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CLINICAL REPORT

Zirconia Intra Mucosal Inserts as a Retentive Aid for Maxillary Complete Dentures: A Case Report

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Abstract Complete dentures fabricated for edentulous patients with resorbed ridges generally have compromised retention and stability. The use of intramucosal inserts in order to aid retention of a maxillary denture has been reported in the past. Zirconia is a tissue compatible biomaterial whose scope and application in dentistry is on the rise. This paper reports the fabrication of zirconia intramucosal inserts and the technique of its incorporation in the maxillary complete denture in order to enhance retention, stability and thereby oral function.

Keywords Zirconia · Intra mucosal inserts · Retention · Palate free denture · Complete denture

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Introduction

Edentulous patients who have resorbed ridges usually lack retention and stability in their dentures. The use of intramucosal inserts as an adjunct for denture retention has shown favourable results [1, 2]. In the early 1940s when this concept was first introduced, cobalt chromium alloy was used, followed by the use of titanium alloys. Zirconia has shown to be more biocompatible than titanium alloys with respect to reduced bacterial colonization and soft tissue compatibility [3, 4]. Zirconia is therefore a promising material for use as an intramucosal insert. The zirconium inserts have a highly polished surface that minimizes the formation and accumulation of biofilms [5].

Dahl a pioneer in this area, reported the use of mushroom shaped stainless steel or chrome-cobalt alloy inserts with sizes proportional to the thickness of the mucosa, thereby facilitating their insertion and improving denture retention [6].

Since then a number of newer materials have evolved, however the main criteria for selection of a material as an insert has been its biocompatibility. The use of zirconia in dentistry has taken a steep upward turn because of its superior mechanical properties, its aesthetic properties and predominantly, its biocompatibility.

After the 1990s, there was a significant decrease in the number of reports on the use of intramucosal inserts, probably due to the advent of osseointegrated implants. However, a fundamental requirement for successful osseointegrated implants is the availability of sufficient quantity and quality of bone. In many situations with advanced resorption, bone-grafting procedures may be necessary, increasing the complexity and morbidity of the procedure.

During the fabrication of mucosal inserts supported maxillary dentures, fundamental principles for positioning

