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FULL MOUTH ORAL REHABILITATION WITH IMPLANT SUPPORTED FIXED PROSTHESIS FOR A MEDICALLY COMPROMISED PATIENT - A CASE REPORT

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ABSTRACT

The benefits of full mouth implant reconstruction include increased chewing ability, bone preservation, improved speech, and an improved aesthetic for an edentulous patient. Full mouth rehabilitation for a medically compromised patient is complex and often requires a comprehensive multidisciplinary approach. A 62 year old male patient with ill-fitting maxillary and mandibular removable partial dentures was presented for dental implant treatment to replace his existing prostheses. A review of his medical history indicated that the patient had been under medication for hypertension for the past fifteen years, and diabetes for the past thirty years. The patient had undergone an open heart surgery ten years ago and also undergone six by-pass surgeries. His current medical condition was stable and it was decided to rehabilitate the patient with implant-supported fixed prostheses. The maxillary fixed prosthesis was fabricated and four of the maxillary implants were used for retention. The mandibular overdenture was retained with five implants. The prosthesis was loaded immediately and occlusal splints were provided. Functional occlusion and esthetic appearance were restored with maxillary and mandibular implant supported porcelain-fused-to-metal restorations. Patient was advised to quit tobacco and was also referred to a tobacco cessation clinic. The radiographic assessments of the implants were performed at regular intervals. There was good primary stability for the implants with minimal bone resorption at the end of the five year follow up period. An excellent predictability was observed between the planned procedures and those obtained post treatment. Complete functional and esthetic rehabilitation of the patient was obtained. No adverse events occurred during the treatment phase and the patient was highly satisfied with the final esthetics of the prosthesis. In conclusion, the patient's speech, masticatory efficiency, and swallowing dramatically improved after treatment. The presence of chronic diseases required additional care, but with careful treatment planning, desired results can be achieved.

KEY WORDS: Full mouth rehabilitation, Dental implants

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INTRODUCTION

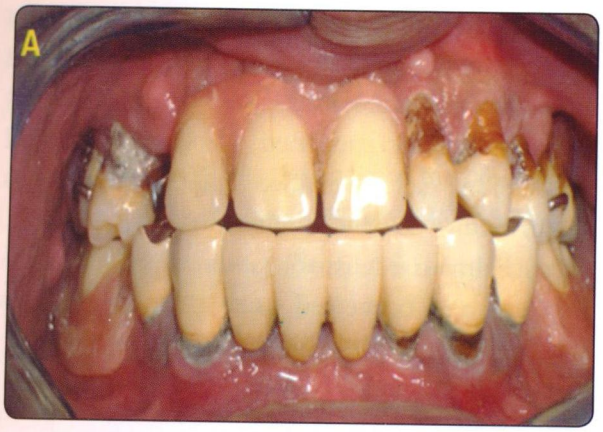
Dental clinicians are dealing with an increasing number of medically compromised patients who necessitate implant surgery for their oral rehabilitation.[1] Dental implant treatment is an excellent option for prosthetic restoration. [2] and numerous clinical studies have revealed encouraging outcomes.[3-5] The successful result of any implant procedure requires a sequence of patient-related and procedure-dependent parameters. [6] On the other hand, the dental literature contains numerous observations on the significance of systemic disorders in implant therapy. [7] Implant success is determined by various factors and primary implant stability may be only one of them. Few literatures provide evidence for an increased failure rate of implant treatment in medically compromised patients.[8-9]

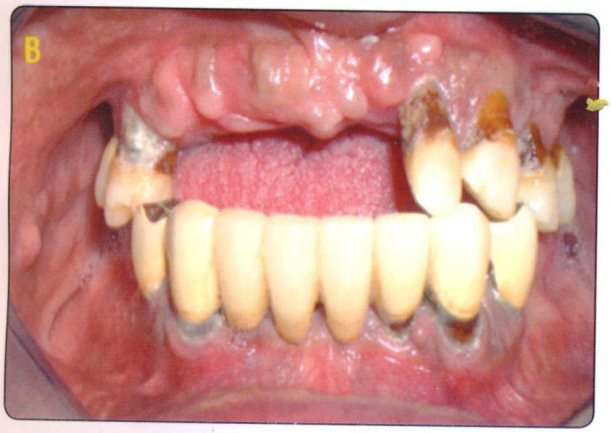
The treatment planning of implant surgery for oral rehabilitation should be well planned. It should involve not only the dental aspect but also consider the general health condition of the patient. A complete detailed medical history of the patient who requires the rehabilitation would help to decide whether the patient is eligible for the surgical appointments needed for dental implant placement. Despite the success and increased use of implants in dentistry, there are still reports on failure of dental implants. So it is important to identify the patient at risk prior for finalizing the treatment plan. Risk factor for implant failure can be anything from implant design to systemic diseases. Studies reported [10-14] that systemic diseases like diabetics, hypertension, osteoporosis, radiation, chemotherapy and steroid therapy as contraindication for implant therapy. Full mouth rehabilitation using implants in periodontally healthy patients has been well documented.[15] However, implant treatment in a medically compromised patient is frequently debated. The present study describes the use of osseointegrated dental implants to rehabilitate a diabetic, hypertensive and periodontally compromised patient with implant-supported fixed prostheses.

