(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume3, Issue 6, Page No: 569-573
November-December 2020

DMLS Screw Retained Full Maxillary Arch Prosthesis on Immediate Loaded Implants- A Case Report

[1]Dr. Nitika Gupta, [2]Dr. Kritika Gupta

[1]Postgraduate Student, Department of Prosthodontics, Crown and Bridge & Implantology, Himachal Institute of Dental Sciences, Paonta Sahib

[2]Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Himachal Institute of Dental Sciences, Paonta Sahib

***Corresponding Author:**
Dr. Nitika Gupta
Postgraduate Student, Department of Prosthodontics, Crown and Bridge & Implantology, Himachal Institute of Dental Sciences, Paonta Sahib

Type of Publication: Case Report
Conflicts of Interest: Nil

ABSTRACT

Combining tilted and straight implants for supporting fixed prostheses can be considered a viable treatment modality resulting in a simpler and less time consuming procedure, in significantly less morbidity, in decreased financial costs and a more comfortable postsurgical period for the patients. Of the several options, complete-arch, fixed screw-retained solutions are generally considered to be the preferred treatment solution. Screw retention offers advantages such as predictable retrievability and potentially easy prosthodontic maintenance, as well as excess cement not being a concern. However, implant mispositioning and malalignment may often necessitate the use of cement-retained prostheses. This clinical report describes a method of fabricating a complete-arch, implant screw-retained, metal-ceramic prosthesis, by using direct metal laser sintering technology.

Keywords: Direct metal laser sintering, immediate loading, maxillary arch

INTRODUCTION

Edentulous condition has a negative impact on our lives functionally and esthetically leading to poor health and loss of confidence, relegated to live like a dental cripple[1].To replace missing teeth due to the need of esthetics and function, many different treatment modalities are available today. One such treatment is the rehabilitation of empty spaces with dental implants[2] .Since the introduction of concept of osseointegration by Branemark in 1960 and successful placement of prosthesis over intraosseous implant, Implant dentistry boomed in recent years[3]. Implant-based prostheses have become the restoration of choice for edentulous patients[4].Ideally implants are placed parallel to each other and adjacent teeth to vertically align the axial forces but combining tilted and straight implants for supporting fixed prostheses can be considered a viable treatment modality resulting in a more simple and less time consuming procedure, in significantly less morbidity, in decreased financial costs and a more comfortable postsurgical period for the patients[5]. In 1993 Dr. Paulo malo advocated the concept of 2 vertically aligned and 2 implants placed at an angle of 35-40 degree in anterior and posterior region respectively.

The earlier concepts of restoration over implants suggested a loading protocol after 3-6 months or to extract decayed teeth followed by healing of sockets and then implant placement. Ever since clinicians trying the possibilities to shorten the treatment time for implants by placing implants in fresh extraction

sockets and immediate restoration or loading[6]. However, this concept has some limitations that patients must not only have good general health and acceptable oral hygiene but also sufficient bone availability for implants of at least 10 mm residual bone. Moreover, immediate function can only be established in case of sufficient primary stability of the implants[2]. In the recent years, the immediate loading procedure for the rehabilitation of edentulous jaws using osseointegrated implants has gained popularity among clinicians due to both the excellent success rates for several types of immediately loaded prosthetic reconstructions, and the technical advantages and simplification introduced by such procedure as widely reported in various reviews (Attard & Zarb 2005; Ioannidou & Doufexi 2005; Del Fabbro et al. 2006; Nkenke & Fenner 2006; Avila et al. 2007; Esposito et al. 2007; Jokstad & Carr 2007; Sennerby & Gottlow 2008)[7]. Among modifications to the immediate load surgical technique has been a suggested redirection of the distal implants from vertical to distally inclined axial positions in both jaws to enhance the anterior-posterior spread and increase the distally inclined implant length[8]. The resultant increase in anterior-posterior spread when compared to their placement in noninclined positions eliminates the need for grafting, facilitates cross-arch stabilization, and minimizes the cantilever extension[8].

This clinical report describes a method of fabricating a screw-retained, complete-arch implant prosthesis for the maxillary arch by using the direct metal laser sintering (DMLS) technology. DMLS technology, also described as 3D metal printing, uses additive manufacturing to fabricate metal frameworks[4].

