

Full Mouth Rehabilitation by Minimally Invasive Cosmetic Dentistry Coupled with Computer Guided Occlusal Analysis: A Case Report

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Abstract Evidence of dentistry dates back to 7000 B.C. and since then has come, indeed a long sophisticated way in treatment management of our dental patients. There have been admirable advances in the field of prosthodontics by the way of techniques and materials; enabling production of artificial teeth that feel, function and appear nothing but natural. The following case report describes the management of maxillary edentulousness with removable complete denture and mandibular attrition and missing teeth with onlays and FPD by the concept of minimally invasive cosmetic dentistry. Computer guided occlusal analysis was used to guide sequential occlusal adjustments to obtain measurable bilateral occlusal contacts simultaneously.

Keywords Minimally invasive cosmetic dentistry · Computer guided occlusal analysis · Ceramopolymer

Introduction

The loss of teeth is matter of immense concern and their replacement by artificial substitute is important to the continuance of normal life for esthetic and functional requirements. The comprehensive concept of minimally invasive cosmetic dentistry and its treatment protocol were introduced in 2009 with the basic aim of a clinician effecting optimum clinical therapeutic improvements in smile enhancement, while performing corrective procedures that require as little clinical intervention as possible

[1]. Computer guided occlusal analysis was used for bilateral occlusal contact equilibration [2].

Case Report

A 70-year old man reported to the Department of Prosthodontics, Dayananda Sagar College of Dental Sciences and Hospital with the chief complaint of worn out teeth in the lower arch and an ill fitting upper denture Fig. 1. Intra oral examination revealed a well formed ridge covered with healthy mucosa in the upper arch with an ill fitting maxillary denture. In Fig. 2 in the mandible, generalized attrition of the remaining teeth and an anterior FPD involving 23, 26 and 27 as abutments replacing missing 24 and 25, with debonded ceramic in the pontic area was seen.

Keeping the clinical situation and the age of the patient in mind, a new removable maxillary complete denture was fabricated after establishing a good occlusal plane in the mandible, utilizing ceramopolymer onlays and a new PFM bridge for the lower anteriors.

Procedure

After thorough oral prophylaxis, diagnostic impressions were made. The diagnostic waxing was done on lower arch with which occlusion was developed and this analogue was used for making an index to be used for temporization. Custom tray for the upper and lower arch was fabricated using tray resin on the diagnostic models. Mandibular anterior teeth in relation to 23, 26 and 27 were prepared. Teeth were prepared in relation to 18, 19, 20, 21, 22, 28, 29, 30 and 31; to receive on lays. The working casts were prepared from the final impressions

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Fig. 1 Worn out denture



Fig. 2 Pre treatment—mandibular fractured fixed dental prosthesis and attrition of posterior teeth

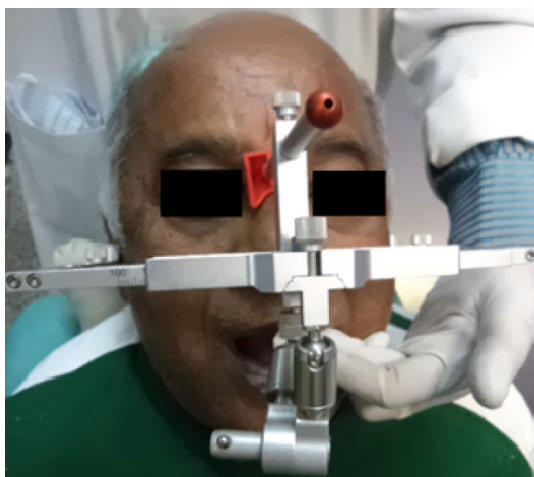


Fig. 3 Face bow transfer

made of additional silicone material. Upper occlusal rim was fabricated and evaluated. In Figs. 3, 4 face bow transfer was used to mount the models on semi-adjustable articulator (Arcon). Centric relation records were made



Fig. 4 Balancing achieved in articulator

by bimanual manipulation method (Dawson's Technique) [3]. Maxillary denture was fabricated using polymethyl methacrylate resin. Die preparation and wax pattern were prepared followed by investing of the wax pattern and casting of the same. Metal try in was done to check the clearance and marginal fit and PFM bridge was fired using feldspathic porcelains. The FPD was luted using type I GIC (GC Corporation, Tokyo, Japan).