Case Report

A 62 year old male with ill-fitting maxillary and mandibular removable partial dentures was presented for dental implant treatment to replace his existing prostheses. A review of his medical history indicated that the patient had been under medication for hypertension for the past fifteen years, and diabetes for the past thirty years. The patient had undergone an open heart surgery ten years ago and also undergone six by-pass surgeries. The patient's medication included once daily, 75 mg Clopidrogel, 40 mg of Atorvastatin, Aspirin, 5mg Coversyl, 50mg Atenolol and twice daily, 100 IU/mL of Insulin, Vitamin C 500mg. He has a stabilized but elevated blood pressure of 140/90 mm Hg. He smoked one to two packs of cigarettes a day for over thirty five years. The rest of the patient's medical history was unremarkable, and the patient appeared to be in good health and had no known allergy.

The patient explained that he constantly had difficulty wearing his removable partial dentures which had to be remade numerous times. Intra-oral examination revealed severe periodontitis and generalized gingival recession. Most of the remaining teeth in the maxilla (#15, #14, #22, #23, #23 and #24) had Grade II or Grade III mobility (Fig. 1A). In the mandible, the patient had ceramometal fixed partial denture in the mandibular anterior's (Fig. 1B). The missing teeth were prosthetically replaced with maxillary and mandibular removable partial dentures (Fig. 1C). Rehabilitating the patient with implant-supported fixed maxillary and mandibular prostheses was considered as a possible treatment option. After reviewing the study models and radiographs, the patient was provided with detailed information regarding the planned treatment, alternative treatment options and possible





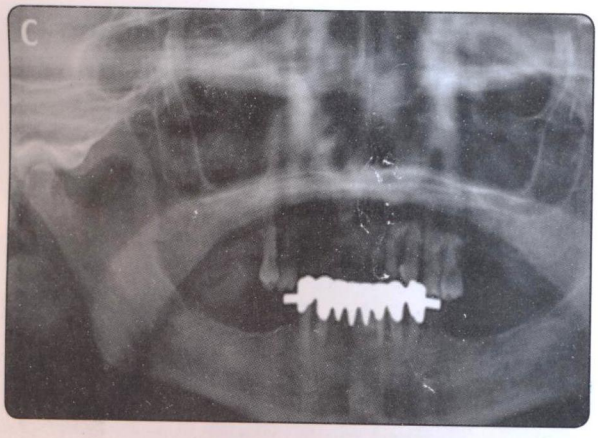


Fig. (1) : (A) Intra oral preoperative frontal view of the patient mouth with removable partial denture. (B) Intraoral preoperative frontal view of the patient mouth without removable partial denture. (C) Preoperative panoramic radiograph showing remaining upper teeth and lower fixed partial denture.

risks. It was explained to the patient that there would be increased chewing ability, increased stability, and improved phonetics versus the existing tissue-supported dentures. Written informed consent from the patient and clearance from his cardiologist were obtained. He was advised to reduce or quit smoking and was also referred to a tobacco cessation clinic.

At the first visit, alginate impression of the maxilla and mandible were made, the facebow was transferred and the maxillofacial relationship was recorded. In the lab, the study cast were prepared and mounted on a semi adjustable articulator. All the teeth were removed from the maxillary and mandibular study cast and wax up for maxillary and mandibular complete denture was done. On this study cast the transitional complete denture was fabricated. To prepare the surgical template, the transitional complete denture was duplicated with clear polymethyl methacrylate (Orthoresin, Dentsply Ltd, Weybridge, Surrey, England).

In the next visit, the patient received preoperative antibiotic treatment (Amoxycillin 500mg three times a day for seven days). Pre-operative radiographs were taken and the width, height, density, and angulation of the patient's bone were ascertained prior to surgery. This information was used in selecting the correct implant size with respect to available bone. The treatment room was surgically draped for asepsis, and the patient was anesthetized utilizing Carbocaine with Neo-Cobefrin to reduce cardiac effects. All the remaining teeth in the maxilla were extracted. Utilizing the prepared surgical template, initial osteotomy sites were marked with 2-mm drills (Fig. 2A). Following removal of the surgical template, the periosteal flap was raised to expose the bone. Twelve Osseotite® Implants (BIOMET 3i, Implant Innovations Inc, West Palm Gardens, FL) implants were placed in the maxilla (Fig. 2B). The sizes of implants used were 5X10mm, 4X15mm, 3.75X13mm and 3.75X10 mm. Different sizes of implants were used based on

the anatomical site of placement. Primary closure was achieved by suturing and four fixtures (in the region of #14, #11, #21 and #24) were selected to be used as abutments based on their initial stability and position in the arch. The interim complete denture was converted to interim fixed prosthesis by attaching it to the selected abutments with the help of temporary cylinders (PreFormance®BIOMET 3i, Implant Innovations Inc, West Palm Gardens, FL) and pink cold cure acrylic resin (DENTSPLY Caulk, 38 West Clarke Avenue, Milford, DE) (Fig. 2 C, D and E). The patient was advised to continue his antibiotic medication in addition to analgesics (Brufen 400mg, t.d.s for five days), soft diet and complete cessation of smoking.

