

Functional and Aesthetic Full Mouth Rehabilitation of a Severely Worn Dentition to Restore Vertical Dimension: A Case Report

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Abstract Deterioration or malfunction of any part should be viewed as an effect that has the direct or indirect result of one or more identifiable cause. The establishment of definitive goals is the foundation for the full mouth rehabilitation. Severe wear is common in prosthodontic patients whose teeth have been held in functional interference for long period of time. This case report presents a description of a patient's oral rehabilitation with metal ceramic restorations to increase vertical dimension while achieving canine guided occlusion.

Keywords Vertical dimension loss · Canine guided occlusion · Metal-ceramic restorations

Introduction

A great number of techniques have been generated over a period of time for full mouth rehabilitation. The philosophies associated with the techniques of rehabilitation may be highly individualistic or based on a specific philosophy of occlusion [1, 2]. Based on the clinical and laboratory procedures full mouth rehabilitation may be divided into

three categories (1) where simultaneous restoration of both the arches are done [3–5]. (2) Restoration of individual quadrant is done in a programmed manner [6, 7]. (3) A combination of full mouth simultaneous rehabilitation and the programmed quadrant approach [8]. Each one of them have their advantages and disadvantages. Furthermore, while restoring the mouth fully, one of the most important criteria that has to be taken into the consideration is whether an increase in the vertical dimension is required or not [9]. This article describes a procedure for full mouth rehabilitation to restore vertical dimension. The procedure combines technical features of all the above mentioned three techniques and adds on a differential approach at certain steps so as to overcome the disadvantages which would otherwise be encountered.

Case Report

A 54-year-old male was reported with the complaint of sensitivity to hot and cold food, reduced chewing ability, chipped off restorations and was not satisfied with the aesthetics.

Examination

The intraoral examination revealed (1) non-vital maxillary right lateral incisor. (2) Three unit metal ceramic fixed partial denture in relation to right maxillary first premolar, second premolar and first molar. (3) Four unit metal ceramic fixed partial denture in relation to left maxillary first premolar, second premolar, first molar and second molar. (4) Metal-ceramic crown in relation to right mandibular first molar, metal crown in relation to second molar. (5) Generalized attrition with occlusal interferences. (6)

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Fig. 1 Pre-operative view

Chipped off ceramic from occlusal surface of existing fixed partial dentures (Fig. 1).

Technique

During initial appointments endodontic and restorative procedures were done for the decayed and non-vital teeth to resolve sensitivity. Diagnostic impressions were made after complete oral prophylaxis using irreversible hydrocolloid (Zelgan 2002, Dentsply) and diagnostic casts poured in type III stone (Pearlstone, Asian Chemicals, Gujarat, India). Shade selection was done with patient consent (VITA 3D-Master). Centric relation was recorded using anterior deprogramming device (lucia zig) and inter-occlusal records were made to restore vertical dimension (Virtual Refill CADbite Registration, Ivoclar Vivadent AG, Schaan/Liechtenstein). Protrusive, left lateral and right lateral inter-occlusal records were also made (Virtual Refill CADbite Registration, Ivoclar Vivadent AG, Schaan/Liechtenstein). Maxillary cast was mounted on a semi-adjustable articulator (Hanau, Wide-View) with split cast technique using face-bow. Mandibular cast was then mounted on the articulator using centric relation records. Programming of articulator was done using lateral and protrusive inter-occlusal records. A full wax-up was performed on mounted casts to achieve canine guided occlusion (Fig. 2). Plane of occlusion was determined using Broadrick's occlusal plane analyzer. Wax-up was duplicated using irreversible hydrocolloid and poured in type III stone (Pearlstone, Asian Chemicals, Gujarat, India). To fabricate provisional restorations vacuum form template (Prestige Dental Products Ltd, West Yorkshire, UK) was adapted on the maxillary and mandibular casts. Provisional restorations were fabricated using indirect-direct technique. Provisional restorations were sectioned at the junction of canine and first premolar for easy placement and removal during successive appointments and polished following conventional technique.

