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Full Mouth Rehabilitation: A Multidisciplinary Approach

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ABSTRACT

Full mouth rehabilitation of the severely collapsed dentition is one of the most challenging procedures in restorative dentistry. The treatment aims are not only to restore function with sustainable restorations and to provide patients with an aesthetic smile, but also to conserve the remaining dentition and maintain the health of supporting structures. This case report describes the complete oral rehabilitation of a patient with severely broken down dentition and loss of posterior support. Loss of posterior support will not only result in breakdown of remaining dentition in the anterior region due to occlusal overload, it also adds years to the patient's appearance. A complete treatment plan was outlined involving multidisciplinary team treatment included sessions of oral hygiene instructions and re-assessments, a diagnostic stage with provisional overlay denture at an increased occlusal vertical dimension (OVD), endodontic treatment and retreatment, crown lengthening as well as implant surgery. Final restoration involved both fixed and removable prostheses. Maintenance review was carried out periodically after completion of treatment for two years and good outcome was observed.

CLINICAL REPORT

A full mouth rehabilitation typically involves a well synchronize multidisciplinary team which may comprise of the restorative dentist, periodontist, endodontist orthodontist and the oral surgeons. A comprehensive examination is required to determine the extent of the problem and to come up with all possible treatment options to correct it. Depending on the situation, most of full mouth rehabilitation will involve multiple phases and numerous clinical visits. A complex case may require 18 months or more to complete.

A healthy 57-year-old lady presented with complaint of difficulty in chewing and poor dental appearance. The patient had history of multiple restorations and serial extractions due to decay since her teens. Her first maxillary removable prosthesis was constructed 20 years ago. Mandibular removable prostheses prescribed previously failed to serve its function. Extraorally, patient presented with sunken midface, a prominent nasolabial fold and prominent chin. Patient was partially dentate and all teeth were restored. Poor oral hygiene with associated generalized gingivitis was observed. Patient was found to be wearing a poorly functioning and unaesthetic partial acrylic denture, with loss of occlusal vertical dimension and posterior support. Sinus tracts were present on labial surface of tooth 32, 31 and 41. Radiographically, radiolucent lesions were noted on root apices of tooth 41, 31, 32 and 33. Gutta percha tracked towards the apices of tooth 41, 31 and 32 on periapical radiograph. Tooth 32 appeared to be adequately root filled but with poorly angulated metal post. Radiolucency was also noted beneath

the coronal restoration of tooth 32. Chronic periapical abscess was diagnosed on tooth 32, 31 and 41; chronic apical periodontitis on tooth 33. Patient attributed her poor dental condition to lack of knowledge on the basic skills of keeping a good oral hygiene. Therefore, a treatment strategy was developed where first, patient had to improve her oral hygiene status and show commitment towards improvement. Oral hygiene instructions followed by multiple re-evaluation sessions were carried out to ensure improvement of oral hygiene status before the patient was considered suitable for a full mouth rehabilitation.

Occlusal analysis was carried out and facebow transfer (ARCUS®, KaVoDental GmbH, Biberach, Germany) recorded. Study casts were mounted on a semi adjustable articulator (PROTAR® evo 5, KaVo Dental GmbH, Biberach, Germany) at centric relation. A diagnostic wax up at 4mm increase of occlusal vertical dimension was done, which served to guide the clinician and to help the patient visualize the treatment outcome. The treatment plan was developed with the following aims: (i) to restore masticatory function, (ii) to improve aesthetics, (iii) to conserve the remaining dentition and (iv) to maintain health of supporting structures. In the mandibular arch, fabrication of full ceramic crowns for anterior teeth and implant retained bridges to replace missing posterior teeth were planned. Chrome cobalt overdenture was planned for missing teeth replacement on the maxillary arch. Remaining maxillary teeth were to be utilized as overdenture abutments.