After one week, extraction of all the mandibular teeth was performed under LA and antibiotic coverage (Fig. 3A). The prepared surgical template was used to mark the initial osteotomy sites with 2-mm drills. A mucoperiosteal flap was raised and 12 Osseotite® Implants (BIOMET 3i, Implant Innovations Inc, West Palm Gardens, FL) implants were placed (Fig. 3B). The sizes of implants used were 5X10mm, 4X15mm, 3.75X13mm and 3.75X10 mm. Similar to the maxilla, five fixtures (#35, #33, #41, #43 and #45) were used as abutments for retaining the immediate mandibular implant supported fixed prosthesis (Fig. 3C). Implant supported fixed prosthesis was delivered to the patient on the same day. The prosthesis was inserted and radiographs were taken (Fig. 3D). The vertical dimension, esthetics, phonetics, and occlusion were evaluated (Fig. 3E).

After four months, as a part of the second stage surgery, all the implants were surgically exposed. The cover screws were removed and healing abutments (4.1mmX5mmX4mm EP® Healing Abutments 3i, Implant Innovations Inc, West Palm Gardens, FL) were placed. The clinical and radiographic examinations confirmed failure of the implant placed in the maxillary #24 region. It was clinically mobile and radiolucencies were seen around the implant. The fixture was removed and the adjacent fixture (#25) was used as abutment for the implant supported prosthesis. For final impression, screw-retained impression copings 5mmX5mm EP® (3i, Implant Innovations Inc, West Palm Gardens, FL) were secured to the implants and connected using plastic sprue bars (Plastic Sprue Bars; Harvest Dental, Santa Fe Springs, Calif) and acrylic resin (Pattern Resin; GC Corp, Tokyo, Japan) (Fig. 4A). An acrylic custom tray (Triad Trutray; Dentsply, St. Charles, MO and Fastray LC; Bosworth, Skokie, IL) was used. Impressions were made with polyether (Impregum F, 3M-ESPE, Seefeld, Germany) impression material (Fig. 4 B, C). The impression adhesive (Polyether Adhesive; 3M ESPE, St. Paul, Minn) was applied to the impression material and dried to the tray. After the material was set, the impression was removed, implant lab analogs were connected to the impression copings, and type IV dental stone (ResinRock; Whip Mix Corp, Louisville, Ky) was used to fabricate the definitive cast. A facebow record was obtained and a maxillofacial relation record was made using record block.

In the laboratory, master casts were mounted on a semi-adjustable articulator (Denar Mark II, Teledyne Water Pik, Fort Collins, CO). After casts were mounted, denture teeth (SR Vivodent; Ivoclar Vivadent) were set on the record bases which was fixed to the temporary cylinders and attached by GC resin material (GC Corporation, Tokyo, Japan) (Fig. 5A). In the try-in visit esthetics, phonetics and occlusion were analyzed (Fig. 5B). In the laboratory putty index (Aquasil Putty DECA ™, Canada) of the established tooth position were made. The abutments were selected and the full wax-up of the maxillary and mandibular frameworks were done with the index in place. Cut back of the wax pattern was performed (Fig. 6A) followed by casting the framework with high noble metal alloy (Leo;

Ivoclar Vivadent) (Fig. 6B). In the next visit try-in of the metal frame work was performed and bite registration was obtained.

The frame work was then sent to the laboratory for porcelain application. Finally, esthetic and occlusions corrections were made on the prosthesis. In the final visit, the abutments were torqued to 35 Ncm^2 and the screw holes were sealed with light polymerizing provisional resin (Fermit-N; Ivoclar Vivadent) and composite resin (Tetric Ceram HB; Ivoclar Vivadent). After the final insertion of the prosthesis, the interfaces were checked for accuracy (Fig. 7A). The occlusal vertical dimension, esthetics, phonetics, occlusion and patient satisfaction were evaluated (Fig. 7B). The patient was also provided

