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IMPLANT SUPPORTED FULL MOUTH PROSTHESIS IN A COMPLETELY EDENTULOUS DIABETIC PATIENT WITH BONE AUGMENTATION AND INDIRECT SINUS LIFT PROCEDURE - A CASE REPORT

RAJARAMAN V*[1], PRIYADARSHINI V[2], ROHINIKUMAR S[3] AND NESAPPAN T[4]

1: Postgraduate student (MDS), Department of Prosthodontics & Implantology, Saveetha Dental College, Saveetha Institute of Medical And Technical Sciences, Chennai, India

2: MS (Implantology) Student, Department of Implantology, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai, India

3: Senior lecturer, Department of Prosthodontics, Saveetha Dental College, Saveetha Institute of Medical And Technical Sciences, Chennai, India

4: Professor, Department of Prosthodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai, India

***Corresponding Author: Vaishnavi Rajaraman: E Mail: drvaish.sav@gmail.com; Mobile: +91-8779565950**

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ABSTRACT

Full mouth rehabilitation is a very challenging and comprehensive treatment protocol for most clinicians. It requires intensive understanding of the concepts and fine skills, to execute and establish successful clinical outcomes. Often surgical interventions are necessary to provide these desired results which may include bone grafting, guided tissue regeneration, sinus lift (transcrestal approach or lateral window approach), especially diabetes which can be really challenging for a clinician in terms of anticipation of the surgical outcome especially for patients with diabetes mellitus. The decision however has always been like walking on thin ice for these kinds of scenarios. Diabetes in general has never been an absolute contraindication for implant placement or any surgical intervention. Nevertheless, it is a challenging question whether to proceed or defer from such treatment protocol. This case report describes a successful implant supported fixed full mouth rehabilitation using a two stage protocol involving various surgical procedures, in a completely edentulous diabetic

patient. This case report also aims to focus on emphasising the need for clinicians to pursue such a treatment and thereby motivate them to provide the best treatment option so as to maintain their dental health effectively.

Keywords: Full mouth rehabilitation, Diabetes, Indirect Sinus Lift, Bone Augmentation, Peri-implantitis, Grafting procedure

CASE REPORT

A 63-year-old female patient reported the department of Prosthodontics and Implantology, with a chief complaint of missing teeth and wanted rehabilitation of the missing teeth. The concerns of the patient included the prognathic appearance of her face and her unesthetic existing complete denture.

DIAGNOSIS

On extra oral examination, the patient had a straight profile with prominence of premaxilla.

On intraoral clinical examination, the patient had a completely edentulous high we rounded; order 3 (Atwood classification) ridges **[1, 2]**. The intraoral frontal view showed the nature of the edentulous ridges. Diagnostic impressions and tentative jaw relation records were obtained to devise a well-structured treatment plan. A CBCT was advised using radiopaque markers placed in existing complete dentures to serve as a stent **[3] (Figure 1)**.

Figure 1: CBCT cross sections of each tooth panned for implant placement in maxillary and mandibular arches

The complete blood report was done and being a known diabetic, the patient was referred to for a physician's consent for any surgical procedure.

TREATMENT PLAN & PROCEDURE

An implant supported full mouth rehabilitation was the treatment protocol decided after obtaining physicians consent. A FP-3 type **[4–6]** of PFM prosthesis with 6 implants in the maxillary and 4 implants in the mandibular arch was panned (Straumann bone level implants SLActive®).

Stage I- Surgical Phase

Local anaesthesia was administered with 1:100000 lignocaine with epinephrine in the form of inferior alveolar nerve block in the mandible and infraorbital and posterior superior alveolar nerve blocks in the maxilla on both sides. After achieving good aesthetic action, the stents were placed to locate the implant osteotomy entry positions, intraorally. Punch cuts were made till a drop in the bone was obtained on the planned sites through the stent **[7, 8]**. A full thickness mucoperiosteal flap was elevated by giving a mid-crestal incision extending from molar to molar in maxillary and mandibular arches **(Figure 2)**. Releasing incisions were given bilaterally to ease in the vision of the operating field. Pilot drill was used and paralleling pins were used to check the positions of implants in each arch **(Figure 3)**.

