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CLINICAL REPORT

A Novel Design of a Transitional Complete Denture in Full Arch Fixed Implant Restoration

G. Arun Kumar · B. Sapna

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Abstract The transitional denture given in a full arch fixed implant restoration should not disturb the healing and osseointegration process. This is made possible by lining the denture with a uniform thickness of soft liner. The article describes a method of achieving uniform thickness of soft liner and minimizing the load transmitted to the area where implants were placed.

Keywords Transitional denture · Soft liner · Implant

Introduction

The predictability of osseointegration had led to the widespread use of implants. Osseointegration of implants requires 3–6 months depending on the type of bone [1]. During the healing phase after implant placement, a transitional complete denture has to be given in a full arch implant case to combine biologic demands of undisturbed healing with maintenance of clinical support for the patient. The force that is transmitted to the underlying soft tissues by the denture during function may affect the osseointegration of implants. The force can be reduced by lining the denture with soft liner. The soft liner will absorb some of the energy produced by masticatory impact that would otherwise be transmitted through the denture to the area where implants were placed. The soft liner returns to its predeformed shape and the absorbed energy is slowly released [2]. The thickness of soft liner will influence the force transmitted, bond strength of soft liner, and the strength of denture base. A controlled thickness of 2–3 mm is suggested, and several methods have been described to achieve this [3–6]. This article describes a novel design and fabrication of a soft lined transitional complete denture that minimize the load transmitted to the implant site area, without losing the peripheral and posterior palatal seal.

Case Report

A middle aged man of 50 years came to our department with a complaint of missing teeth, mobile teeth and mobile fixed partial denture [FPD].Clinical examination revealed Grade III mobility of remaining teeth and the abutment supporting the FPD's. Past dental history revealed FPD were given 7 years back. Orthopantogram (Fig. 1) showed severe bone loss around the natural teeth. After thorough intraoral examination, analysis of the articulated diagnostic cast, Orthopantogram and discussing with the patient about the advantages and disadvantages of various treatment modalities possible, a comprehensive treatment plan was made to extract all the teeth and rehabilitate the maxillary and mandibular arches with implant supported ceramometal fixed prosthesis. The remaining teeth were atraumatically extracted under local anaesthesia. All extraction sites were debrided thoroughly. A crestal incision was made with full thickness flap elevation. A minimal osteoplasty was performed to shape the crestal bone to facilitate implant placement. Eight implants (Uniti, Equinox, Holland) were placed in maxilla and seven implants in mandible. (Fig. 2). The cover screws were secured over the implant and the flap was meticulously sutured. The sutures

G. Arun Kumar · B. Sapna
Department of Prosthodontics, Noorul Islam College of Dental Science, NICE Garden, Neyattinkara, Trivandrum, India

G. Arun Kumar (✉)
Madhavam, TC 17/1092-13, CG 193, Cherukara Road, Poojappura PO, Trivandrum 695012, Kerala, India
e-mail: drarunkg@yahoo.co.in

