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RESEARCH ARTICLE

MAXILLARY AND MANDIBULAR SCREW RETAINED FIXED FULL ARCH PFM RESTORATION – A CASE REPORT

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ABSTRACT

The fabrication of a full-arch implant supported maxillary and mandibular prosthesis has been associated with several prosthetic complications and difficulties. Even though it has been reported that phonetics, esthetics, and proper lip support are difficult to achieve with fixed full arch implant supported, there is a scarcity in the literature regarding the clinical and laboratory procedures necessary to minimize these complications. This article provides clinical and laboratory steps that may enable the clinician to achieve more predictable restorative results when using computer-aided design/computer-assisted manufacture (CAD/CAM). The technique presented here describes the fabrication of a wax pattern of the metal framework using CAD/CAM followed by casting to fabricate a maxillary and mandibular implant supported porcelain fused to metal restoration in a more predictable manner.

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INTRODUCTION

For many patients, being edentulous must be regarded as a handicap with respect to oral function and psychosocial impact on quality of life. As a result, restoration of oral function through oral surgery and placement of implants is often welcome. Long-term studies have demonstrated that the edentulous jaw can be restored successfully with implant-supported fixed prostheses (Zarb and Schmitt, 1990a, 1990b,1990c; Adell *et al.,* 1990; Qui- rynen *et al.,* 1992). The success rate has been defined at various times by various authors (e.g. Albrektsson *et al.,* 1986; Smith and Zarb 1989; Buser *et al.,* 1991; Albrektsson and Zarb 1993; Roos *et al.,* 1997), and different limits have been set for the upper and lower jaw: .≥95% and ≥90% after 5 and 10 years for the mandible and ≥90% and ≥85% for the maxilla, respectively. Special consideration has been given to the full-arch maxillary and mandibular implant-supported fixed prosthesis because it has been associated with esthetic and phonetic difficulties (Watson *et al.,* 1991, Desjardins, 1992, Sadowsky, 1997, Zitzmann and Marinello, 1999). Therefore, adequate planning is needed when fabricating a full-arch fixed prosthesis. Even though it has been reported that the fabrication of a maxillary full-arch implant-supported fixed prosthesis requires careful treatment planning and prosthetic design (Zitzmann NU, Marinello, 1999; Proussaefs, 2002), there is a scarcity in the literature regarding laboratory and clinical guidelines for the fabrication of such a prosthesis. The current article offers clinical and laboratory steps for the fabrication of a screw-retained implant-supported maxillary full-arch fixed prosthesis by incorpo- rating a conventional wax-up of the tentatively designed prosthesis and newly developed computer-aided design/computer-assisted manufacture (CAD/CAM) technology.

CASE REPORT

A 52-year-old woman presented at the Department of Prosthodontics and Implant Dentistry at Government Dental College & Hospital Mumbai seeking treatment for her completely edentulous maxilla and mandible. Patient was not satisfied with the existing maxillary and mandibular complete denture because of the inconvenience of removing it every day. She also encountered speech problems related to the full palatal coverage of the complete denture and lack of adaptability to its bulk. In addition, her upper denture lost retention many a times at some of her important business meetings causing her a lot of embarrassment. After discussing various treatment options, a decision was made to restore the maxilla and mandible with a fixed implant-supported prosthesis. Six threaded root form implants (Tuff pro Noris Medical) each were placed in the maxillary and mandibular

arch. Before implant placement, a new maxillary and mandibular complete denture had been fabricated. A duplicate of the new complete denture was made and used as a surgical template during implant placement (Graser *et al.,* 1999). Implant placement and postoperative healing occurred without surgical complication. After osseointegration was confirmed, four months later, at the second stage surgery, it was decided to carry out the prosthetic phase. The cover screws were removed and replaced with gingival formers .A preliminary impression was made with alginate in a suitable stock impression tray with adequate depth. The elevations of the gingival formers denoted the regions of the implants for making the special tray for an open tray impression, also recording the relationship of the implant to the adjacent soft tissue and functional sulci in order to aid in positioning the teeth and framework of the prosthesis. The impression was rinsed in water, sprayed with disinfectant and sent to the laboratory for pouring and making the special tray. Patient was recalled after three weeks and open tray impression copings corresponding to the implant sizes was placed. The impression copings were linked to each other with dental floss and quick setting auto polymerizing resin (Pattern Resin, GC Company) placed on them assuring immovable stabilization of the impression copings during the impression procedures, while transferring to the laboratory and during laboratory pouring procedures.