Sequential drilling was then continued to finally place the following implants: 15(4.1 x 10 mm), 13, 11, and 22 (3.3 x 14mm), 23 (41. X 12 mm), 25 (4.8 x 10 mm), 34 (4.1 x 10 mm), 32, 42 (3.3 x 12mm), 44(4.1 x 10 mm). The anterior regions of the incisors did not have adequate width in the middle third of cross section, hence horizontal bone augmentation **[9, 10]** using xenograft material (Osseograft ®) followed by resorbable GTR membrane (Periocol ®) **(Figure 4)**.

Maxillary bone was D3 (350-850 HU) and mandibular bone was D1 (>1250HU) **[11–13]**, thereby the osteotomes were used in maxillary arch to condense the surrounding highly porous bone. Indirect sinus lift was performed in regions of premolars on both sides of maxillary arch without graft placement **(Figure 5)**.

After successful implant placement the corresponding cover screws were placed over the implants and the flap was closed with simple interrupted sutures (ETHICON®).

Post-Operative Instructions and Recall

Patient was advised to apply Oxygen enriched gel (consist of Sodium Saccharin, Sodium Perborate, Sodium Gluconate, Lactoferrin gluconate (highly concentrated active oxygen) Aqua, Alcohol, Glycerin, Silica, Citric Acid, PEG-32, Xanthan Gum, Cellulose Gum, BLUE M® gel) over the implant site, 2 times a day to enhance the healing process and effectiveness of oxygen increases angiogenesis and promotes revascularization, re-epithelization and cell proliferation. Patient was recalled for suture removal 1 week after and evaluated for healing. Temporary complete dentures were relined and inserted in the patient's mouth.

Stage II - Prosthetic Phase

A resonance frequency analysis was done after 6 months of implant stage I procedure, to evaluate the secondary stability of implants. The ISQ values were in the range of 70-75 ISQ, indicative of good osseointegration **(Figure 6)**.

Stage II recovery was done by making punch cuts near implant sites and replacing the cover screws with healing caps to develop a soft tissue emergence profile. After a waiting period of 1 week, the patient was recalled for an impression making procedure. Open tray was fabricated and monophase impression (Zhermack hydrorise®) was taken by splinting the implants intraorally, with open tray impression copings and using ligature wire and pattern resin (GC® pattern resin) **(Figure 7)**.

A jig trial was done and intra oral periapical radiographs taken to verify and correlate the position of implants in master cast and intraorally. A facebow record (UTS 3D transfer system®) and centric relation record was taken and master casts were mounted. Shade selection was done according to patients face and complexion. Teeth setting trial was performed to serve as a template for the future ceramic prosthesis **(Figure 8)**.

Decision was made to splint the full arch since placement of implants did not provide an option of splinted prosthesis. Angulated Implant abutments (15 degree) were used for maxillary anterior region to reduce the proclination and stock abutments were used for other implants and they were torqued to 20 Ncm (according to Straumann protocol). Metal framework was fabricated and checked for marginal fit and clearance. Intraorally jaw relation was verified **(Figure 9)**.

Ceramic was layered using the teeth setting index initially obtained, adding staining characterisation required. A bisque ceramic trial was evaluated intraorally and was checked for occlusion in centric and eccentric movements (IPS Classic®). Aesthetics at rest and occlusion and phonetics was also evaluated and corrections noted. A canine guided implant protected occlusion scheme was given. After a necessary evaluation the prosthesis was finally glazed (25–500°C). Prosthesis was cemented after sealing the abutment access channels with gutta percha. The pre-operative to post-operative rehabilitation showed a drastic difference **(Figure 10)**. The change from pre-operative to post-operative smile of the patient was satisfactory **(Figure 11)**.

RECALL AND REVIEW

Patient was recalled for a recall after 1, 3 and 6 months. She was advised water floss

(ORACURA®) to enhance oral hygiene maintenance. At 3 months post cementation panoramic radiograph was taken to evaluate peri implant marginal bone levels **(Figure 12)**.