CLINICAL REPORT

A 65 years old male reported to our department with a chief complaint of mobile bridge in the upper front region of the jaw and wanted to get it replaced thereby restoring the esthetics and function. Intraoral examination revealed few remaining teeth which were periodontically compromised and bilaterally missing upper posterior molars and premolars (15,16,17,24,25,26) (Fig.1 a,b). The patient was then explained about treatment option of immediate extraction followed by immediate loading over six implants in maxillary arch but due to insufficient bone the treatment plan was modified to 5 implant supported full arch prosthesis. Generalized periodontal condition was not satisfactory and retained abutments were not in healthy condition therefore it was decided to extract them. After patient's consent initial treatment started with diagnostics, photographs and radiographs (Panaromic and Radiovisual graphs) (Fig 2). Implant-retained fixed prostheses were planned to restore the maxillary arch.

fig.1(a)Preoperative in occlusion

fig.1(b) Preoperative occlusal view

fig.2 Preoperative opg

fig.3 Extracted maxillary teeth

fig.4 Implants placed

fig.5 Impression copings placed for immediate impression

Volume 3, Issue 6; November-December 2020; Page No 569-573

Prophylactic antibiotic coverage(amoxicillin 1gm) was given 2 hrs prior to surgery followed by rinse with chlorhexidine mouth wash (0.20%) 1 minute prior to surgery. Local anaesthesia was administered bilaterally containing lidocaine(2% with adrenaline (1:100000). All the retained abutment teeth were extracted along with mobile bridge atraumatically, granulation tissue was removed and sockets were cleaned (Fig.3). This was followed by sequential drilling and five implants were placed by open flap procedure in axial direction at site 11,13,21,23,26 (Osteem TS III) (Fig.4). After placing implants in sockets and confirming primary torque 35Ncm, multiangle abutments alongwith guiding screws were placed. Impression for immediate fixed prosthesis was made with multiunit impression copings (Fig.5). Healing caps were placed and flap was sutured using resorbable sutures to approximate the wound (Fig 6). Immediate loading was done within 48 hours followed by occlusal adjustment (Fig.7). The patient was advised for soft diet for 2 weeks. a standard antibiotics regimen was prescribed. Regular follow-up was done to assess the treatment outcome.

fig.6 Healing cap placed and flap sutured

fig.7 Immediate fixed prosthesis

fig.8 DMLS screw retained metal framework

fig. 9 Final prosthesis

fig.10 Final maxillary prosthesis

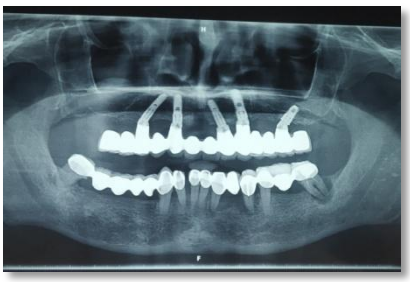

fig.11 Post operative follow up

fig.12 Preoperative

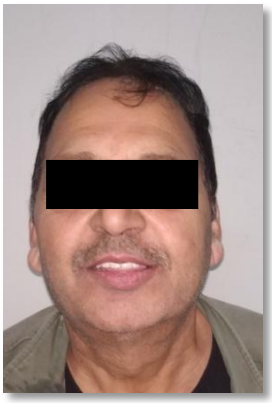

fig.13 Postoperative

Final treatment procedures started after 3 months after confirming osseointegration of implants. Jig trial followed by metal trial was done. Framework was milled from solid pieces of titanium by DMLS

Volume 3, Issue 6; November-December 2020; Page No 569-573

(Direct metal laser sintering). The metal frameworks were clinically evaluated for fit, passivity, occlusion, esthetics and phonetics (Fig.8).The fit was found satisfactory and frameworks were veneered with gingival pink porcelain to resemble soft tissue in gingival areas (Fig.9) and the screw-retained framework then was secured to the implants at 25 Ncm torque. The screw access holes were sealed and composite fillings were placed on top of it (Fig.10). The patient was placed on regular recall for oral hygiene and periodontal maintenance every 3 months for the first year and every 6 months thereafter (Fig.11). The implant prosthesis restored lost function and provided the necessary esthetics; the patient was seen at follow up maintenance with no complaints.

DISCUSSION

This clinical report described the use of selective DMLS to provide a custom, highly esthetic, complete-arch, screw-retained implant prosthesis that overcomes unfavorable implant angulations. This design is proposed as an esthetic alternative to conventional designs and is an alternative way of maintaining screw retention with retrievability[4].DMLS is a relatively recent additive manufacturing method for fabricating metal frameworks for metal ceramic restorations[9,10]. It produces metal frameworks with equivalent or better fit and marginal adaptation than milling-based CAM systems, potentially reducing technical complications[11,12]. Passive fit is assumed to be a significant prerequisite for maintaining the integrity of the bone implant interface. Failure to produce passive fit may cause mechanical failure of the prostheses or implants and biologic complications in surrounding tissues[13]. Branemark suggested that precision of the prosthesis fit should be within the range of 10 micrometer.

For the rehabilitation of the edentulous mandible and maxilla, especially in those cases of extremely reduced posterior ridges, the ideal approach should endeavour at the following: minimization of the total number of implants to decrease surgical morbidity, reduction of the distal cantilever without compromising the functional support, avoidance of demanding bone grafting procedures and decrease of total treatment time and costs which may be achieved by immediate loading protocol.[6] Schnitman *et al.* reported the first case series patients successfully rehabilitated with immediately loaded fixed prostheses[14]. Several advantages have been related to immediate loading, including immediate function and esthetics, avoidance of temporary removable prostheses, avoidance of second surgeries and preservation of soft tissue anatomy[15].

