DIGITAL SMILE DESIGN WITH EMAX CAD

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INTRODUCTION

Digital Smile Design(DSD) is a known concept in Dentistry. The ability to accurately predict the ideal Tooth dimensions for getting a bilaterally symmetrical smile window, different smile styles from the smile library helps choose ideal teeth dimensions prior to executing the case. However the ability to transfer this design digitally and accurately to individual crowns was limited to full contour zirconia that lack the depth in internal light characteristics that are desirable. This is only possible with LiSi in the form of Emax Press Ceramics. The ability to transfer the dimensions from the Digital Smile software to Exocad and then use these dimensions to fabricate printed and pressed Emax LiSi Crowns is the ultimate combination of Aesthetics and Technology.

Mentioned below are the holy trifecta of smile design and bonded ceramics for the years to come.

1)DSD +Exocad

2) 3D Printed Models for APT (Aesthetic Provisional Temporaries / Test Drive Smile)

3) Milled Emax LiSi CAD crowns and Veneers

EMAX CERAMIC RESTORATION

Ivoclar Vivadent offers a wide range of products for creating life like restorations which imitate natural tooth structure, it combines the benefits of lithium disilicate and fluorapatite glass ceramics and covers a broad spectrum of indications.

IPS EMAX CERAM

It is a consistent layering material which helps us to achieve a harmonious shade match, ease to handle and efficiency in the lab. The system comprises of a wide choice of materials for getting true colours transparency with supporting effect materials, and wide-choice of shade and stains to create a natural looking restoration.

CASE HISTORY, EXAMINATION AND TREATMENT PLAN

A 40 year old Chef from Italy, residing in Mumbai, India visited our practice unhappy with his smile done elsewhere. On Clinical Examination the following was noted:

- Upper anterior had multiple PFM restorations on 15, 14, 13, 12, 11, 21, 22, 23, 24.
- Metal Crown on 46.
- Lower anterior crowding.

He wished to change all his existing crowns and get an overall better looking smile w.r.t to his upper and lower teeth. His posterior teeth had root canals and posts but were without crowns.

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FIG 1: Pre Operative Smile Presentation

FIG 2: Digital Smile Simulation

Our plan involved a thorough digital work up of the final result prior to beginning the case to determine the ideal length of teeth to get a desirable bilateral symmetry. We would go for crowns on all upper teeth. Lower posterior crowns with lower anterior 9 Emax Veneers. All restorations were digitally planned and milled Emax restorations.

DIGITAL PLANNING AND SMILE SIMULATION SOFTWARE

Prior to beginning treatment we made multiple simulations of dif-

FIG 3: Digital Smile Simulation

FIG 4a: Old PFM restorations

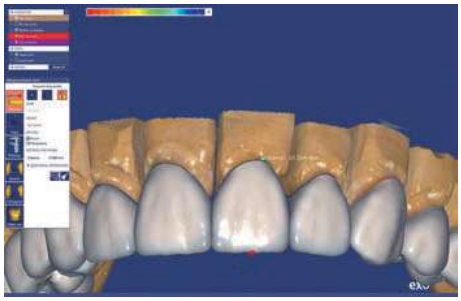
FIG 4c: Asymmetry in lowers

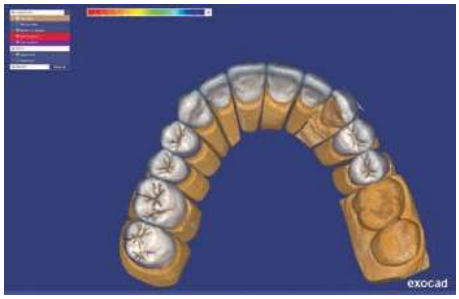
FIG 4b: Removal of PFM restorations

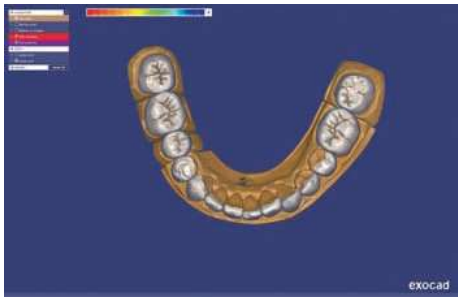
FIG 4d: Preparations done by APT technique {Dr Galip Gurreal}