An open tray impression was made in stiff elastomeric impression material after injecting light bodied impression material around the copings and the impression sent to the laboratory for pouring. In the lab, implant analogs attached to the copings and the impressions poured using die stone. The accuracy of the master cast was clinically established using a verification jig (check bar). The jig was initially made on the master cast using castable abutments which was later verified by seating it intraorally. One screw was tightened while the others remained slack. The fit of the abutments were also checked clinically for any visible gaps. Thus, the verification jig returned from the laboratory was analyzed in the mouth, its passive fit and clinical stability ascertained and sent to the lab.
The maxillomandibular relation record was made by using a customized shellac record base plate and wax occlusal rim and a facebow transfer was done. The base that was constructed by incorporating holes over the abutments was secured by using the screws. The wax rims were contoured to establish lip support, incisal edge position, buccal corridor, midline and vertical dimension of occlusion (Stevens *et al.,* 1999). Teeth selection was done based on conventional principles. Proper verification of records was made in order to ensure that the teeth are in the most advantageous position prior to constructing the definative framework and that the teeth was positioned in a way that it could be linked to the underlying implants as well as be hygienically maintained along with controlling occlusal loads. A canine occlusal scheme was planned in this case. The waxed up trial denture on the master cast was tried. It was ensured that both the patient and dentist were satisfied with the facial appearance, position of the teeth with the opposing dentition, underlying ridge and implants, space below prosthesis to maintain oral hygiene and with the accessibility to the fixture screws. The diagnostic waxed up trial denture was then transferred to the laboratory, placed on the master stone cast, and subsequently scanned with a laboratory scanner unit (Model S600, Zirkonzahn). Scanning abutments were also placed and implant positions were scanned as well by using the same laboratory scanner. The software incorporated in the specific scanner had the potential to superimpose data from the scanned diagnostic wax-up and the scanned stone model with the scanning abutments in place. Therefore, the technician, in cooperation with the operating clinician, had the ability to digitally design a prosthesis that was based on a clinically confirmed diagnostic waxed up trial denture. In the first quadrant because of unfavourable implant position access hole was coming out buccally so a decision was made to follow a Malo Implant Bridge design (Kodam, 2012). The definitive wax pattern for casting was designed with a uniform 1-mm cutback on the facial and lingual/palatal aspect for ceramic layering, A silicone matrix (Lab-putty, Coltene/Whaledent) was used as a guide for ceramic buildup and was based on teeth position and flange thickness of the waxed up trial denture. After milling the definitive wax pattern was tried intraorally before casting to check the fit and accuracy, definitive wax pattern was sent back to laboratory for casting and casted metal framework was sent for the metal trial. The metal framework was screwed into the patient mouth and wax bite was made to again verify the jaw relation record before ceramic buildup. Bisque trial was verified and the final prosthesis was inserted after initially tightening the screws lightly and sequentially. The fit of the framework, level of bone, position of the abutment and contact of the fixtures were ascertained before torquing it to its final position. Examination of the occlusion using articulating paper was done with the appliance in the mouth. After the screws were fully torqued, the holes through which they were inserted were sealed using a silicone impression material and the access holes were sealed with light cure composite resin. The patient was given oral hygiene instructions and discharged. The patient was recalled after one week and a thorough examination of the prosthesis and surrounding tissues was made. Further recall appointments were given at six month intervals.

DISCUSSION

The clinical procedures and a brief description of the various laboratory procedures involved in the construction of a full arch fixed maxillary and mandibularporcelain fused to metal prosthesis made from a milled wax pattern is described here starting from the second stage surgery. In an edentulous patient, at least four and upto six or eight fixtures are required to support a fixed superstructure. The number of fixtures depends on the implant length, location, implant orientation, bone quality and the length of the cantilever (Weinberg LA 2003). Though, the type of superstructure to be employed is made primarily on the basis of clinical examination, inter-arch space and assessment of a trial or diagnostic denture, it is wise to caution the patient that even with careful assessment, the findings at implant insertion may dictate the number and location of implants which can be inserted and hence the type of prosthesis that may be used. Previous careful inspection of original study casts articulated with the trial dentures and comparison of the position of the healing abutments in relation to adjusted complete dentures will provide useful guidance on the choice of the type and length of the definitive abutments. In a majority of cases, the measured depth of the healed mucosal cuff *plus* 2 mm produces sufficient clearance beneath the fixed prosthesis. Some of the factors must be evaluated when planning the treatment that would influence the final outcome are to analyse the bone anatomy - to see if sufficient bone depth and width is present to accommodate 4-5 fixtures (Spiekermann *et al.,* 1995), checking of the opposing