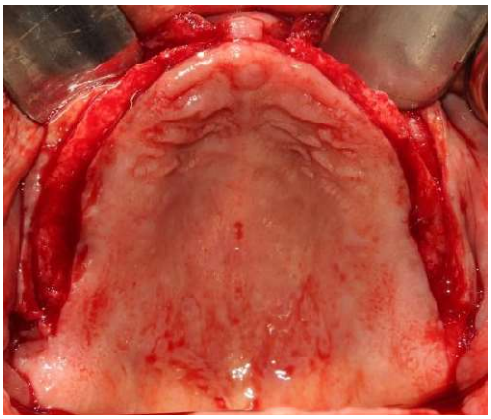

Figure 2: Full thickness mucoperiosteal flap was elevated by giving a mid-crestal incision extending from molar to molar in maxillary and mandibular arches

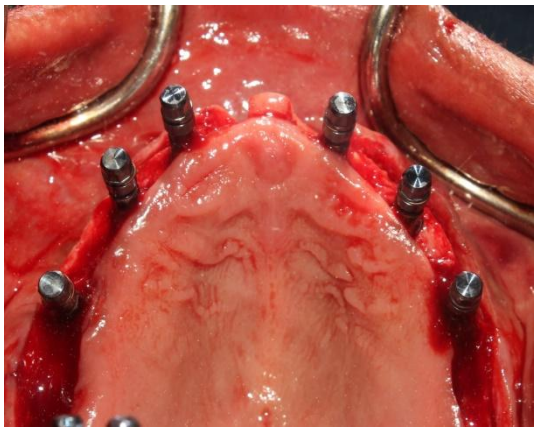

Figure 3: Pilot drill was used and paralleling pins were used to check the positions of implants in each arch

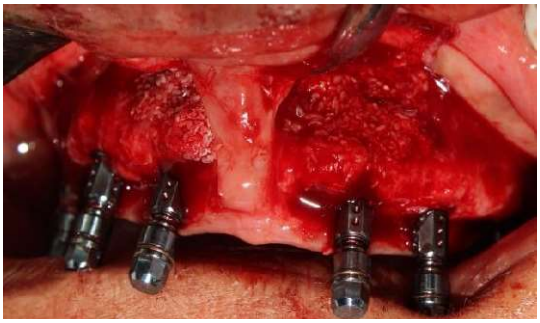

Figure 4: Horizontal bone augmentation using xenograft material (Osseograft ®) followed by resorbable GTR membrane (Periocol ®)

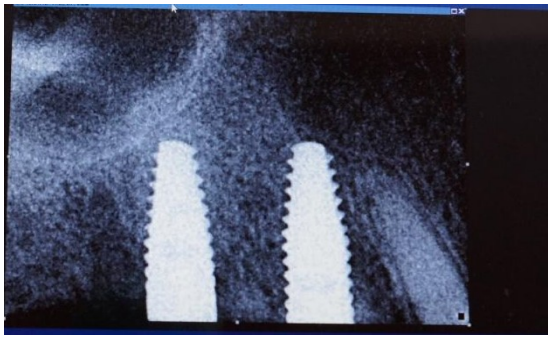

Figure 5: Indirect sinus lift was performed in regions of premolars on both sides of maxillary arch without graft placement

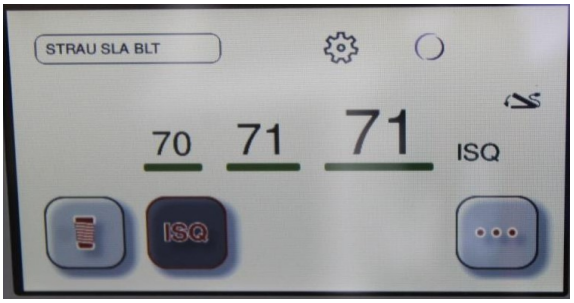

Figure 6: Resonance frequency analysis with ISQ indicating secondary stability

Figure 7: Monophase impression (Zhermack hydrorise®) of maxillary and mandibular arch

Figure 8: Teeth setting trial

Figure 9: Metal framework trial

Figure 10: Final Prosthesis

Figure 11: Pre- operative and post-operative extra oral profile view of the patient

