

Use of Lasers for Smile Designing

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Introduction

Advances in all ceramic materials allow practitioners to restore function and esthetics using conservative and biologically sound methods as well as promoting long term oral health. To design the optimal outcome for a patient during esthetic enhancement, the restorative dentist must seek to create a symmetrical and harmonious relationship between the lips, gingival architecture, and the positions of the natural dentate forms.^{1,2}

Dental lasers enable painless, minimally invasive, more precise, and significantly more efficient completion of procedures associated with esthetic and restorative dentistry^{3,4}. Gingival and osseous recontouring can be easily done to establish a harmonious and esthetic soft tissue profile⁵. Patients typically experience little postoperative discomfort when a laser is used, with faster healing resulting in greater patient acceptance.

Case Report

A 20 year old female patient came to our practice with the chief complaint of malaligned teeth and desired a more esthetic smile in a short period of time.

Clinical examination showed malposed anterior teeth with crowding, caries and staining. Right canine was labially placed and left lateral incisor was tipped labially. The lower anteriors exhibited mild crowding and both lower right and left canines were labially placed. Overall gingival asymmetry was observed. Orthodontics was advised but due to lack of time, the

patient was not willing for the same and opted for a quicker technique of smile designing.

Treatment Plan

Impressions for study models and pre-operative photographs were taken (Fig1A). After careful analysis of the study models and consultation with the patient, the treatment was planned.

The treatment plan included all ceramic veneers on 11,12,14,21,23,24 and full ceramic crowns on 13,22,and 33-44 with gingival re-contouring to correct the irregular gingival architecture. Those teeth which required realignment or had large carious lesions would need endodontic treatment (11-14, 21, 22, and 24, 33-44).

The treatment plan was divided into 2 phases in which the maxillary arch would be restored first followed by the mandibular arch(Fig 3).

In the first phase, Veneer preparation was carried out on 11, 12, 14, 21, 23 and 24 with the 2780 nm Er,Cr:YSGG laser (Waterlase MD, Biolase) and tapered round end diamond points, tooth preparation for full ceramic crowns was done on 13 and 22 with diamond points(Fig 2).

The laser parameters were as follows:-

For veneer preparation – 2.5W, 25 Hz, 30% water, 30% air

Prior to making the mandibular impression, 33 and 43 were re-contoured. Impressions were made in addition silicone (Aquasil Putty and Light Body, Dentsply), shade was selected as per the patients desire to have lighter and brighter teeth. Provisional restorations were fabricated with composite resin (Charisma A1, Heraeus Kulzer)

The crowns and laminates were planned in Pressed Ceramic (IPS Empress, Ivoclar)

After 2 days, the provisional restorations were removed, teeth cleaned and restorations were tried in to check for fit, shape, colour and contour. With try in paste, the shade was judged, once the patient was satisfied with the restorations, etching of the laminates and crowns with 9.5% Hydrofluoric acid (Ultradent Porcelain etch) was carried out for 60s

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Fig 1A Pre-operative intraoral view



Fig 1B Pre-operative orthopantomogram

followed by silane (Ultradent Silane) application, bond application (Adper Single Bond Plus, 3M ESPE) and luting. Veneers and crowns were luted with light cure resin cement (Variolink, Ivoclar Vivadent), short curing was done to remove excess cement followed by full curing, contacts were checked, occlusion was adjusted.

In the second phase of treatment, the mandibular teeth were prepared for all ceramic crowns to correct the alignment of the teeth. As was discussed earlier, both mandibular canines were prominently placed labially, mandibular incisors exhibited mild crowding, mandibular right first premolar was placed lingually giving the appearance of an edentulous area and gingival profile was irregular, so gingival and osseous re-contouring was carried out in the region of the incisors using the 2780 nm, Er,Cr:YSGG laser (Waterlase MD, Biolase) (Fig4). Bone tapping was carried during the osseous recontouring procedure to ensure that ledges were not created. Examination of the biologic width was carried out before tooth preparation of 33-44.

The laser parameters were as follows:-

For Soft tissue recontouring – 1W, 20 Hz, 8% water, 11% air

For Hard tissue recontouring – 2.5W, 25 Hz, 30% water, 30% air

Tooth preparation for all ceramic crowns was carried



Fig- 2 -Tooth Preparation for all ceramic crowns and veneers
Note the modified cusp tips of both mandibular canines



Fig 3 Maxillary restorations luted.

out. Impression was made in addition silicone impression material (Aquasil Putty and Light Body, Dentsply), and sent to the laboratory for fabrication. The same shade as the maxillary restorations was taken as the patient was satisfied with the result. Provisional restorations were fabricated with composite resin (Charisma A1, Heraeus Kulzer) and patient was recalled after 2 days for try –in procedure and cementation. The crowns were planned in Zirconia (Lava, 3M ESPE)

After 2 days, healing of the tissues (Fig 5) after gingival and osseous re-contouring was excellent, temporaries were removed, teeth cleaned and restorations were checked for fit, shape, colour, and contour. As with the Maxillary restorations, after the patient was satisfied with the restorations, the protocol for luting was as follows.

The zirconia crowns were luted using resin modified glass ionomer cement (RelyX,3M ESPE). Excess cement was removed and contacts were checked. Occlusion was adjusted.

The final result showed that the definitive restoration was esthetic, maintaining form, function and harmony while keeping in mind the patient's goals (Fig6B).

Discussion

Dental lasers are widely accepted to be minimally invasive, cause less post-operative discomfort



Fig 4 - Gingival and osseous recontouring with the erbium laser



Fig 5 - Post operative healing following closed flap osseous recontouring in lower anterior region



Fig 6A- Pre-operative view



Fig 6B - Post- operative view - three days post luting

with minimal bleeding and swelling therefore they can be used as an adjunct or alternative to traditional approaches. The popularity of the 2780 nm Er,Cr:YSGG Laser is based on its dual action . It can be used on both soft tissues and hard tissues without significant thermal effects, collateral damage to tooth structure or patient discomfort.

It can also reduce post-operative sensitivity as the laser action on the dentine helps in sealing off the open dentinal tubules. Etching of the tooth surface is also achieved which helps with the retention of the restorations.

Though tooth preparation is a slightly more time consuming procedure with the laser, its advantages and benefits as enumerated cannot be ignored.

As was observed in this case, as the patient desired the treatment in a very short period of time, laser assisted preparation helped with reduced post-operative sensitivity and quicker soft tissue healing with minimal discomfort.

The choice of the restorative material also plays a vital role in the final outcome of the treatment. Though it has been observed that matching the esthetics of a pressed ceramic restoration to that of a zirconia restoration is an extremely challenging task, we were able to successfully bridge the gap and deliver a magnificent esthetic outcome.

Conclusion

All ceramic restorations are extremely popular and have been used for many years with success. Dental lasers are a very useful tool in the hand of the skilled operator inasmuch it is minimally invasive, reduces patient discomfort, therefore increases patient acceptance. This article demonstrates the combined use of all ceramic restorations and dental lasers to successfully address the esthetic concerns of a patient.

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