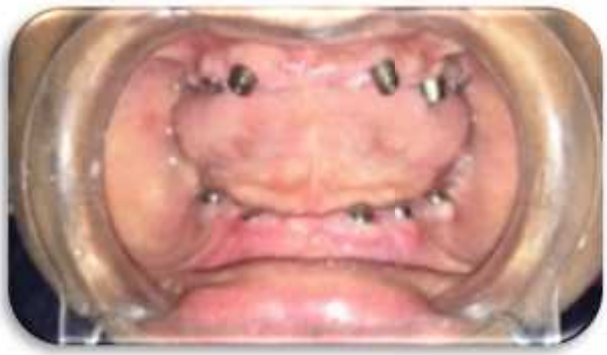

Fig. 1.

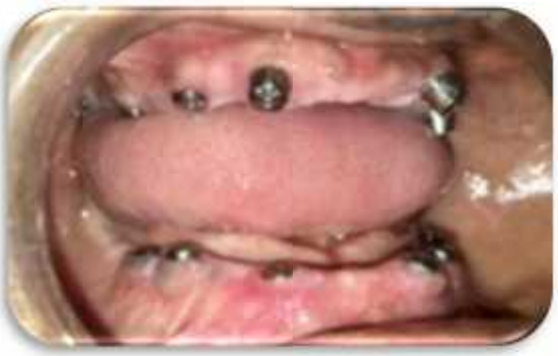

Fig. 1a.

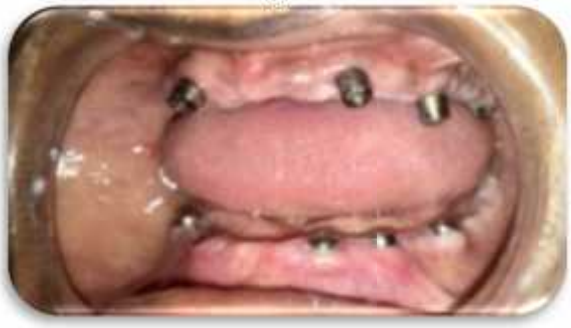

Fig. 1b.

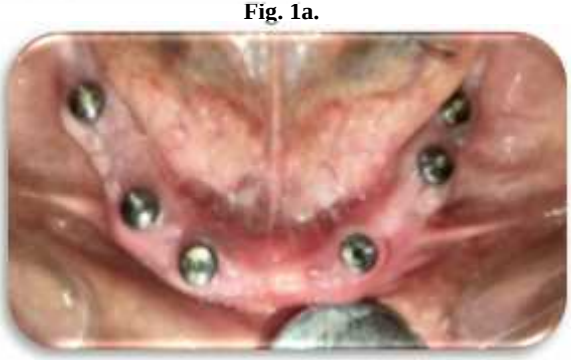

Fig. 1c.

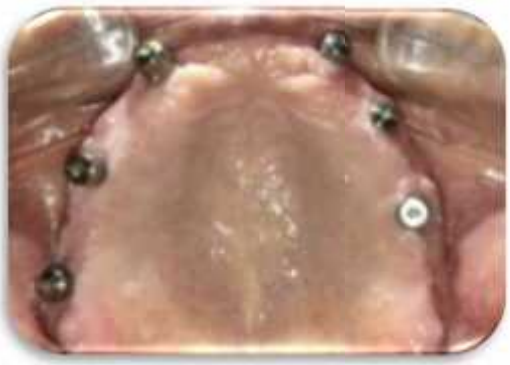

Fig. 1d.

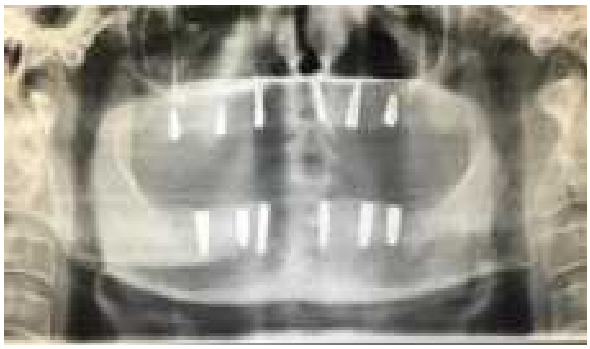

Fig 2.