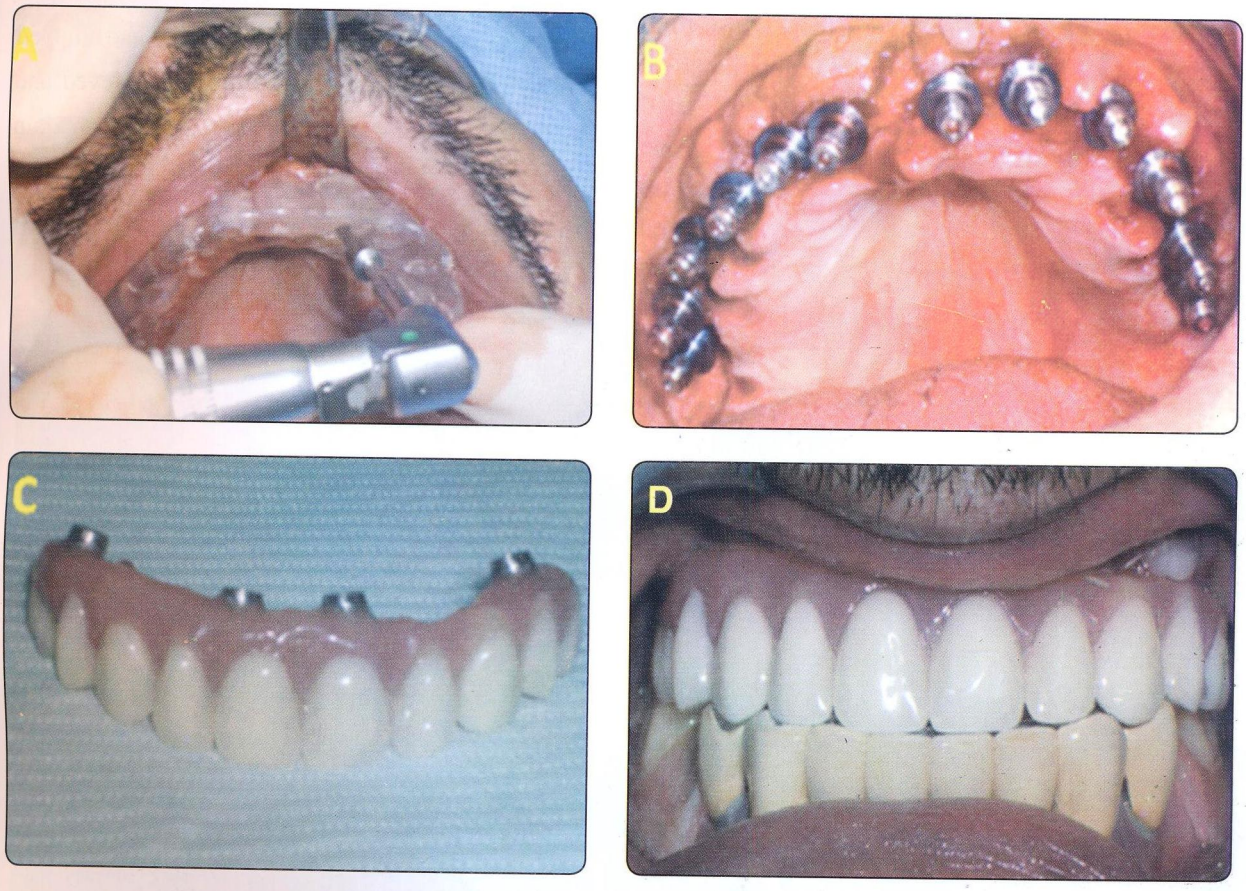


Fig. (2) : (A) Surgical template were used to mark initial osteotomy sites with 2 mm drills. (B) Twelve implants (BIOMET 3i) placed in the maxilla. (C) Maxillary immediate fixed prosthesis. (D) Maxillary immediate fixed prosthesis placed in mouth with the support of four abutments. (E) Panoramic view showing maxillary immediate fixed prosthesis in mouth with the support of four abutments.

with an occlusal splint (Fig. 7C). Post insertion instructions regarding maintenance of oral hygiene, use of water jet (Waterpik® Ultra Cordless Dental Water Jet, Surrey), proxy brushes (Go-Betweens Cleaners, Sunstar Butler) and dental floss (Satin Floss Oral-B) were provided.

Follow-ups were performed after the first week, first month, sixth month, and annually for the next six years following prostheses insertion. Radiographic assessments of the implants were performed at regular intervals. There was good stability for the implants with minimal bone resorption at the end of the six year follow up period. An excellent predictability was observed between the planned procedures and those obtained post treatment. Complete functional and esthetic rehabilitation of the patient was obtained. No abnormality was detected in the oral mucosa or the soft tissues around the implant. No adverse events occurred during the treatment phase and the patient was highly satisfied with the final esthetics of the prosthesis (Fig. 8 A). During the six years follow up visit it has been notice that the porcelain of crown in relation to tooth area number 14 and 23 had chipped (Fig. 8 B). The fixed prosthesis was retrieved and sent to the laboratory for reapplication of porcelain and reinserted back. The patient was pleased with the result and was motivated to maintain his oral hygiene and also to quit smoking.