FIG 5: Model ready for scan

FIG 6: Scanned model







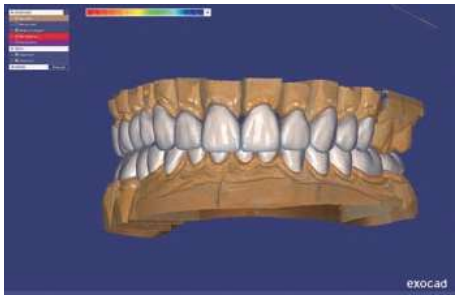


FIG 7: Designing done in exocad software

ferent smile types from our smile library and showed the patient. Based on his choice we went ahead with the Digital planning for ideal dimensions for the final restorations. Based on this the Lab prepared an Exocad Plan with 3D Printed Models for the case. (DSD by Coachman)

REMOVING ALL RESTORATIONS AND FINAL PREPS

We begin by removing all old PFM restorations from the patient's mouth by sectioning.

All Maxillary teeth are prepped for crowns and cord placed, impressions made with VPS (Ivoclar, Virtual). Lower posteriors are prepped for crowns. Lower anterior teeth (35, 34, 33, 32, 31, 41, 42, 43, 44) are prepped for Veneers. Lower double cord retraction and impression made with VPS (Ivoclar, Virtual). Impressions sent to the lab for processing, the stump shade was recorded and pictures were shared with the lab for better understanding of the ingot to be used. Aesthetic provisional Temporaries (APT) made for the patient with a Putty Index from the 3D printed Models. All records required, Jaw relation, Face bow transfer were taken.

Models were fabricated and mounted as per the records and were scanned for digitally designing the restorations with exocad software. The design files were shared with the clinic for approval, the next step was to print them in burnout resin.

The printing was done in 3D system Nextdent printer 5100. This gives us much better control and makes it more predictable and consistent in the final outcome.

The printed restorations were placed on model and checked for occlusion, and minor corrections were done with wax to get the corrected restorations. We call it ANODIGITAL, a perfect amalgamation of technology and hand skill.

An index was made with Siltec putty for

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FIG 8a: Full anatomical printed resin

FIG 8b: Full anatomical printed resin

FIG 8c: Printed resin modified with minimal cut back

FIG 8d: Checked against index

FIG 8e: Final cut back

FIG 8f: Checked against index

FIG 8g: Final cut back

FIG 8h: Ready to be pressed

FIG 9a: Pressed emax laminates/crowns

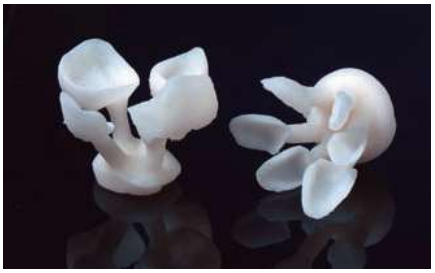

FIG 9b: Crowns and laminates seated on the model

FIG 10a-b: Layering done with Emax Ceram and Emax Ceram selection

FIG 10c-d: Micro layering for fine details and internal translucency

FIG 10e: Topped with Transpa and enamel

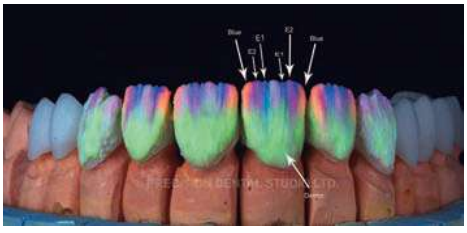

FIG 10f: Various transpa and effect materials used as per colour mapping

analysing the further course of the pressed restorations.