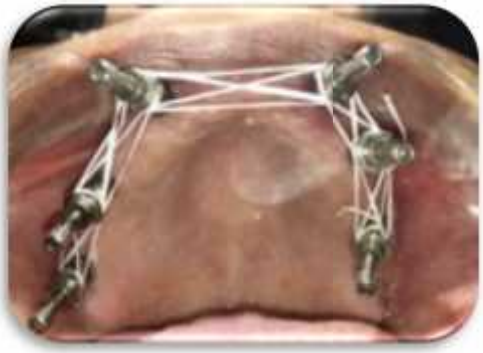

Fig. 3.

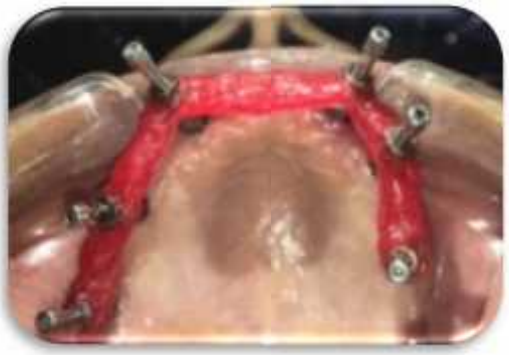

Fig. 3a.

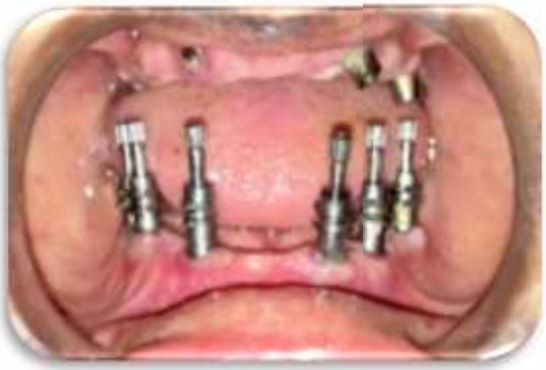

Fig.4.

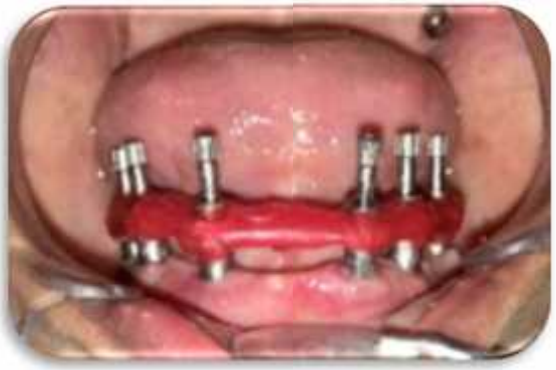

Fig. 4b.

Fig 5.

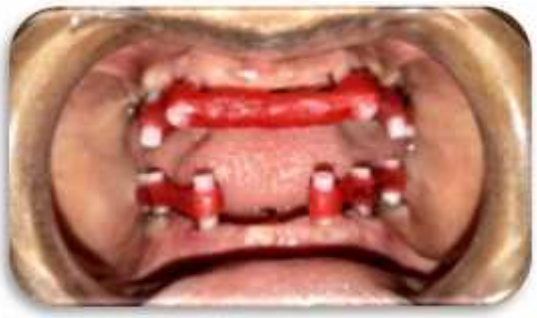

Fig 6.

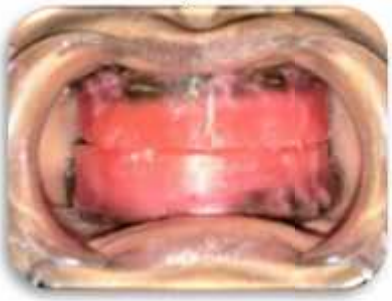

Fig 7.

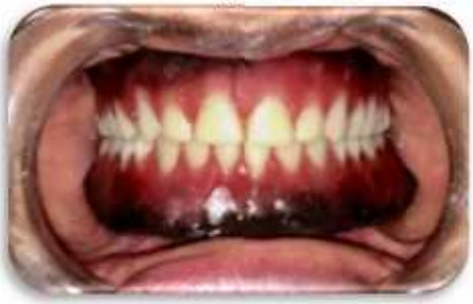

Fig 8.

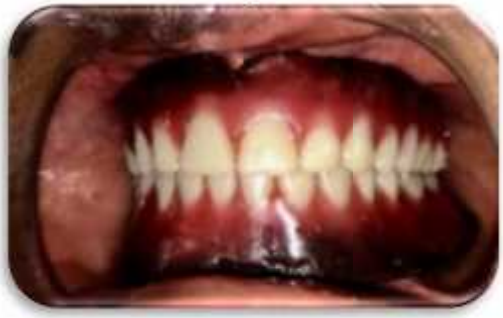

Fig 8b.