At tooth preparation appointment existing restorations from right maxillary posterior and right mandibular



Fig. 2 Diagnostic wax-up

posterior teeth were carefully sectioned and removed. Preparations were modified and deep chamfer finish margin was created. Tooth mousse was applied over the prepared surfaces of teeth as a remineralisation agent to seal the dentinal tubules with pellicle formation (GC Asia Dental Pte. Ltd, Singapore). Petroleum jelly was applied on the prepared teeth to fabricate provisional restorations using indirect-direct technique. After resin was polymerized provisional restorations were finished and cemented.

The left maxillary posterior and left mandibular posterior existing restorations were then sectioned carefully and removed. The steps of tooth preparation and provisionalization followed the same procedure as right maxillary and right mandibular teeth. Finally maxillary anterior and mandibular anterior teeth were prepared and provisional restorations were fabricated and cemented. Anterior guidance was verified with posterior disclusion.

After 2 weeks left maxillary posterior and mandibular posterior provisional restorations were removed. Inter-occlusal record was made using bite registration paste (Virtual Refill CADbite Registration, Ivoclar Vivadent AG, Schaan/Liechtenstein) at maximum intercuspation. Left maxillary and mandibular posterior provisional restorations were then resealed and checked for occlusion. The procedure for removal of other provisional restoration, inter-occlusal record registration and resealing of provisional restorations was performed in the right posterior and anterior regions. Finally all provisional restorations were removed and final impressions made using putty relining technique (Aquasil Soft putty/Regular set and Aquasil LV, Dentsply). Casts were poured in type IV hard stone

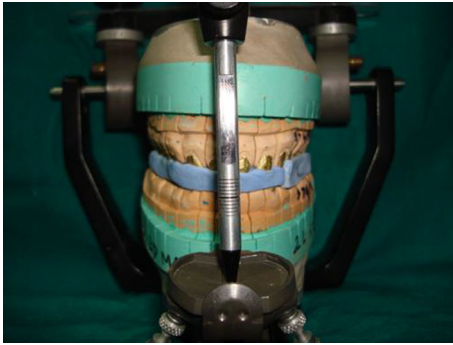


Fig. 3 Mounted casts using inter-occlusal record



Fig. 4 Metal frameworks



Fig. 5 Complete ceramic try-in

(Pearlstone, Asian Chemicals, Gujarat, India). Maxillary cast was mounted on the articulator using face-bow transfer and mandibular cast was articulated using inter-occlusal records (Fig. 3). Metal copings were fabricated and tried in patient's mouth to evaluate precise fit (Fig. 4). Following ceramic build-up a ceramic try-in was done and occlusal interferences were removed (Fig. 5). After glazing final restorations were cemented with glass ionomer cement (GC Gold Label, GC Corporation, Tokyo Japan) (Fig. 6). Occlusion was verified for canine guidance (Fig. 7a, b). Anterior guidance was also verified with posterior disclusion (Fig. 8).



Fig. 6 Cemented final restorations

At subsequent recall appointments, the occlusion remained unchanged. The patient reported total comfort and satisfaction with the masticatory performance and aesthetics of the definitive restorations.

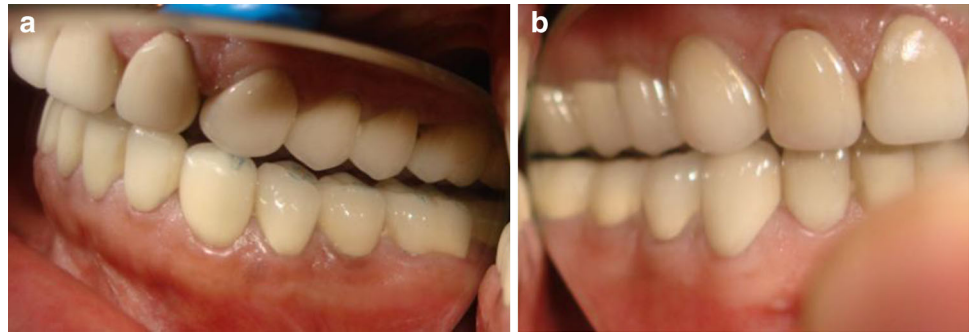
Discussion

Radiographs (intraoral and extraoral), oral tissue examination, periodontal assessment, and occlusal analysis with mounted diagnostic casts are key factors for diagnostic evaluation [10–12]. Diagnostic wax up is essential to provide primary view of the final restorations for the clinician as well as patient, and serves as guide for fabrication of provisional restorations [13, 14].