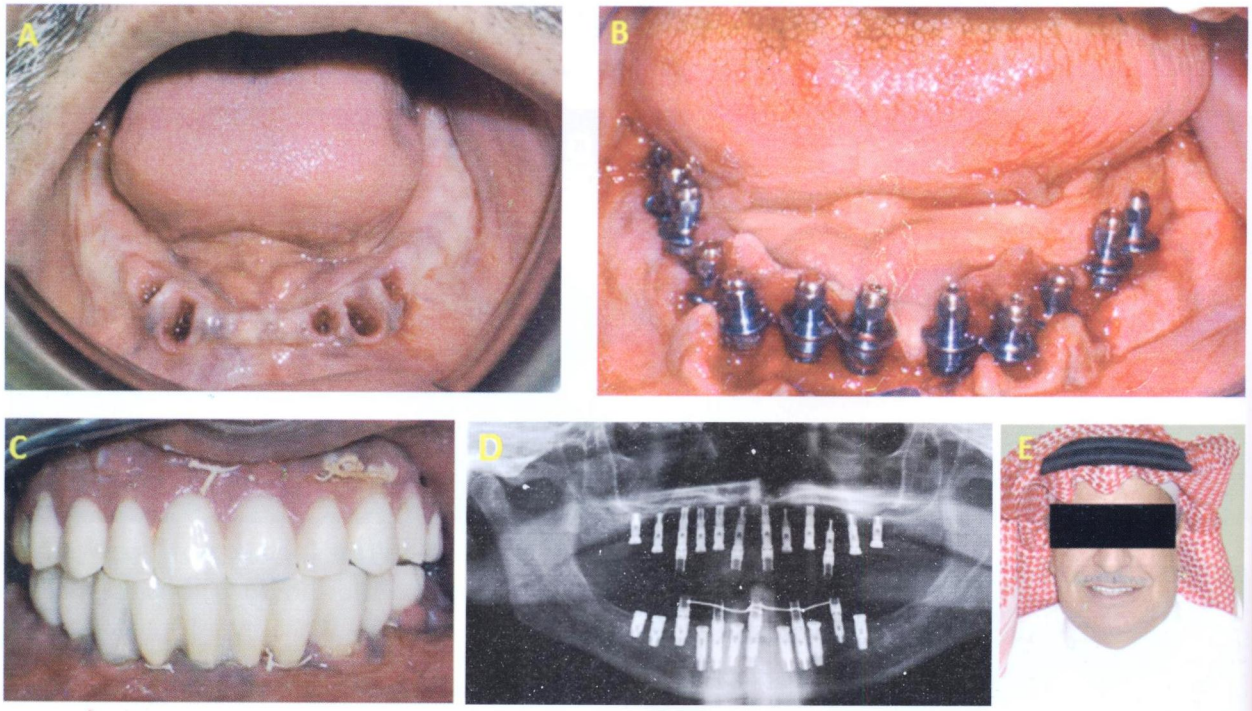


Fig. (3) : (A) Mandibular arch after the extraction of the remaining teeth. (B) Twelve implants (BIOMET 3i) placed in the mandibular jaw. (C) Maxillary and mandibular immediate fixed prosthesis in place. (D) Panoramic view showing both maxillary and immediate fixed prosthesis and the selected abutments. (E) Patient view after immediate placement of interim fixed prosthesis.

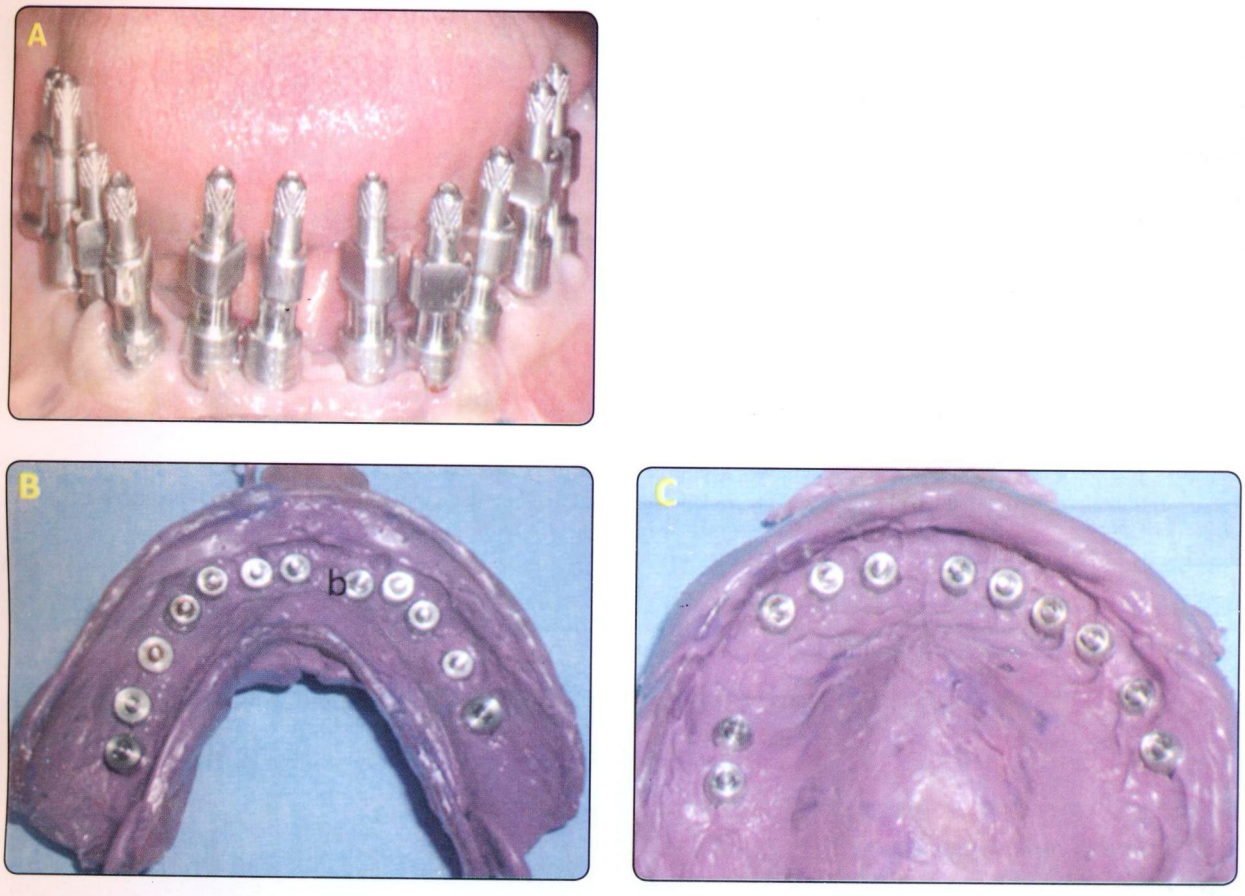


Fig. (4) : (A) Mandibular implant transfer coping in place. (B,C) Definitive impression showing pick up type transfer impression coping in maxilla and mandible.