With respect to full-arch immediate loading over immediate implants, Degidi et al carried out immediate full-arch maxillary loading in 175 immediate implants and 213 implants in mature bone, finding no differences between the 2 groups[16]. Balshi et al,18 in a study carried out on 276 implants (164 maxillary and 112 mandibular) with immediate loading,observed a reduction in the ISQ values from the day of surgery until the third month, recommending not to remove the provisional prosthesis during the first 2 months[17].

CONCLUSION

Edentulous maxilla's anatomy is often challenging for dental implant treatment due to absorption of alveolar ridge and sinus pneumatisation. It is often observed that posterior maxillary region presents with low bone quality and quantity therefore combination of axially placed and tilted implant for the immediate rehabilitation of edentulous jaws leads to excellent clinical outcomes. Many systematic and meta analyses showed that immediate implant loading does not impair treatment success. The advantages of the immediate loading procedure, the reduced morbidity, the high patient's satisfaction and the relatively low costs of the surgical technique should be taken into account when a decision among the alternative therapeutic options has to be made.

REFERENCES

1. Christopher CK. Implant rehabilitation in edentulous jaw: the all on four immediate function concept. Australian Dental Practice. 2012:138-148
2. Koseler AE, Saridag S, Coskunses FM. The Rehabilitation of Edentulous Maxilla with the Use of All-on-Four Implants. Mod App Dent Oral Health 2018;1(4) : 77-82
3. Branemark PI, Adell R, Albbrektsson T, Lekholm U, Lindstrom J, Rockler B. An experimental and clinical study of

Volume 3, Issue 6; November-December 2020; Page No 569-573

osseointegrated implants penetrating the nasal cavity and maxillary sinus. Journal of oral rehabilitation 1979; 43: 497-505

4. Shah K, Lee DJ. Fabricating a screw-retained, complete arch, fixed implant prosthesis using selective metal laser sintering: A clinical report. J Prosthet Dent. 2020;123(3):373-378
5. Hassine MB, Bucci P, Gasparro R, Lauro AE, Sammartino G. Safe approach in "All-on-four" technique:a case report. Annali di Stomatologia 2014;142 V (4):142-145
6. Cochran DL, Morton D, Weber HP. Consensus statements and recommended clinical procedures regarding loading protocols for endosseous dental implants. Int J Oral Maxillofac Implants. 2004;19:109-113
7. Agliardi E, Panigatti S, Clerico M, Villa C, Malo P. Immediate rehabilitation of the edentulous jaws with full fixed prostheses supported by four implants: interim results of a single cohort prospective study. Clin. Oral Impl. Res. 2010;21:459–465
8. Parel SM, Phillips WR. A risk assessment treatment planning protocol for the four implant immediately loaded maxilla: preliminary findings. J Prosthet Dent 2011;106(6):360-366
9. Tamac E, Toksavul S, Toman M. Clinical marginal and internal adaptation of CAD-CAM milling, laser sintering, and cast metal ceramic crowns. J Prosthet Dent 2014;112:909-913
10. Strub JR, Rekow ED, Witkowski S. Computer-aided design and fabrication of dental restorations: current systems and future possibilities. J Am Dent Assoc 2006;137:1289-96.
11. Murr LE, Martinez E, Amato KN, Gaytan SM, Hernandez J, Ramirez DA, et al. Fabrication of metal and alloy components by additive manufacturing: examples of 3D materials science. J Mater Res Technol. 2012;1:42-54.
12. Bhaskaran E, Azhagarasan NS, Miglani S, Ilango T, Krishna GP, Gajapathi B. Comparative evaluation of marginal and internal gap of CoeCr copings fabricated from conventional wax pattern, 3D printed resin pattern and DMLS tech: an in vitro study. J Indian Prosthodont Soc 2013;13:189-195
13. Baig MR, Rajan G, Rajan M. Edentulous Arch Treatment With A Cad/ Cam Screw-Retained Framework And Cemented Crowns: A Clinical Case Report. J Oral Implanto. 2009;295-299
14. Schnitman PA, Wohrle PS, Rubenstein JE. Immediate fixed interim prostheses supported by two-stage threaded implants: methodology and results. J Oral Implantol. 1990;16:96-105
15. Oltra DP, Covani U, Diago MP, Diago MP. Immediate loading with fixed full-arch prostheses in the maxilla: Review of the literature. Med Oral Patol Oral Cir Bucal. 2014;19(5):512-517
16. Degidi M, Piattelli A, Felice P, Carinci F. Immediate functional loading of edentulous maxilla: A 5-year retrospective study of 388 titanium implants. J Periodontol 2005;76 (6):1016-1024
17. Balshi SF, Allen FD, Wolfinger G, Balshi TJ. A resonance frequency analysis assessment of maxillary and mandibular immediately loaded implants. Int J Oral Maxillofac Implants 2005; 20(4):584-594.

Volume 3, Issue 6; November-December 2020; Page No 569-573