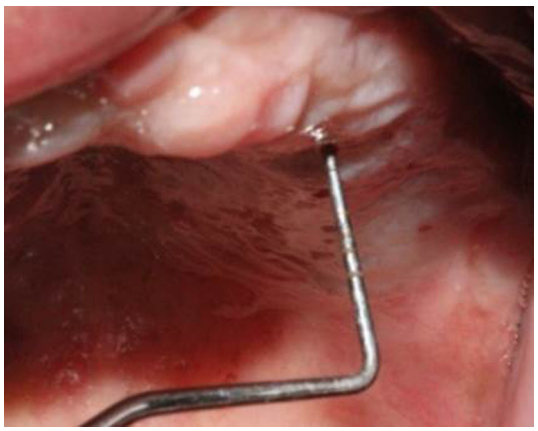

Fig. 1 Evaluation of soft tissue thickness

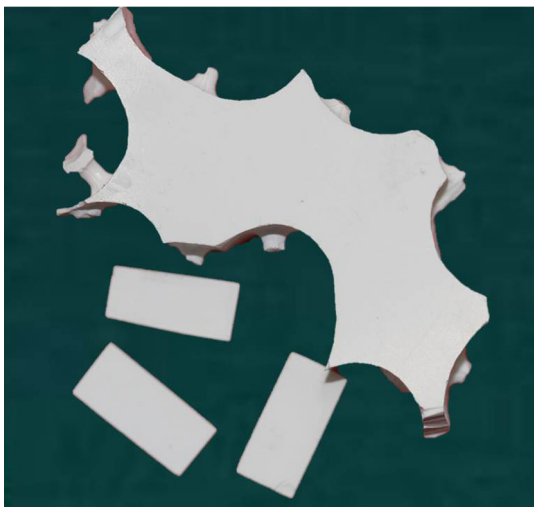

Fig. 2 Commercially available pre sintered zirconia

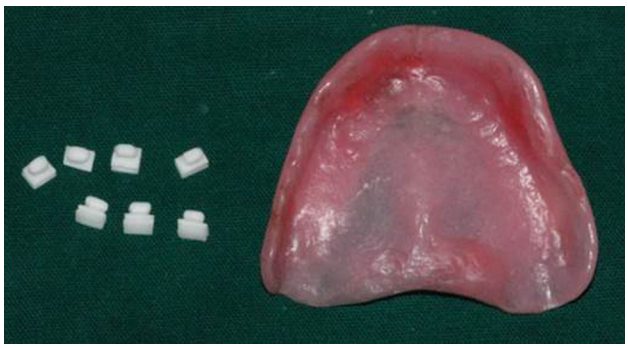

Fig. 3 Sintered zirconia inserts

of the inserts on the edentulous maxilla must be followed. The inserts can be placed on the crest of the ridge or on the horizontal portion of the hard palate to maintain a single path of insertion for all the inserts [7]. Placement of the insert sites slightly to the palatal side of the alveolar ridge, where the submucosa is thicker can facilitate better engagement of the soft tissues. There is no previous report in the literature where customised zirconia inserts were customized according to the patient's mucosal thickness.

Case Report

A 45 year old edentulous patient presented to the Department of Prosthodontics with the complaint of difficulty in eating, speech and poor facial appearance because of loss of teeth. A treatment plan was formulated taking into the consideration the time constraints and the financial situation of the patient. A complete denture with zirconia intramucosal inserts was planned for the maxillary arch and an implant retained overdenture was planned for the mandibular arch.

The treatment protocol followed for the patient utilised the following sequence: Conventional denture fabrication, designing and fabrication of inserts, incorporation of inserts in the denture, surgical phase and follow up.

The treatment plan for the case was approved by the Institutional Review Board of the college. A conventional complete denture with bilateral balanced occlusion was fabricated using routine clinical and laboratory protocol. The patient was asked to wear those dentures for 3 weeks.

Bone sounding was done to determine the soft tissue thickness to determine the location for placement of the inserts (Fig. 1). Sites which were more than 4 mm thick were selected to maintain a gap of more than 1 mm between the insert (depth 3 mm) and the bone. Customized intramucosal inserts were hand milled using a straight hand-piece and diamond drill, out of a pre-sintered commercially available zirconia block (Lava, 3M, USA). The peripheral, surplus areas of blocks used to mill conventional zirconia restorations was used to obtain such pre sintered zirconia inserts (Fig. 2). The pre-sintered zirconia was shaped into an oval ball head, the long end being 5 mm and the shorter end being 3 mm. An undercut of 0.75 mm was maintained uniformly. The dimension of the insert to be embedded in soft tissue was customized as per the evaluated depth of soft tissue. Post sintering; shrinkage of approximately 20 % was seen. Six such inserts were fabricated (Fig. 3). A groove was placed at the base of each insert for mechanical retention by the acrylic.

Once the depth and the position of the inserts were determined, the corresponding positions were transferred onto the denture with an indelible pencil. The undercuts were blocked out in the denture using modelling wax and a cast was poured using Type 3 gypsum (KAL Rock,

Fig. 4 Marks recorded from bone sounding transferred to the cast

Fig. 5 Surveying the cast and stabilizing the inserts in wax

Kalabai, Mumbai, India). The cast was flasked before removal of the denture from the cast to maintain orientation and prevent a raise in the vertical dimension during incorporation of the inserts. The markings on the denture were transferred to the cast (Fig. 4). Based on the depth evaluated intraorally, holes were drilled in the casts. Each insert was placed individually in the stone cast, surveyed to ensure a single path of insertion and stabilized with inlay wax (Schuler Wax—S-U-Gnatho-Wax-A) (Fig. 5). The denture base was relieved on its intaglio surface to accommodate the inserts. Autopolymerising resin (DPIRR cold cure, *DPI*, Mumbai) was used to pick up the inserts within the denture (Fig. 6). The denture was deflasked and the excess acrylic on the intaglio surface was polished. The denture was soaked in a disinfectant (Betadine—10 % povidone iodine solution, Alcon Laboratories, Inc.) overnight for 12 h.