Indirect ceramopolymer (Ceramage, Shofu Inc., Japan) restorations were fabricated for 18, 19, 20, 21, 22, 28, 29, 30 and 31. These restorations were bonded by using bonding agents (Beautiful bond Shofu Inc., Japan) and resin reinforced cement (Panavia F, Khurare Inc., Japan).

Post insertion of maxillary denture and mandibular fixed prosthesis, digital analysis of occlusion was carried out by using T-scan III from Tekscan, USA [4]. The forces were harmonized by occlusal corrections as seen in the pre treatment and post treatment Tekscan recordings, and the restorations were finished and polished intraorally by using ceramage finishing and polishing kit and one gloss kit from Shofu Inc., Japan [1].

Regular recall and maintenance were advised for long term success. In addition patient was instructed on good oral hygiene habits.

Discussion

Minimally invasive cosmetic dentistry focuses on conservation of healthy tooth structure and more conservative preparations while still restoring the worn or damaged dentition in the most esthetic manner. In addition to regaining dental health, it also pays emphasis on usage of durable dental materials which require less future interventions and repairs.

Inlays and onlays Fig. 5 have become increasingly popular because they require less removal of tooth structure than full veneer crowns, thus preventing future fractures, sensitivity, and need for root canal treatment for vital teeth.

Although ceramics have been the material of choice for all crown and bridge work, indirect composite restorations can supplement and complement ceramic restorations in certain clinical situations. Ceramics exhibit a high modulus of elasticity and absorb little of the masticatory energy. Thus, considerable amount of the masticatory force is transmitted to the implant's and the periosseous structure, reducing the longevity of the restoration. Polymers become the materials of choice in this situation because they absorb relatively more of the occlusal stress. For patients with poor periodontal structures who require occlusal coverage, stress-absorbing materials like indirect resin composites are indicated [5].

A recent study has shown that reinforcement of dental composites with ZS or ZYS nanofibers (2.5 or 5.0 %) can significantly increase the flexural strength, flexural modulus, energy at break of dental composites over the control. All ZS reinforced composites (containing 2.5, 5.0 and 7.5 % ZS nanofibers) exhibit significantly higher fracture toughness than the control [6]. Thus ceramopolymer based restorations can be used less invasively while still giving the desired aesthetic results.

It's not just the usage of the best material in the mouth, but also precise occlusal finishing of restorations for increasing the life span of any rehabilitation. The T-scan III computerized occlusal analysis system (Software Version 7.0, Tekscan Inc., South Boston, MA, USA) uses an electronically-charged, mylar-encased recording sensor (High-definition Generation IV sensor, Tekscan Inc., S. Boston, MA, USA) that is scanned in 0.003 s time increments, to acquire occlusal contact relative force variances excessively forceful tooth contacts, and occlusal contact timing sequences. The recording sensor is placed intraorally and when the patient intercuspatates or performs excursive

movements, it captures real time occlusal force data. The dynamic playback separates all the force variance into their contact order, while simultaneously grading their relative occlusal force, so that clinician can observe them for diagnosis and possible treatment Figs. 6, 7, 8, 9, 10, 11, 12. In two or three dimensions, the contact timing sequence can be played forwards or backwards continuously, to reveal an occlusal “movie” that describes the occlusal condition. In the 3D playback view, the force columns change both their height and color designation. In the 2D contour view, the colour-coded force concentration zones alter size, shape and colour as the occlusal forces change.