Pathologically, curve of Spee may be altered in situations resulting from rotation, tipping, attrition and supra-eruption of teeth. Restoration of the dentition to such an altered occlusal plane can lead to posterior protrusive interferences [15]. Such interferences have been shown to cause abnormal activity in mandibular elevator muscles, especially the masseter and temporalis muscles [16]. This can be avoided by reconstructing the curve of Spee to pass through the mandibular condyle, which has been demonstrated to allow posterior disclusion on mandibular protrusion [17, 18]. Posterior disclusion is achieved when condylar guidance is greater than the curve of Spee [19, 20].

The Broadrick's occlusal plane analyzer permits reconstruction of the curve of Spee in harmony with the anterior and condylar guidance, allowing total posterior tooth disclusion on mandibular protrusion [21, 22]. Its use assumes proper functional and aesthetic positioning of the mandibular incisors. Should the anterior guidance be inappropriate, it must be redesigned prior to use of the Broadrick flag.

Centric relation record was registered using the technique of "bimanual manipulation" described by Dawson [23, 24]. A "j" shaped anterior deprogramming device was made with green stick compound to register centric relation record at planned vertical dimension within physiological limits [25, 26]. Maxillary cast was mounted on semi-adjustable articulator using split cast technique mentioned

Fig. 7 a, b Canine guided occlusion**Fig. 8** Anterior guidance

by Needles [19]. Later Lauritzen and Wolford [27] used this technique to verify the cast mountings in the terminal hinge relation on semi-adjustable articulator. Split cast provides a precise method for programming the articulator using protrusive and lateral inter-occlusal records.

After removal of existing restorations preparations were modified and deep chamfer finish margin was created. Initial researches showed greater marginal metal distortion when porcelain fused to metal restorations were prepared for chamfer finish line but subsequent studies based on difference in marginal fit and effect of cementation related to finish line form failed to prove any significant difference. Therefore, selection of finish line should be based on ease of formation, personal preference, aesthetic considerations, and type of crown rather than expectation of enhanced marginal fit of the restoration [28].

A good provisional restoration should fulfil certain vital requirements such as pulpal protection, occlusal function, marginal integrity, structural durability, retention and stability, aesthetics and hygiene. In this case report provisionalization shells were fabricated using a template formed from clear thermoplastic resin with certain modifications [29, 30].

Group function or unilateral balanced occlusion concept was proposed by Schuyler and co-workers [31] who observed the destructive nature of tooth contact on the non-working side. Working side tooth contact distributes the occlusal load and absence of contact on the nonworking side prevents those teeth from being subjected to the

destructive forces found in nonworking interferences. Canine protected/mutually protected/organic occlusion was given by D'Amico [32], Stuart [33], Stallard and Stuart [34], and Lucia [35] and the members of Gnathological Society. In this case report canine guided occlusion was achieved as per the occlusion present at diagnosis and treatment planning appointment.

Conclusion

The ultimate goal of all dental treatment is optimum oral health. Visualization of the final outcome prior to the beginning of the treatment is of paramount importance for long term success. That is to say that forewarned is forearmed. The use of metal ceramic restorations offers increased possibilities in the field of aesthetics, biocompatibility and mechanical advantages. The greatest advantage of the technique described in this case report is the profound reduction in the number of patient visits and chair side time.

References

- Schweitzer JM (1981) An evaluation of 50 years of reconstructive dentistry. Part I: jaw relations and occlusion. *J Prosthet Dent* 45:383–338
- Schweitzer JM (1981) An evaluation of 50 years of reconstructive dentistry. Part II: jaw relations and occlusion. *J Prosthet Dent* 45:492–498
- Kazis HK (1948) Complete mouth rehabilitation through restoration of loss vertical dimension. *J Am Dent Assoc* 37:19–39
- Linkow LI (1961) An oral rehabilitation technique utilizing copper band impressions. *J Prosthet Dent* 11:16–21
- Sendax VI (1962) Master impression technique for fixed and precision removable bridge restorations. *Dent Dig* 68:554–556
- Mann AW, Panky LD (1960) Oral rehabilitation. Part I: use of the PM-instrument in treatment planning and in restoring the lower posterior teeth. *J Prosthet Dent* 10:135–150
- Mann AW, Panky LD (1960) Oral rehabilitation. Part II: use of the PM-instrument in treatment planning and in restoring the lower posterior teeth. *J Prosthet Dent* 10:151–162
- Binkley TK, Binkley CJ (1987) A practical approach to full mouth rehabilitation. *J Prosthet Dent* 57:261–266