Restorations were planned from first molar to first molar only, adapting the shortened dental arch concept, as they were enough for function[1] and easier for patient to maintain. A diagnostic stage was carried out by providing an upper overlay acrylic denture at the planned increase of occlusal vertical dimension. It serves as an interim prosthesis, to evaluate the aesthetic outcome and to assess the patient's ability to tolerate the proposed increased vertical height. The overlay denture was worn daily for the first three months. Development of temporomandibular joint disorder were negative after several months of observation and patient was deemed prepared for execution of the planned definitive restorations. The interim prosthesis was subsequently worn throughout the course of treatment, fitting adjusted whenever necessary.

Root canal treatment was carried out with rubber dam isolation involving tooth 41, 31 and 33 followed by fibre post and composite core build up. A poorly angulated metal post on tooth 32 was removed using an ultrasonic tip with counter clockwise motion. The self-threading metallic post was unscrewed but a very small perforation (approximately 1mm x 1mm) was observed at midroot level on the mesial aspect under the microscope (OPMI PROergo™, Carl Zeiss Meditec AG, Jena, Germany) as a result of the poorly angulated post. Root canal re-treatment was carried out and the perforated mesial wall of the root canal was repaired under high magnification utilizing MTA (ProRoot™, Dentsply International, Delaware, USA). Prefabricated fibre post (RelyX™, 3M ESPE, Minnesota,USA) was then cemented with resin cement (RelyX™ U200™, 3M ESPE, Minnesota, USA) followed by core build up with nanohybrid

composite (Filtek™ Z250™, 3M ESPE, Minnesota, USA). Elective root canal treatment with rubber dam isolation were also carried out on tooth 22, 23 and 26 as a preparation for overdenture abutments.

Laser crown lengthening (Waterlase™, Biolase, California, USA) was done on palatal surface of tooth 26 as upon exploration, the margin was found to be subgingival. Healing was faster and patient experienced no pain post operatively.

A CBCT scan (i-CAT® Cone Beam 3D imaging system, Imaging Science International, Pennsylvania, USA) was taken with a prepared surgical stent in place and measurements were made of the available bone height using the viewer software (i-CATVision®, Imaging Science International, Pennsylvania, USA). Due to the reduced amount of available mandibular bone posteriorly, short and wide implants (7mm diameter x 7mm length) were selected (Superline™, Dentium, Seoul, Korea). The surgical phase of implant retained bridge construction was carried out by the oral maxillofacial surgeon. The second stage of surgery performed three months later revealed a fully healed surgical site. Closed tray working impression was taken at implant level using monophase polyether impression material (Impregum™, 3M ESPE, Minnesota, USA). Implant retained bridges from 34 to 36 and 44 to 46 were later fitted and cemented with non-eugenol zinc oxide temporary cement (Tempbond® NE, Kerr Dental, Plymouth, USA) for retrievability.

Crown preparations from tooth 33 to 43 were done after construction of implant bridges were completed. The prepared teeth were restored with highly aesthetic lithium disilicate full ceramic crowns (IPS e.max® Press, Ivoclar Vivadent, Schaan, Liechtenstein). Upper arch reconstruction was started with preparations for milled telescopic crowns on 16, 14 and 26 and metal copings on 22 and 23. This was followed by construction of removable prosthesis. At completion, the overdenture was fitted and necessary occlusal adjustments were made and then returned to the laboratory for construction of metal occlusal surfaces on 15, 24 and 25. The occlusopalatal surfaces of the denture were cut back, the original cusps were rebuilt with resin pattern and casted in nickel titanium metal. The prepared metal casts were adhered to the respective occlusal surfaces with resin cement (Panavia F™, Kuraray Medical, Okayama, Japan). The buccal surface of tooth 14 on the overdenture was then veneered with zirconium silicate indirect restorative material (Ceramage™, Shofu, Kyoto, Japan).

The patient has shown to have maintained satisfactory oral hygiene for the past two years of review. Two incidents of dislodgement of overdenture metal copings occurred and they were re-cemented. The cause was minor imbalance in occlusion. Patient is satisfied with the aesthetic and functional outcomes. Maintenance review together with radiographic evaluation was continued yearly.