Fig. 6 Post treatment–frontal



Fig. 7 Post treatment- left



Fig. 5 Post treatment–fixed dental prosthesis and onlays



Fig. 8 Post treatment-right

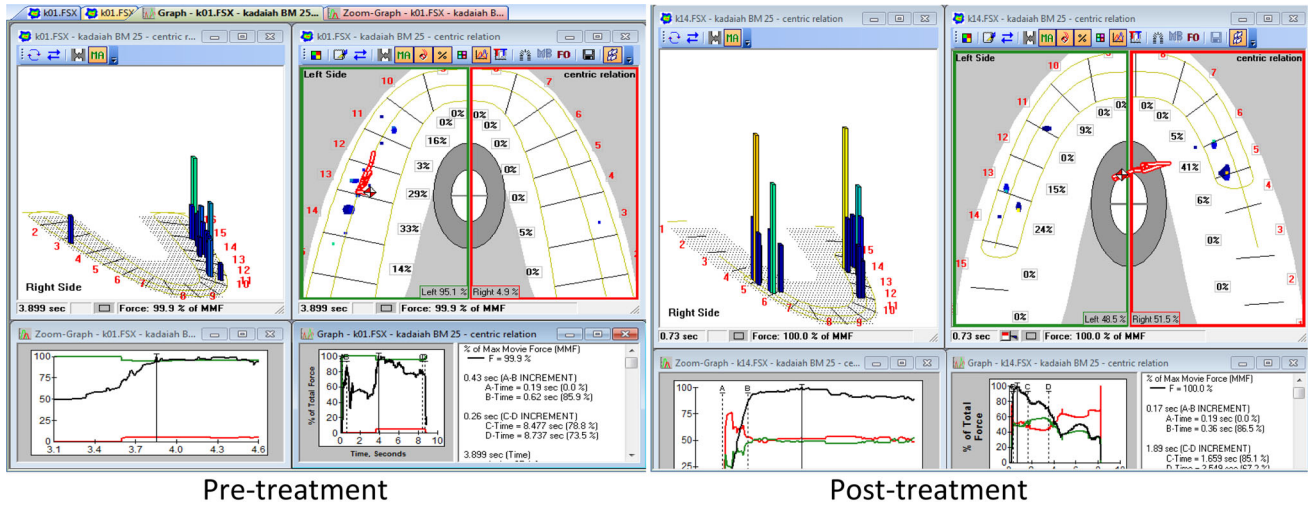


Fig. 9 Centric

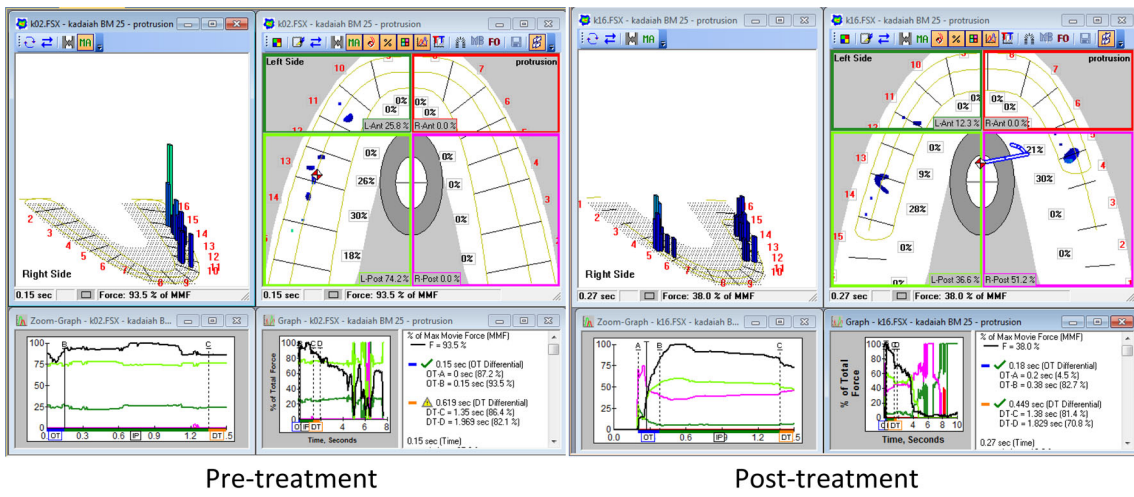


Fig. 10 Protusive

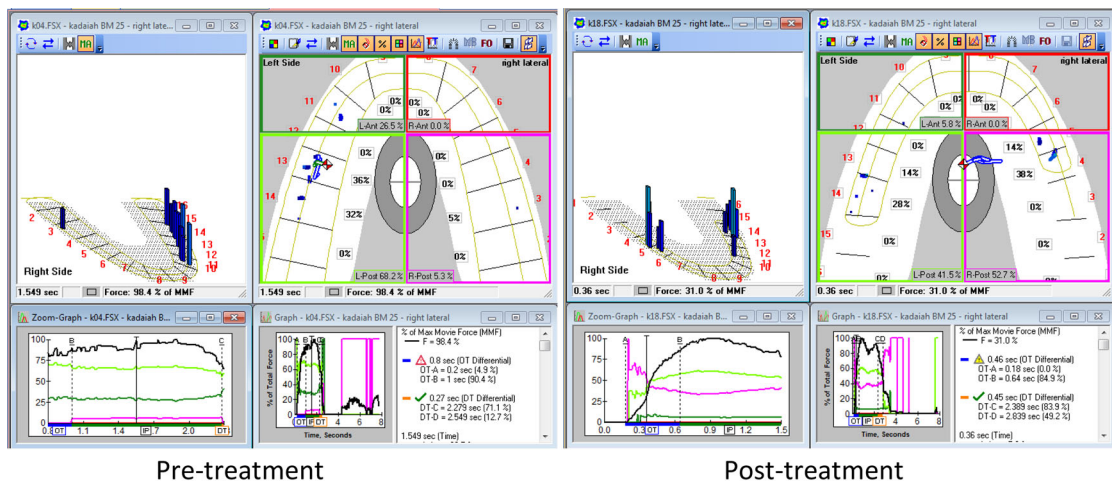


Fig. 11 Right lateral

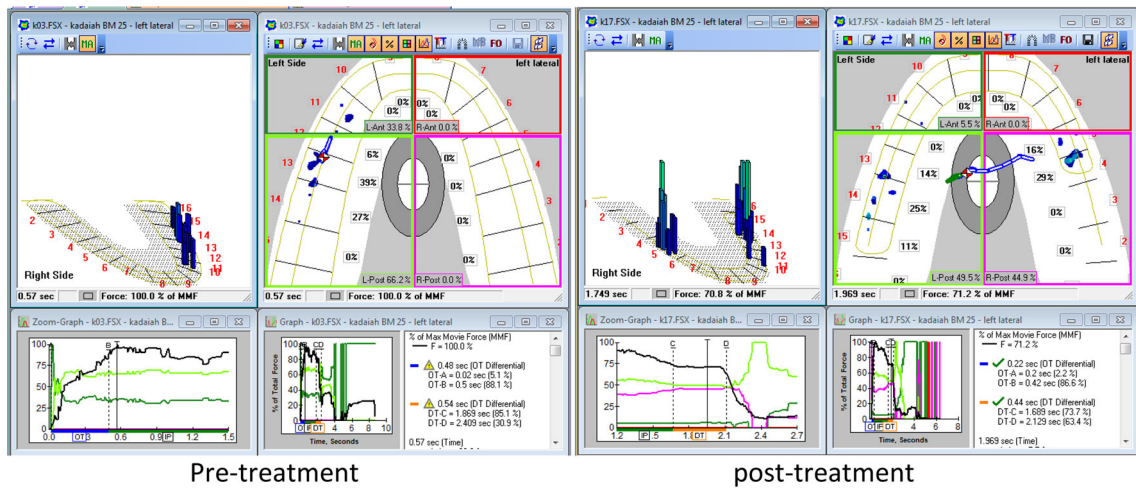


Fig. 12 Left lateral

Warmer colors indicate forceful contacts, while darker colors indicate lower force contacts [7, 9]. This system simplifies occlusal adjustments, as it quickly isolates excessive force concentrations and time-premature contacts, so their eradication is predictable and effective.

Conclusion

Minimally invasive cosmetic dentistry uses advanced clinical techniques, and new innovative materials have been developed to meet our treatment goals. The latest advancement in composite resins-ceramopolymers may offer long-term solutions to what was once considered a short-term restoration. This is not only a less destructive approach but also give excellent esthetic results. Tekscan occlusal analysis system helps us achieve bilateral occlusal contact equilibration. Combination of these two techniques can potentially redefine the traditional approach to smile design planning.

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