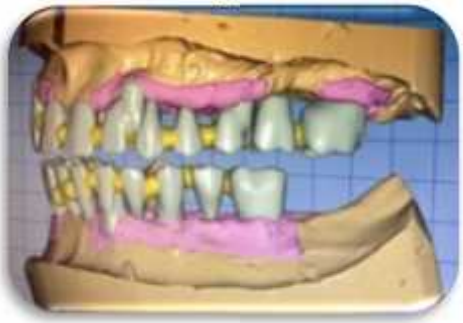

Fig 9.

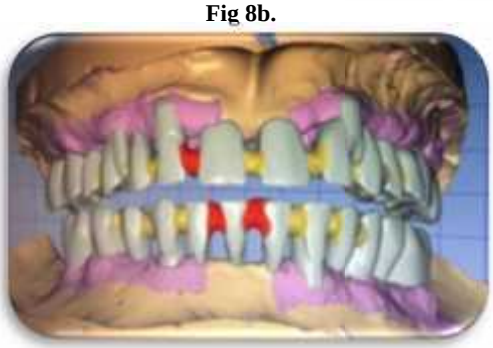

Fig 9b.

Fig 9c.

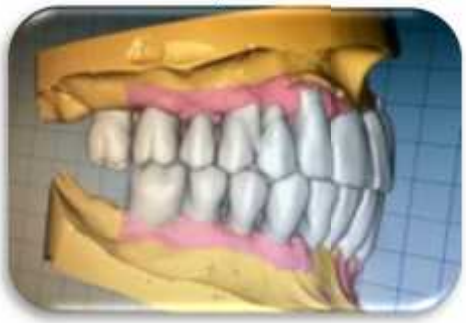

Fig 9d.

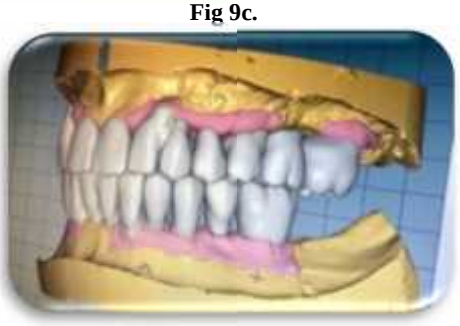

Fig 9e.

prosthesis or natural teeth influences the choice of restoration. Also the prosthetic space, that is, the amount of resorption present should be looked for (Spiekermann H *et al.,* 1995).For instance, in case of severe resorption, it would be advisable to give flanged prosthesis for lip support. The potential location of fixtures should be compatible with the positions of the teeth required to restore the appearance and occlusion without creating excessive leverage (Spiekermann *et al.,* 1995). Impression copings, which are implant specific, are necessary as they help in recording the position and orientation of the fixtures accurately. Linking of the impression copings is at the discretion of the clinician.

Fig. 10.

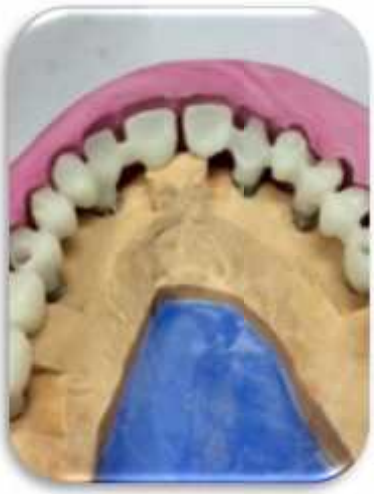

Fig. 10a.

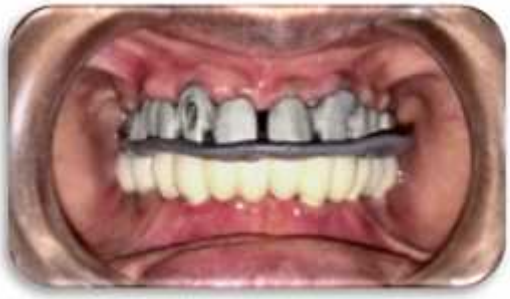

Fig 12.

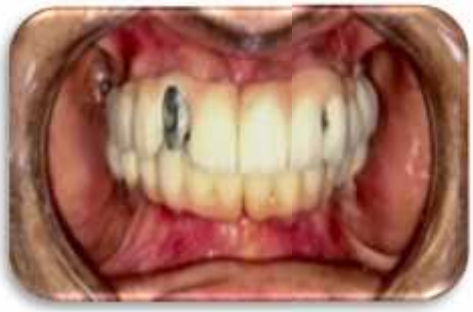

Fig 13.