CLINICAL PHOTOGRAPHS

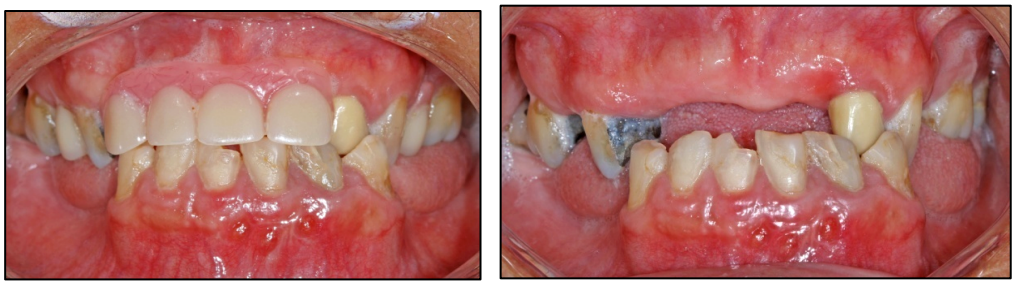

Figure 1 & 2 Pre-operative intraoral frontal view with and without denture in place. Note the sinus tracts labial to tooth 41,31 & 32.

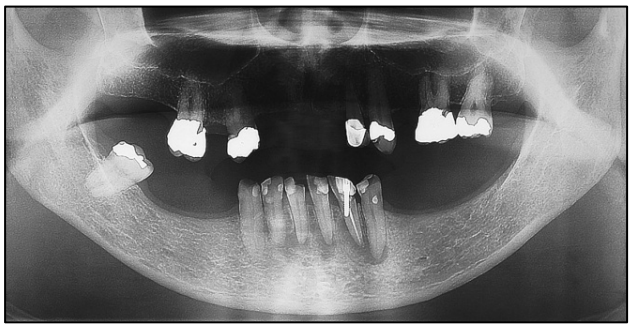

Figure 3 Existing orthopantomogram at presentation revealed generalised horizontal bone loss on maxillary arch and marked bone loss on the mandibular posterior region

Figure 4 Diagnostic wax up at an increased occlusal vertical dimension

Figure 5 Provisional overlay denture in-situ at diagnostic stage. Improvement in appearance is apparent

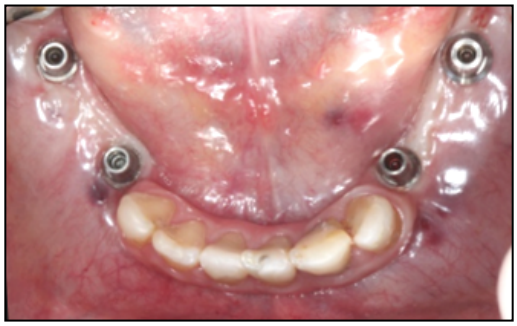

Figure 6 & 7 Implant retained bridges to replace missing lower posterior teeth cemented with non-eugenol zinc oxide temporary cement

Figure 8 Crown preparations on tooth 33 to 43 with retraction cord in place

Figure 9 Cemented lithium disilicate full ceramic crowns on tooth 33 to 43

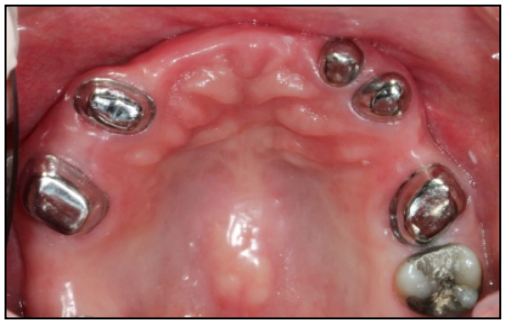

Figure 10 Primary telescopic crowns and metal copings in-situ

Figure 11 Cobalt-chrome overdenture with metal occlusal surface on posterior teeth.

Figure 12 View of the completed combined fixed and removable restorations

Figure 13 A beautiful smile of a satisfied patient. The treatment goal of restoring the chewing function and aesthetics was obviously achieved.