9. Bloom DR, Padayachy JN (2006) Increasing occlusal vertical dimension: why, when and how. *Br Dent J* 200(4):251–256
10. Gill JR (1952) Treatment planning for mouth rehabilitation. *J Prosthet Dent* 2:230–245
11. Mann AW (1967) Examination, diagnosis, and treatment planning in occlusal rehabilitation. *J Prosthet Dent* 17:73–78
12. Kazis H, Kazis JK (1960) Complete mouth rehabilitation through fixed partial denture prosthodontics. *J Prosthet Dent* 10:296–303
13. Barly BV (1966) A preliminary wax-up as a diagnostic aid in occlusal rehabilitation. *J Prosthet Dent* 16:728–730
14. Seol HW, Koak JY, Kim SK, Heo SJ (2010) Full mouth rehabilitation of partially and fully edentulous patient with crown lengthening procedure: a case report. *J Adv Prosthodont* 2(2):50–53
15. Shillenburg HT, Hobo S, Whitsett LD (1997) *Fundamentals of fixed prosthodontics*, 3rd edn. Quintessence, Chicago p 85–86
16. Williamson EH, Lundquist DO (1983) Anterior guidance: its effect on electromyographic activity of the temporal and masseter muscles. *J Prosthet Dent* 49:816–823
17. Needles JW (1923) Practical uses of the curve of Spee. *J Am Dent Assoc* 10:918–927
18. Marshall SD, Caspersen M, Hardinger RR, Franciscus RG, Aquilino SA, Southard TE (2008) Development of the curve of Spee. *Am J Orthod Dentofacial Orthop* 134(3):344–352
19. Needles JW (1923) Mandibular movements and articulator design. *J Am Dent Assoc* 10:927–935
20. Pandis N, Polychronopoulou A, Sifakakis I, Makou M, Eliades T (2010) Effects of levelling of the curve of Spee on the proclination of mandibular incisors and expansion of dental arches: a prospective clinical trial. *Aust Orthod J* 26(1):61–65
21. Lynch CD, McConnell RJ (2002) Prosthodontic management of the curve of Spee: use of the Broadrick flag. *J Prosthet Dent* 87(6):593–597
22. Bowley JF, Stockstill JW, Attanasio R (1992) A preliminary diagnostic and treatment protocol. *Dent Clin North Am* 36:551–568
23. Dawson PE (1973) Temporomandibular joint pain dysfunction problems can be solved. *J Prosthet Dent* 29:100–112
24. Dawson PE (1974) *Evaluation, diagnosis, and treatment of occlusal problems*. CV Mosby Co, St. Louis
25. Lucia VO (1960) Centric relation: theory and practice. *J Prosthet Dent* 10:849–856
26. Lucia VO (1964) A technique for recording centric relation. *J Prosthet Dent* 14:492–505
27. Lauritzen AG, Wolford LW (1964) Occlusal relationships: the split-cast method for articulator techniques. *J Prosthet Dent* 14:256–265
28. Goodacre CJ (2004) Designing tooth preparations for optimal success. *Dent Clin North Am* 48:359–385
29. Fiasconaro JE, Sherman H (1968) Vacuum-formed prostheses. I. A temporary fixed bridge or splint. *J Am Dent Assoc* 76:74–78
30. Sotera AJ (1973) A direct technique for fabricating acrylic resin temporary crowns using the Omnivac. *J Prosthet Dent* 29:577–580
31. Schuyler CH (1953) Factors of occlusion applicable to restorative dentistry. *J Prosthet Dent* 3:772–782
32. D'Amico A (1961) Functional occlusion of the natural teeth of man. *J Prosthet Dent* 11:899–915
33. Stuart CE (1964) Good occlusion for natural teeth. *J Prosthet Dent* 14: 716–724
34. Stallard H, Sturt CE (1961) Eliminating tooth guidance in natural dentition. *J Prosthet Dent* 11:474–479
35. Lucia VO (1962) The gnathological concept of articulation. *Dent Clin North Am* 6:183–197