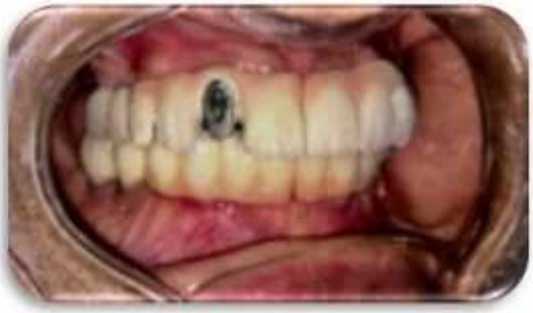

Fig 13a.

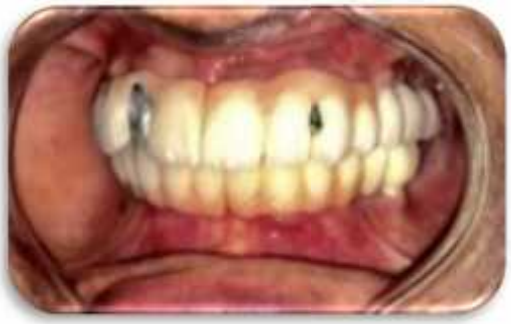

Fig 13b.

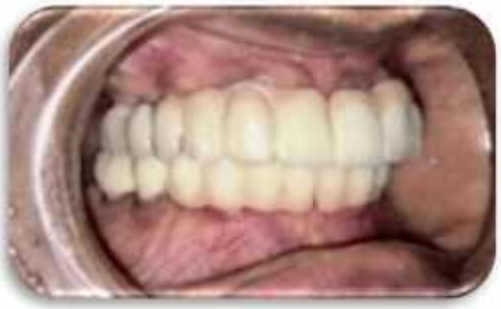

Fig 14.

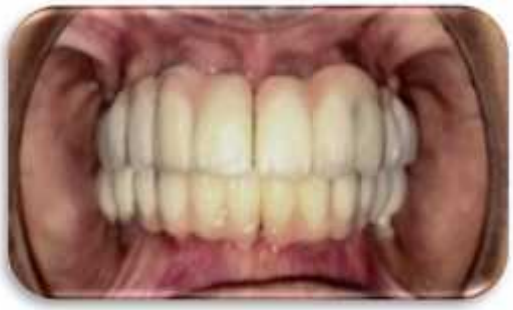

Fig 14a

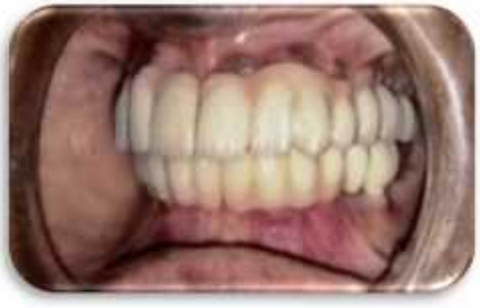

Fig 14b.

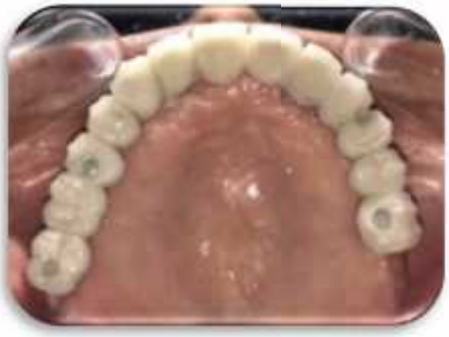

Fig 14c.

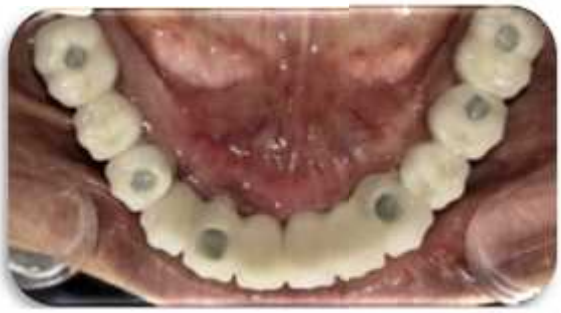

Fig 14d.