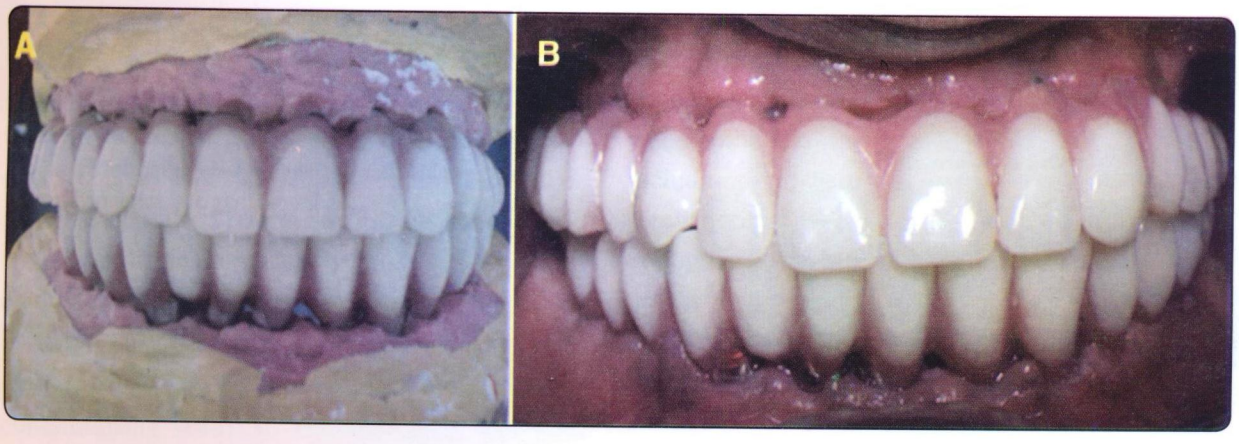


Fig. (5) : (A) Maxillary and mandibular teeth set up in a semi adjustable articulator. (B) Intraoral view of teeth set up try in patient mouth.

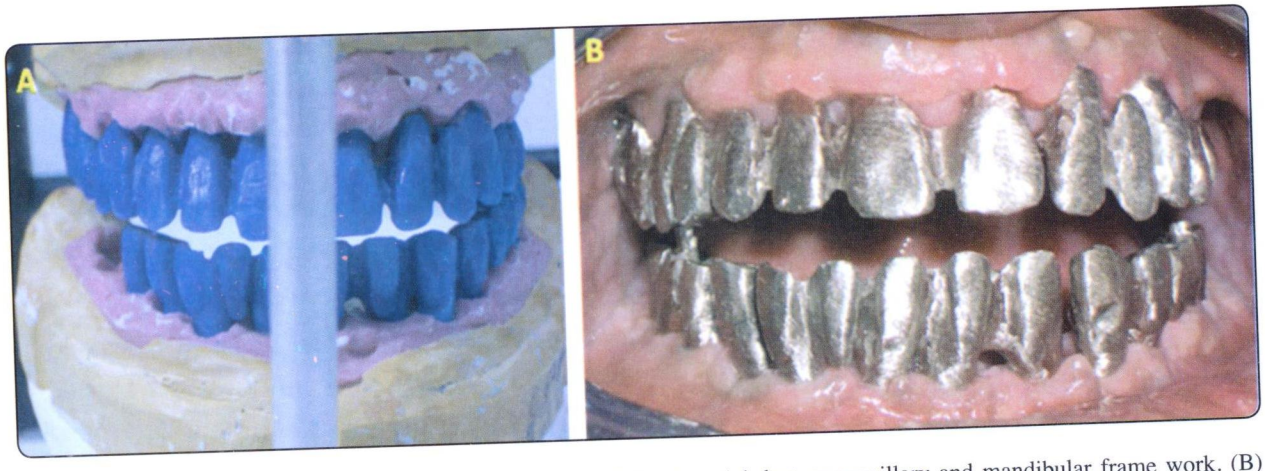


Fig. (6) : (A) Wax cut back of screw type implant supported fixed partial denture maxillary and mandibular frame work. (B) Intraoral view of metal try in of screw type implant supported fixed partial denture maxillary and mandibular frame work.