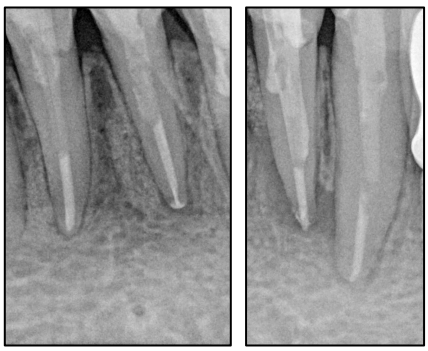

Figure 14 Root canal treatment on tooth 41,31,32 and 33 at 2 years review. Complete healing on tooth 41,31 & 33. Lesion on 32 although remained, has shrinked in its size. All teeth are asymptomatic.

DISCUSSION

Dental awareness plays a very important role in this case. Dramatic changes in the standard of oral hygiene were seen immediately after proper oral hygiene instructions were given. Patient's excitement on the dramatic improvement of her appearance during the period of provisional denture was apparent and she was very motivated to improve her dentition after enduring a lifetime of difficulty in chewing and poor appearance.

Root canal treatment is considered successful when there are absence of clinical symptoms and evidence of apical healing seen from radiographic examinations [2]. This is illustrated in the review radiographs with reduction of lesion size and healed sinus tract intraorally, after the sources of infection were removed. A good root filling quality and provision of a good permanent post-operative restoration is mandatory in predicting the outcome of root canal re-treatment [3].

Mineral Trioxide Aggregate (MTA) used in repairing root perforation in this case has been proven to be able to provide a good seal between the root canal system and external root surfaces of the teeth [3]. It is superior to amalgam, glass ionomer cement or reinforced zinc oxide eugenol as repair material as shown in microleakage studies [5]. Utilisation of microscope in this case enhanced the overall treatment quality. In this case, crown lengthening at the palatal of tooth 26 was necessary to avoid periodontal injuries during restorative procedures [6].

Short and wide implants were used to restore the mandibular posterior region. Blanes and co-workers showed that crown:implant ratio of implant-supported reconstructions do not influence peri-implant crestal bone loss [7]. The crown:root ratio guideline to establish prognosis for natural teeth should not be applied to implant prostheses, as the average crown:implant ratio exceeds that which is considered favourable for natural tooth [8]. According to another systematic review, crown to implant ratio was not associated with implant loss and marginal bone loss of implant supporting fixed partial dentures [9]. However, there is an increased risk of decementation when compared to single implant crowns. Success is predictable for the application of short, wide implant in molar areas with minimal ridge height [10].

Patient's remaining upper teeth were prepared and restored as overdenture abutments to prolong the useful life span of the retained abutments and preservation of alveolar bone. However, overdenture abutment loss can occur due to periodontal diseases or caries. As suggested by Ettinger & Qian [11], thimble coverage was provided and advice were given for daily high fluoride application, effective plaque removal and yearly dental check up to preserve and prolong the lifespan of the overdenture abutments.

Dislodgement of metal copings on the posterior occlusal surface of the overdenture is prone to happen in presence of even the slightest occlusal disharmony as its retention depended solely on resin bonding. Another option available is to incorporate it in the metal framework. The posterior

occlusal surface of the overdenture had to be in metal because it was opposed by comparatively highly abrasive porcelain in the occlusal surfaces of mandibular posterior fixed prosthesis selected by the patient for aesthetic reasons.

Lucia jig and interocclusal records were utilized in recording the centric relation together with a facebow transfer. The lucia jig helps to obtain accurate centric relation by deprogramming the muscles and allowing the condyles to seat on the most superior position. The method was selected as it is simple, reliable and comfortable for the patient. To restore with reasonable aesthetic and functional restorations, the occlusal vertical dimension had to be raised 4mm from centric relation. The diagnostic wax up was balanced in protrusive and lateral excursions. The interim prosthesis was constructed in accordance to the diagnostic wax up. However, the occlusal scheme of the definitive prosthesis was duplicated from the adjusted interim prosthesis which the patient had accustomed to over the interim period. This ensures a smooth transition from provisional to permanent restoration.

Throughout the planning and during the restorative phase, patient's concern and expectations were given highest priority. Her expectations to have an aesthetic smile and functional dentition were achieved. She was extremely happy and more motivated to maintain her dentition than before. She was made clear of the importance of maintaining good oral hygiene and to have regular maintenance visits to ensure the longevity of the full mouth rehabilitation.

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