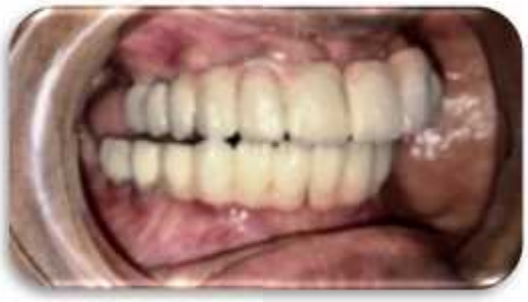

Fig 15

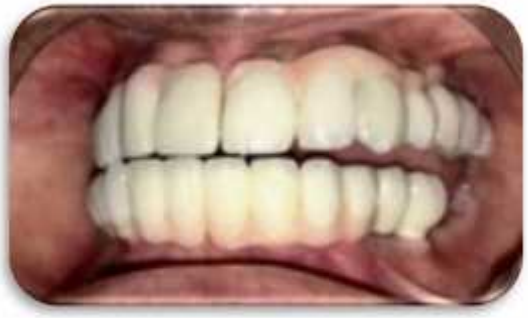

Fig 15a.

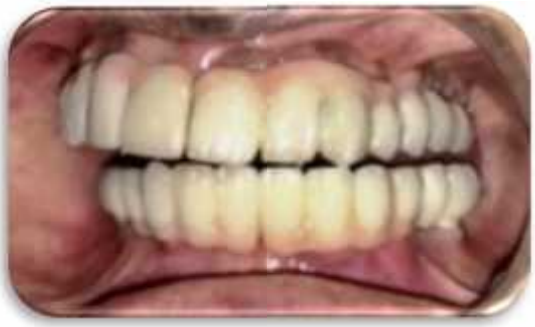

Fig 15b.

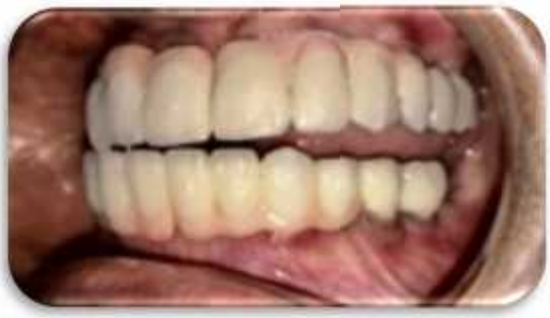

Fig 15c.

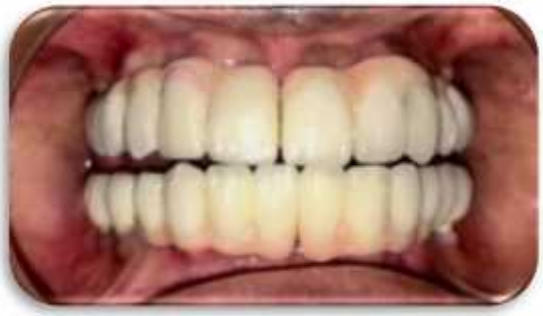

Fig 15d.

Fig 16.

There are disparate school of thought regarding the linking of impression copings prior to the final impression recording. This is done to record the relationship between the fixtures and to produce an accurate impression which would not distort during its transit to the laboratory and during laboratory pouring procedures. The fixtures can be linked by use of dental floss, self-cure acrylic resin and by custom fabricated cast cobalt-chromium bar. It is said that this method of linking the copings with floss and self- cure can lead to considerable inaccuracies due to the curing shrinkage of acrylic.It is at the discretion of the clinician to decide the impression procedure. An impression may be recorded in a stiff elastomeric impression material without linking the copings. With an open tray impression technique, impression copings with long screws make it easier to remove the copings when the impression material has set. Closed trays or nonperforated trays are used along with tapered copings in areas with restricted access like in the more distal areas of the mouth (Spiekermann H *et al.,* 1995). Here, the impression copings remain attached to the implants when the impression is removed from the mouth. The advantages of milled wax pattern are that it is more accurate with less errors compared to conventional wax pattern and it can be tried in patient mouth prior to casting to access the fit and contour of the framework ,it has a passive fit and adaptability. No mucosal support is required here as the implant abutment unit supports the prosthesis. Hence, no potential tissue irritation due to prosthesis movement is caused. A few complications may arise in such fixed prosthesis. Primary among these complications are bridge screw loosening and fracture, prosthesis fracture and prosthetic tooth wear. Tooth wear is a complication that must be addressed intermittently. The increased functional capacity imparted to the implant-supported fixed denture patient is clearly observed by prosthetic tooth wear.

The restoration of the occlusal and vertical dimension of occlusion for acrylic denture teeth should be considered approximately every 3-5 years.