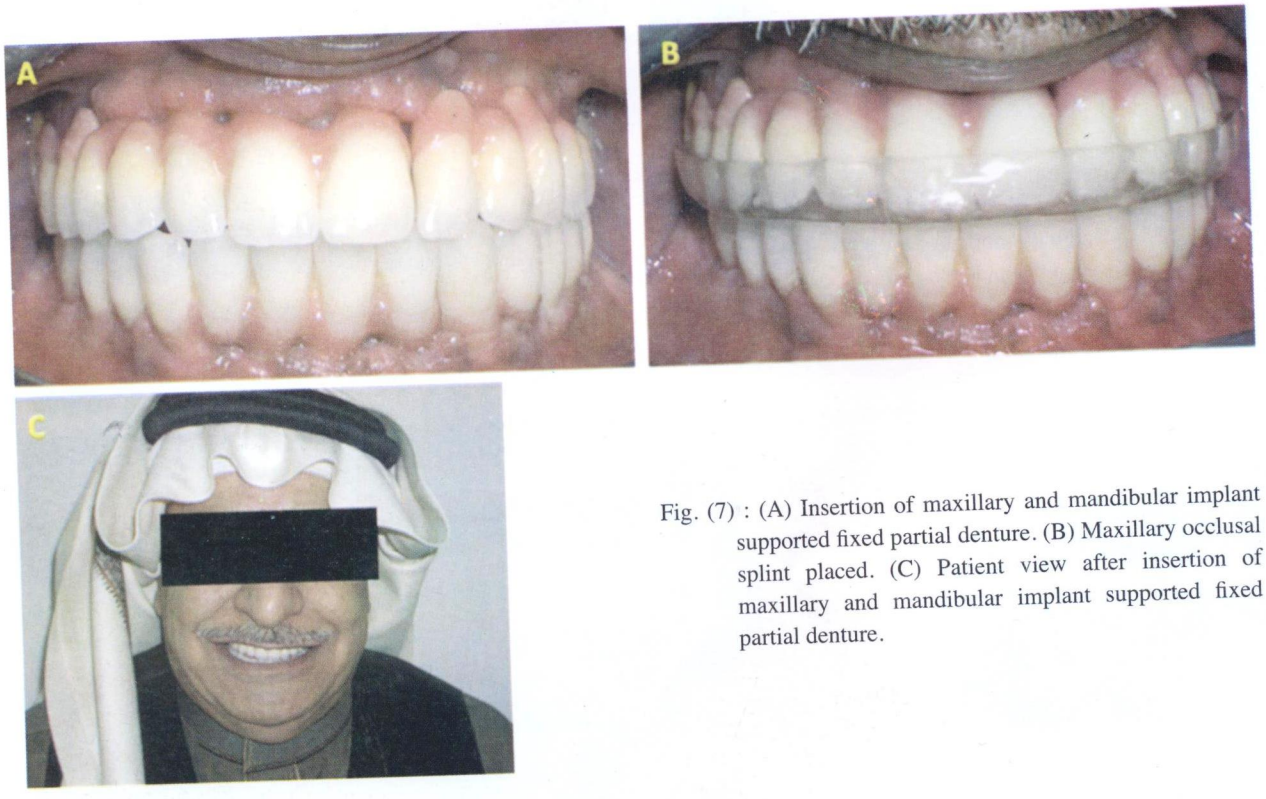


Fig. (7) : (A) Insertion of maxillary and mandibular implant supported fixed partial denture. (B) Maxillary occlusal splint placed. (C) Patient view after insertion of maxillary and mandibular implant supported fixed partial denture.

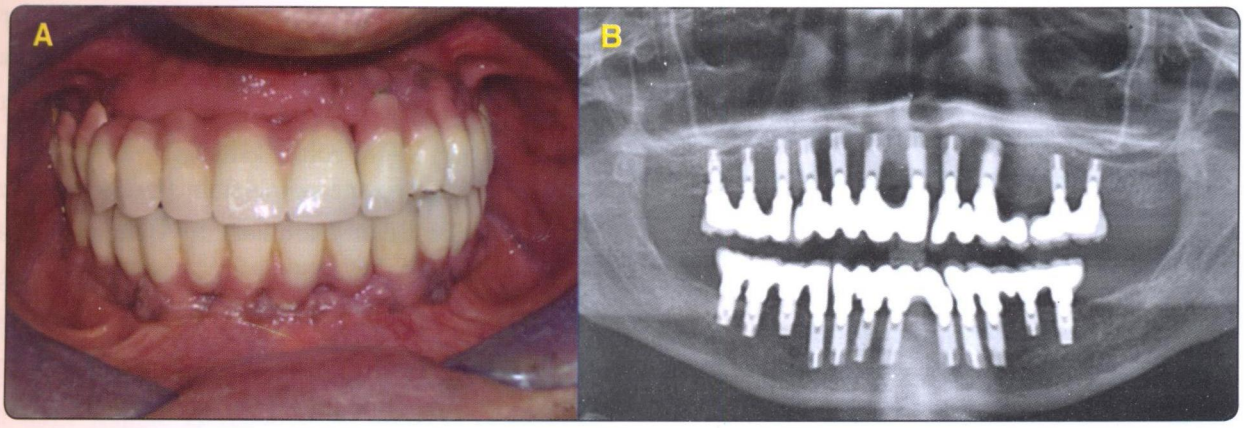


Fig. (8): (A) Post operative intraoral view after six years (B) Panoramic radiograph after six years of follow up.

