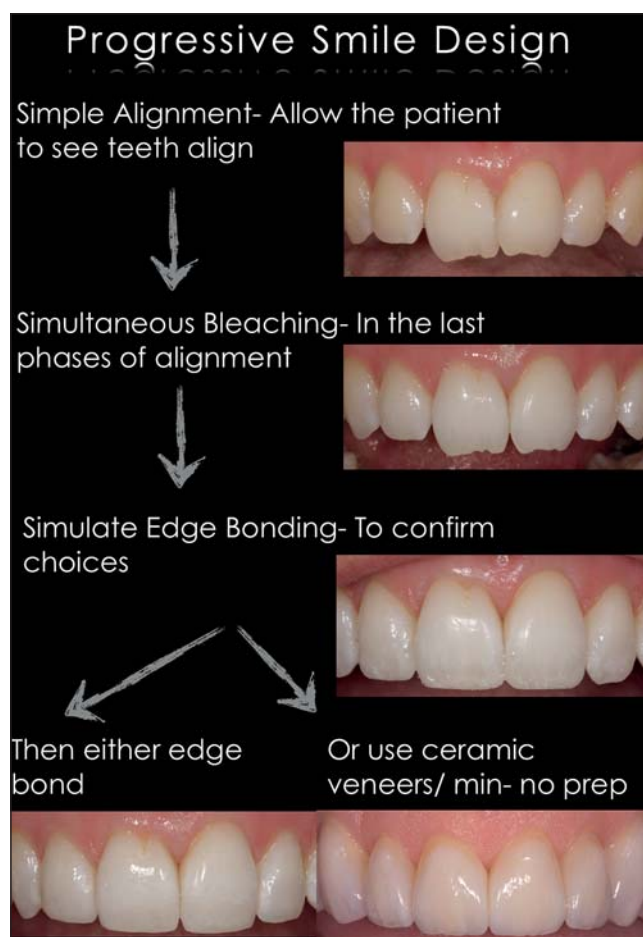


Figure 35: Progressive Smile Design Flow Chart

Disclosure

Dr. Qureshi teaches the official Inman Aligner educational programme.

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