Conclusion

Intraoral evaluation of a screw- retained wax pattern is essential for the design and fabrication of a maxillary and mandibular full-arch implant-supported fixed prosthesis. CAD/CAM technology enables the operator to duplicate the interim teeth trial to the definitive restoration. Long-term studies are needed to evaluate the potential and limitations of the presented prosthesis.

REFERENCES

Adell R., Eriksson B., Lekholm U., Brånemark PI., Jemt T. 1990. A long-term follow-up study of osseointegrated implants in the treatment of totally edentulous jaws. *International Journal of Oral & Maxillofacial Implants*. Dec 1;5(4).

Albrektsson T., Zarb G., Worthington P., Eriksson AR. 1986. The long-term efficacy of currently used dental implants: a review and proposed criteria of success. *Int j oral maxillofac implants.*, 1(1):11-25.

Albrektsson T., Zarb GA. 1993. Current interpretations of the osseointegrated response: clinical significance. *International Journal of Prosthodontics*. Mar 1;6(2).

Buser D., Weber HP., Brägger U., Balsiger C. 1991. Tissue integration of one-stage ITI implants: 3-year results of a longitudinal study with Hollow-Cylinder and Hollow-Screw implants. *International Journal of Oral & Maxillofacial Implants*. Dec 1;6(4).

Desjardins RP. 1992. Prosthesis design for osseointegrated implants in the edentulous maxilla. *International Journal of Oral & Maxillofacial Implants*. Sep 1;7(3).

Graser GN., Myers ML., Iranpour B. 1989. Resolving esthetic and phonetic problems associated with maxillary implant-supported prostheses. *A clinical report. The Journal of prosthetic dentistry*. 1;62(4):376-8.

Kodama T. 2012. Implant-supported full-mouth reconstruction Malo Implant Bridge. *Journal of the California Dental Association*. Jun;40(6):497-508.

Proussaefs P. 2002. A maxillary screw-retained, implant-supported diagnostic wax pattern. *The Journal of prosthetic dentistry*. Apr 1;87(4):403-6.

Quirynen M., Naert I., van Steenberghe D., Nys L. 1992. A study of 589 consecutive implants supporting complete fixed prostheses. Part I: Periodontal aspects. *The Journal of prosthetic dentistry*. 1;68(4):655-63.

Sadowsky SJ. 1997. The implant-supported prosthesis for the edentulous arch: design considerations. *The Journal of prosthetic dentistry*. 1;78(1):28-33.

Smith DE., Zarb GA. 1989. Criteria for success of osseointegratedendosseous implants. *The Journal of prosthetic dentistry*. 1;62(5):567-72.

Spiekermann H., Donath K., Hassell T., Jovanovic S., Richter J. 1995. Implantology: color atlas of dental medicine. Thieme Medical Publishers, Inc., New York. 114:261-4.

Stevens PJ., Fredrickson EJ., Gress ML. 1999. Implant prosthodontics: clinical and laboratory procedures. Mosby Inc; 29.

Watson RM., Davis DM., Forman GH., Coward T. 1991. Considerations in design and fabrication of maxillary implant-supported prostheses. *International Journal of Prosthodontics*. May 1;4(3).

Weinberg LA. 2003. Atlas of tooth-and implant-supported prosthodontics. Chicago, Ill: Quintessence Publishing Company, Apr.

Zarb GA., Schmitt A. 1990. The longitudinal clinical effectiveness of osseointegrated dental implants: The Toronto study. Part I: Surgical results. The Journal of prosthetic dentistry. 1;63(4):451-7.

Zarb GA., Schmitt A. 1990. The longitudinal clinical effectiveness of osseointegrated dental implants: the Toronto study. Part III: Problems and complications encountered. *The Journal of prosthetic dentistry*. Aug 1;64(2):185-94.

Zarb GA., Schmitt A. 19990. The longitudinal clinical effectiveness of osseointegrated dental implants: the Toronto Study. Part II: *The prosthetic results. The Journal of prosthetic dentistry*. Jul 1;64(1):53-61.

Zitzmann NU., Marinello CP. 1999. Treatment plan for restoring the edentulous maxilla with implant-supported restorations: removable over denture versus fixed partial denture design. *The Journal of prosthetic dentistry*. ug 1;82(2):188-96.

Zitzmann NU., Marinello CP. 1999. Treatment plan for restoring the edentulous maxilla with implant-supported restorations: removable over denture versus fixed partial denture design. *The Journal of prosthetic dentistry*. 1;82(2):188-96.

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