DISCUSSION

This report describes the full mouth rehabilitation of a medically compromised patient using immediate loading implant supported fixed prosthesis. This method of rehabilitation has been reported to reduce the treatment time and cost and also enhance the patient comfort [16]. Twelve osseointegrated implants were used for each arch. This would be advisable because some of the implants may fail over time. Though the patient belonged to the high risk group, complete oral rehabilitation was considered essential for the general wellbeing of the patient. The benefits of full mouth implant reconstruction include increased chewing ability, bone preservation, improved speech, and an improved aesthetic for an edentulous patient. The development of endosseous implants has been proven to be one of the most significant benefits dentistry has offered to restore predictable oral function and improve their quality of life. However, some medical conditions preclude the successful placement and retention of fixtures. Over the years the number of these compromising situations has decreased, and with better understanding of metabolic and pathologic processes many clinicians are willing to explore those perceived contraindications that may not be justified.

The rehabilitation of completely edentulous patients with implant supported fixed proshtesis requires the placement of a number of implants sufficient to withstand the occlusal load. Some studies suggest that a minimum of three implants [17] are required while others suggest more. [18-19] In this patient four maxillary and five mandibular immediate placement and loaded implants were used for the retention of the interim implant supported fixed prosthesis, but in a span of four months, one of the maxillary implants failed. This could be due to overloading of the prosthesis. Studies have reported that the common causes of implant complications are related to biomechanical factors. Early loading failures occur with greatest frequency in very soft bone or implants shorter than 10 mm long, especially when both factors are present. Mechanical problems include complications as cementation failure, screw loosening, fracture of implant components or bodies and porcelain fractures [20-21]. In this patient's mandibular interim implant supported fixed prosthesis did not show any complication. Studies also reported that the implants success rates are higher in the mandibular jaw and are improved when the implants are anteriorly located [22-23].

Eleven implants in the maxilla and twelve implants in the mandible were conventionally loaded after a healing period of four months. The original

Brånemark implant protocol (Nobel Biocare) required a stress-free submerged healing time of three to six months to obtain osseointegration[24]. However, this has been challenged over the past decade with the introduction of early and immediate loaded implants. All the implants that were conventionally loaded showed minimal bone loss radiographically during the follow-up visits. The success rate with the conventional loading is in line with that reported in other studies [25-26].

Two teeth had fracture of the porcelain crown after a period of six years. Porcelain fracture is challenging and expensive to repair [27]. A recent study found approximately fivefold increase in porcelain failure for implant-supported prosthesis as compared to tooth-supported restorations [28]. However, the present case was successfully managed with reapplication of porcelain in the laboratory.

Diabetic patients have, amongst their other problems, impaired immunity due largely to phagocyte defects in chemotaxis, phagocytosis and killing. They may also suffer from microvascular disease and osteoporosis, and thus it would not be unreasonable to suspect that endosseous implant success could be impaired. Many studies have reported an implant success rate of 86–96% for diabetic patients. [29-32] It has been quoted in literature that subjects with periodontitis, diabetes and poor oral hygiene are more prone to develop peri-implantitis. [33] In this case, the patient who was known diabetic under medication for thirty years posed a significant risk on the treatment outcome. However, the final results were encouraging and healing after implant surgery was uneventful.

It has been reported in literature that, cigarette smoking may adversely affect wound healing, and, thus, jeopardize the success of bone grafting and dental implantation. [34] It is also believed that chronic smokers have increased plaque accumulation, higher incidence of gingivitis and periodontitis, higher rate of tooth loss, and increased resorption of the alveolar ridge. The periodontal condition of the patient was poor and it was decided to rehabilitate the patient with implant supported prosthesis. This method of treatment has become an integral part of restorative therapy for the periodontally compromised patient. [35] Though the patient refused to quit smoking in spite of repeated advices, no adverse effect was seen with regard to the treatment outcome. Similar results was reported in a recent study by Tomar [36], who found that cigarette smoking does not increase the risk for early failure of dental implants.

The patient's cardiac condition or the medication that he was taking did not affect the outcome of the treatment. Although there is no evidence that cardiac disorders are a contraindication to implants, medical advice should be taken first. [7] However, the cardiac associated problems like hypertension, bleeding tendency, ischaemic heart disease and infective endocarditis should be considered before finalizing the treatment plan. In view of these reports and facts a great challenge exists in successfully rehabilitating a medically compromised patient with implants. Oral hygiene maintenance and occlusion was evaluated during the recall visits. The patient demonstrated that he was able to keep the prosthesis clean by regular gentle brushing and frequent rinsing. Patient was satisfied with the aesthetics and functioning of the prosthesis.

This case report shows that favorable treatment results can be obtained with titanium implant supported prosthesis for medically compromised patients requiring comprehensive treatment. Clinical observation period was adequate and results obtained are encouraging. Prosthodontic treatment improved the patient's esthetic and functional condition and increased his psychosocial confidence and activities.

CONCLUSION

This present study concludes that implant supported prosthesis may be a meaningful contribution to prosthodontics in the rehabilitation of a medically compromised patient. However, controlled clinical studies are needed to establish the long term serviceability of this prosthesis. Also, prospective clinical studies focusing on long-term outcomes of immediate implant loading, considering different implantation time points on a large sample is required to suggest treatment recommendations. The presence of chronic diseases required additional care, but with careful treatment planning, desired results can be achieved.

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