The printed substructure was cut back for layering before the press and was checked against the index thus giving us a correct idea of the subsequent layering to be done.

The restoration were invested and pressed in Emax MT BL4, after sandblasting them carefully with 110 micron alox they were checked for any reaction layer and cleaned in an ultrasonic with Invex liquid from Ivoclar Vivadent.

The restorations were checked on articulator and against the index, the cutback was futher enhanced carefully for layering of ceramic material.

Posteriors were left monolithic and would be matched with shade and stains later.

The case was sent for try in after sharing all the pictures of each step with the clinic, this helps in better coordination and the clinic can be a part of the whole process.

TRY-IN APPOINTMENT

The crowns and veneers were tried in the patients mouth and photographs taken to

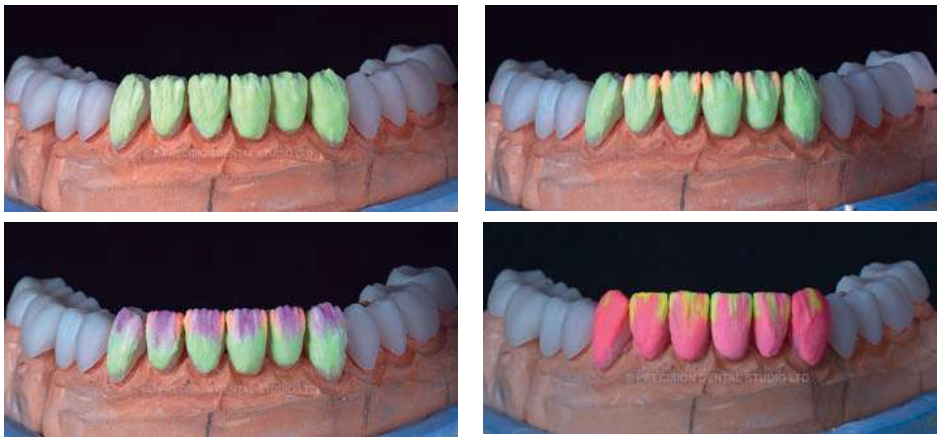

FIG 11: Layered Emax porcelain over the cut back laminates

FIG 12: After firing and finishing of contacts

FIG 13: An over view of work flow from the pre-op to digital stimulation and trial to verify

compare with the planned digital smile template framework. The dimensions double checked and photo records taken and compared to the digital mock up. Patients feedback and desires taken into consideration and communicated to the lab. (Patients lower lip is anesthetised) the trail was compared with the DSD STIMULATION and the preop and was shown to the patient.

After analysing the smile and function minimal adjustments were done in contacts and occlusion.

The final work was further enhanced by adding correct surface texture for golden proportions.

Since it was bleach shade not much stain or shade was needed in anteriors and in the posteriors.

The restorations were polished manually for better results with EVE polishers brizzel brushes leather and cotton buff. Diamond paste from Shofu was used.

FINAL PROCESSING BY LAB

This process involved marking line angles, and finishing the restoration for final surface texture before the shade firing is done with Ivocolor shade and stains, subsequently the restoration is glazed using Ivoclar glaze paste and polished using fine grit silicon in addition to leather buff and cotton wheel along with diamond paste from Shofu Japan.

FINAL CEMENTATION

All Crowns and veneers were tried in the patients mouth for final fit, bite and patient approval. (Variolink, Ivoclar Vivadent Veneer Try in cement). Following final approval all crowns cemented using the following protocol:

Preparation of all ceramic internal surface pre-cementation preparation

1) Ceramic Etchant (Ivoclar Ceram Etch – 20 seconds + Wash + Dry)
2) Orthophosphoric Acid 37% (Ivoclar Etch – 1 Minute + Wash + Dry)
3) Ultrasonic Water Bath (1 Minute + Dry)
4) Ceramic Silane Coupling Agent (Coat + Dry)
5) Universal Bonding Agent (Ivoclar 8th Gen Bond + Dry)
6) Placement of Multilink Resin Cement (Dua Cure, Ivoclar)