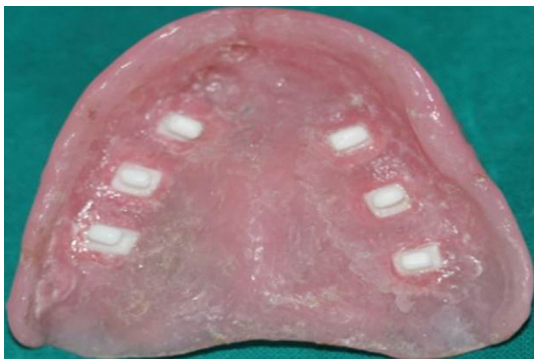

Fig. 6 Tissue surface of the denture with inserts

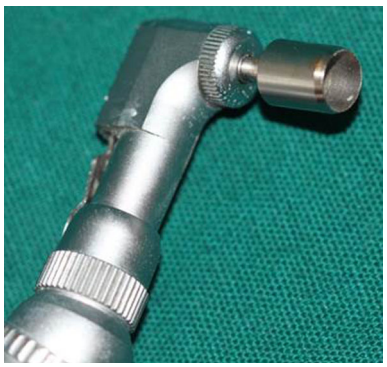

Fig. 7 Tissue punch attached to a micromotor hand piece

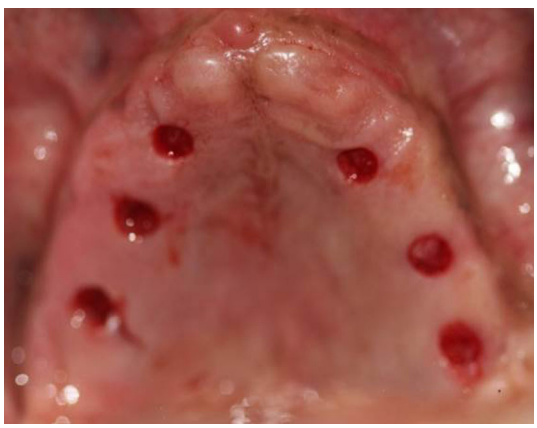

Fig. 8 Excision of palatal mucosa to create space for the inserts

The surgical phase was carried out under local anaesthesia 2 % Lidocaine with 1:80,000 adrenaline (Lignox 2 %-Warren-Navi Mumbai, India). The denture was inserted and blanching sites created by the inserts were marked. A number one tissue punch (Salvin Dental Specialties, Inc., USA) was used to punch out soft tissue sequentially from posterior sites to anterior sites (Figs. 7,

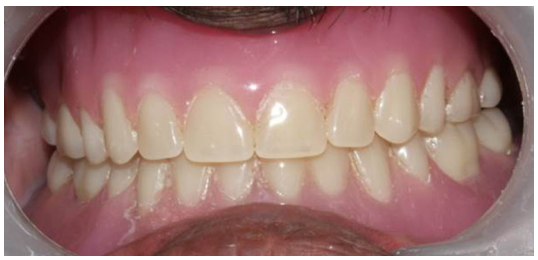

Fig. 9 Denture with intramucosal inserts in situ

8). After the preparation of the insert sites, the denture was inserted in the patient's mouth. The denture was assessed for stability, tissue rebound and normal occlusal contacts (Fig. 9). After these factors were evaluated a denture adhesive paste (Fix-On, ICPA, India) was applied over the non-surgically involved tissue bearing surfaces of the denture and the denture was inserted. Patient was prescribed non-steroidal anti-inflammatory drugs thrice a day for 3 days (Combiflam, Aventis ltd, Mumbai).

The patient was instructed to not remove the denture for 3 days and to have a soft diet. The patient was recalled at the third day and the denture was removed and cleaned thoroughly. The insert sites were thoroughly flushed with saline and the denture was re-inserted in the mouth. The patient was instructed to continue his soft diet, gradually progressing to a regular diet after 7 days. The patient was instructed to wear the denture at all times for the first 15 days and was allowed to remove it only for cleaning purposes. After 15 days the patient was asked to remove his denture at night.