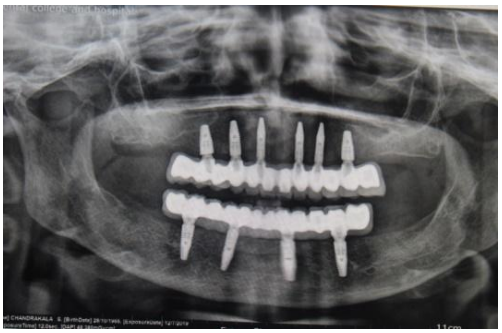

Figure 12: Panoramic radiograph 3 months' post cementation

DISCUSSION

Implant prosthetics have always been crucial in its planning and execution, and in this particular case the wax teeth setting was used as a guide for the final prosthesis. Careful meticulous planning and stringent protocols are required for any case to produce aesthetically and functional satisfactory outcomes. In general, implant supported complete arch prosthesis show better patient related outcome measures (PROMs), with a slight trend of implant supported fixed complete denture being superior to implant overdenture **[14, 15]**.

Medical conditions have always been a dilemma for surgical procedures **[16, 17]**.

Diabetes is just a relative contraindication and extensive procedures like indirect sinus lift, horizontal bone augmentation can provide bone gain if the patient is controlled diabetic **[18, 19]**. The parameters like marginal bone loss, probing depth and bleeding around dental implants were statistically significant favouring patients without diabetes mellitus. Diabetes mellitus or hyperglycaemia seems to be associated with a high risk of peri-implantitis **[20, 21]**. Although this said, the difference between the insertion of dental implants in non-diabetic and diabetic patients does not affect the implant failure rates **[22–24]**.

In this case report, an osteotome mediated indirect sinus lift approach without grafting material was performed. The review of the scientific literature confirmed the successful outcomes of osteotome mediated sinus lifting without the use of any bone substitute **[25–27]**. Sinus lift procedures with simultaneous implant placement with graftless technique are considered reliable procedures. According to immunochemical studies, faster and greater new bone formation was observed in sites that received no grafting material. Blood clot can be considered autologous osteogenic graft material, to which osteoprogenitors can migrate, differentiate, and regenerate bone **[28–30]**. The insertion of dental implants in combination with maxillary sinus floor elevation is a predictable treatment method showing high implant survival rates and low incidences of surgical complications **[28, 29]**.

Implants can be screw or cement retained and they can also replace partial or total dentition. Depending on the part of the tooth implant supported prosthesis could replace the crown (FP1), a portion of root (FP2) or even a portion of edentulous soft tissue site (FP3). Cement-retained implant borne restorations offer several advantages, including the elimination of unesthetic screw access holes, greater resistance to porcelain fracture, screw apertures which may interfere with occlusion may occupy more than 50% of the crown surface and passive fit is difficult to attain for a screw-retained restoration with more than one implant **[31–35]**. Custom abutments were designed for this case with supragingival margins that allow for easy and complete cement removal. The cemented implant crown costs considerably less because of lower laboratory fees and fewer components **[36, 37]**. Fewer and shorter appointments are needed to restore a cement-retained crown, which is more cost effective for the prosthetic dentist. The porcelain fused metal restorations should be used for long-span bridges and have proven to be an effective material choice in the longer term. Clinical success of porcelain fused to metal restorations has

been proven through long-term research **[38, 39]**.

Peri-implant maintenance compliance seems to be crucial to prevent peri-implantitis in healthy patients **[40–42]**. The potentially higher risk for peri-implant diseases in hyperglycaemia should be taken into account when considering implant therapy in patients with diabetes mellitus **[43–45]**. Depending on continuing diagnosis during maintenance, developing peri-implant lesions should be treated according to the Cumulative Interceptive Supportive Therapy (CIST) protocols **[46]**. CIST includes as a first sequence mechanical, antiseptic and antibiotic treatment to control ongoing infection. Following this, peri implant bony lesions may be corrected by regenerative or resective surgical techniques **[46–48]**. These CIST modalities should be followed by the dental health care provider after each follow up visit.

It has been decades since we have been experimenting on similar procedures with a successful outcome. Mastering certain surgical techniques with proper post-operative care and maintenance in al medically compromised patient is the aim of this case report. It is also an attempt to reinforce the fact that good case selection and following proper surgical protocol can give excellent outcomes.

CONFLICT OF INTEREST

The author/s has/ve no conflict of interest.

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