FIG 14a-c: Fit finish and occlusion checked in situ

FIG 14d-g: Try in appointment (lower lip anesthetised)

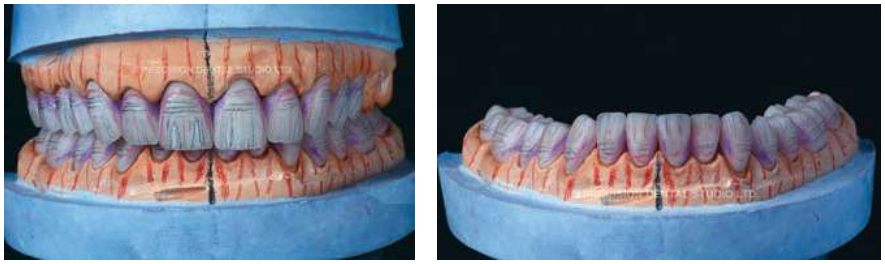

FIG 15: Final check for line angle, axial inclination, midline and surface texture

FIG 16a: Manual polishing after self-glaze with Silicon rubber wheel, Cone shaped silicon diamond impregnated polisher, Bristle brush, Leather buff and Cotton wheel

FIG 16b: Checking golden proportion

Tooth pre-cementation Protocol
1) Clean with water + Pumice Paste
2) Orthophosphoric Acid 37% for 20 Seconds
3) Application of A + B Liquid bonding agent (Multilink – Ivoclar resin Cement)

Variolink was used instead of Dual Cure Multilink for the cementation of veneers. Protocol for ceramic internal surface preparation remain the same. For veneers normal Bonding agent was used.

FINAL RESULTS

One Week post cementation the patient was recalled for final check-up and photographs and shows seamless integration with soft tissues, and bilateral harmony and symmetry as desired. The surface and light characteristics of the LiSi crowns are far more superior than any ceramic system currently available.

CONCLUSION

The ability to combine the precision of milled restorations with the ceramic characteristics of LiSi Crowns provides a dominating combination and force to achieve accuracy in teeth symmetry and ceramic aesthetics. The fit of Emax CAD and Milled Veneer is far more accurate and superior to Emax Press. Milled Emax CAD restorations are without doubt the future.



FIG 17a-c: Final restoration

FIG 17d Final on blacked out model for better understanding of the sillhoute

FIG 17e Final on blacked out model for better understanding of the sillhoute

FIG 18

FIG 19

FIG 20

FIG 21

FIG 22

FIG 21-22 Ceramic Layering and Art Work (Precision Dental Studio Ltd)


FIG 23a-b Final situation

FIG 24: Before and After

FIG 25a: The complete workflow at a glance

FIG 25b: Surface texture

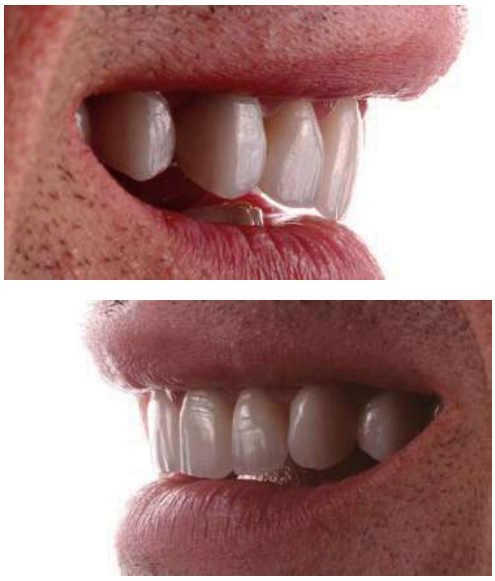

FIG 25c-d: Profile view

FIG 26: Final result before and after

About the AUTHORS

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