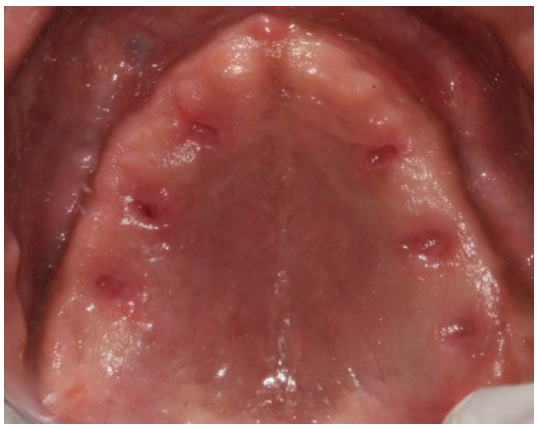

Fig. 10 Healing of soft tissue around the inserts

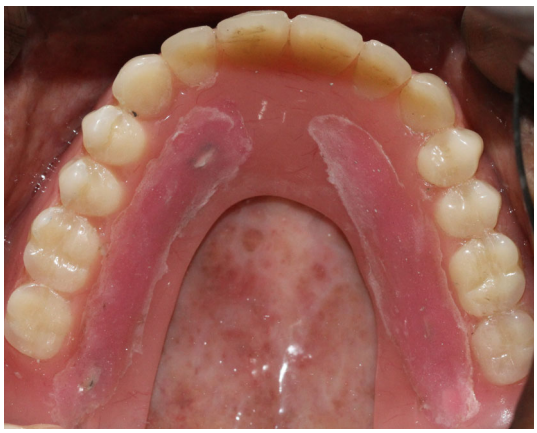

Fig. 11 Palate free complete denture retained by inserts

Patient Follow Up

Patient complained of discomfort for the first 3 days and was on a liquid and semisolid diet. On evaluation the denture was retentive and stable but the patient complained of difficulty in speech. Some discomfort was present when the denture was removed at the third post-operative day. Fourth day onwards he resumed to a normal diet with some amount of difficulty in speech and discomfort on removal and insertion which gradually reduced. On the 20th day a marked increase in the retention and stability was seen. The insert sites appeared healthy, not showing any inflammatory signs (Fig. 10). One year follow up showed stable healthy keratinized mucosa around the insert sites.

Discussion

Rehabilitation of a patient using intramucosal inserts requires meticulous case selection. The patient needs to be very co-operative, as the initial discomfort (first 3 days) is significant. Histologically, it has been documented that the tissue in contact with the inserts becomes keratinized and is not painful (may or may not show mild inflammation) [8]. The technique described here is a simple technique that can be used to customise the insert depth to the patients existent soft tissue thickness. Zirconia used as the intra mucosal insert material has been documented to be biocompatible, have a favourable soft tissue response. This has been described in detail by Scarano et al. [9] who reported adequate keratinization around zirconia samples placed in humans. The zirconia used for this protocol was derived from surplus zirconia available after milling of blocks for restorative use. The hand milling and sintering used for the same is relatively inexpensive and easy to carry out. Initial reports of the use of metallic inserts have merely documented them being used in dentures to enhance the retention [1, 6, 7]. This technique ensures customization of the insert as well as ensures that the inserts are parallel to each other along a single path of insertion. The technique ensures that the rest of the denture maintains its close adaptation to the tissues after the inserts are incorporated in

the denture. The intra mucosal inserts act as mechanical retentive aids utilising soft tissue undercuts, thereby reducing the denture's dependency on peripheral seal. Although most maxillary dentures are adequately retentive and stable, use of retentive aids like the intra mucosal inserts can markedly increase the stability and retention of the denture, make use of palate free dentures, thereby enhancing taste sensation, reducing the bulk of the denture and controlling the gag reflex (Fig. 11).

Conclusion

The use of customized zirconia intra-mucosal inserts is a simple and effective way of improving the efficacy of the denture and can be used as a successful alternative for a patient who cannot have osseointegrated implants.

References

1. Cranin AN, Cranin SI (1958) The intramucosal insert: a method of maxillary denture stabilization. J Am Dent Assoc 57:188–193
2. Guaccio RA (1980) Intramucosal inserts for retention of removable maxillary prostheses. Dent Clin North Am 24:585–592
3. Takamori ER, Cruz R, Gonçalvez F (2008) Effect of roughness of zirconium and titanium on fibroblast adhesion. Artif Organs 32(4):305–309
4. Li J, Liu Y, Hermansson L, Soremark R (1993) Evaluation of biocompatibility of various ceramic powders with human fibroblasts in vitro. Clin Mater 12:197–201
5. Scotti R, Kantorski KZ, Monaco C, Valandro LF, Ciocca L, Bottino MA (2007) SEM evaluation of in situ early bacterial colonization on a Y-TZP ceramic: a pilot study. Int J Prosthodont 20:419–422
6. Dahl GS (1966) Some aspects of the use of intramucosal inserts. J Oral Implant Transplant Surg 12:61–65
7. Lew Isaih (1957) Mucosal inserts—A progress report. J Prosthet Dent 7(6):798–803
8. Gonçalves F, Dias EP, Cestary TM, Taga R, Zanetti VR, Zanetti A, Granjeiro JM (2009) Clinical and histopathological analysis of intramucosal zirconium inserts used for improving maxillary denture retention. Braz Dent J 20(2):149–155
9. Scarano A, Piattelli M, Caputi S et al (2004) Bacterial adhesion on commercially pure titanium and zirconium oxide disks: an in vivo human study. J Periodontol 75:292–296