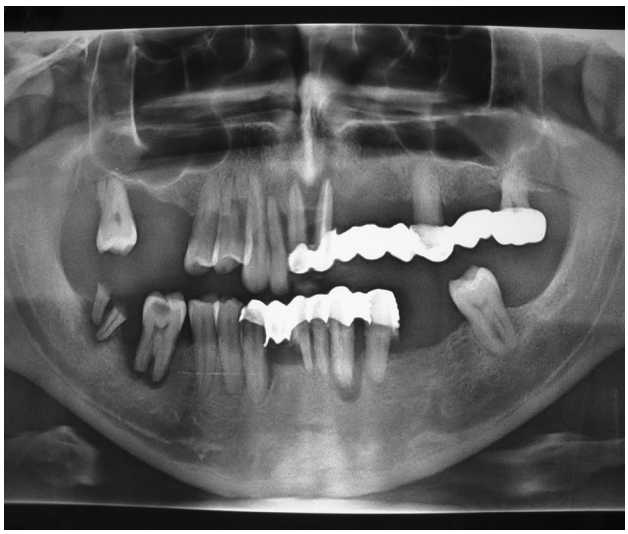

Fig. 1 Pre-operative radiograph

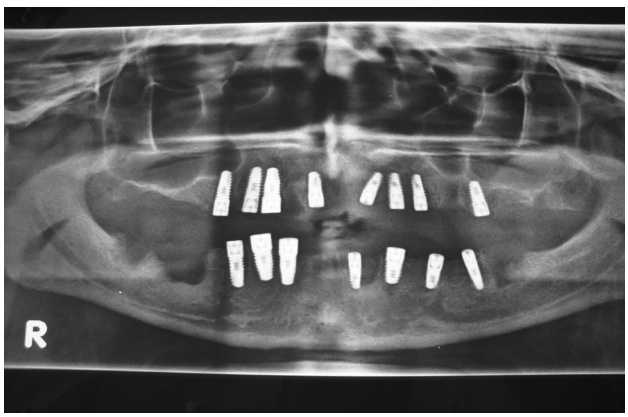

Fig. 2 OPG after implant placement

were removed after 1 week. The patient was recalled after 2 weeks for the fabrication of soft lined transitional denture. The final restoration was planned to give 6 months after the surgical placement of implants.

Procedure

Impression procedures were carried out in the conventional manner using elastomers. To obtain a uniform thickness of soft liner a 2 mm thick blank of clear thermoplastic sheet was adapted to the upper and lower master cast with a vacuum forming machine (Tray-vac, Buffalo dental mfg co Newyork). The design of spacer was outlined on the upper and lower master cast. The resin sheet (spacer) was shaped according to the design outline. In maxilla the spacer did not cover the palate and posterior palatal seal area. In mandible the spacer covered the entire basal seat area since

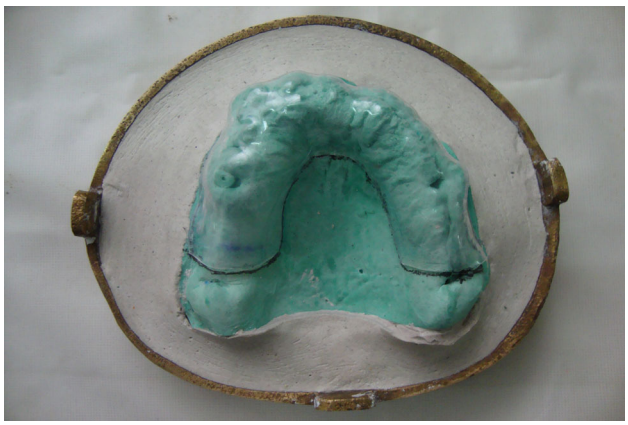

Fig. 3 Resin sheet positioned on maxillary cast

Fig. 4 Resin sheet positioned on mandibular cast

the supporting area is less compared to maxilla. The spacer was 2 mm short of sulcus in maxilla and mandible. This would produce a boxed border with acrylic at the peripheral border. A boxed-in lining where the soft liner does not include the border area of the denture, probably has the longest life span [7]. Temporary denture base (shellac base plate) was made on the cast without the spacer. Try in procedure and flasking was done in the conventional manner. After dewaxing the resin sheet was positioned on the master cast (Figs. 3, 4). A cellophane sheet was placed over the resin sheet. Heat cure acrylic resin (Trevalon, Dentsply, USA) was packed and the trial closure was done. The flash was carefully removed and the flasks were closed with the spacer and cellophane sheet. The flask was kept aside for 1 h to allow the acrylic resin to stiffen. This will prevent the displacement of the unpolymerised acrylic resin when the soft liner is packed into the mold. After 1 h the flask was opened, the cellophane sheet and the resin spacer were removed. Bonding agent was applied to the denture base and the silicone based resilient liner (GC Reline soft GC Dental products corp. Japan) was placed in

Fig. 5 Lining upper denture with soft liner

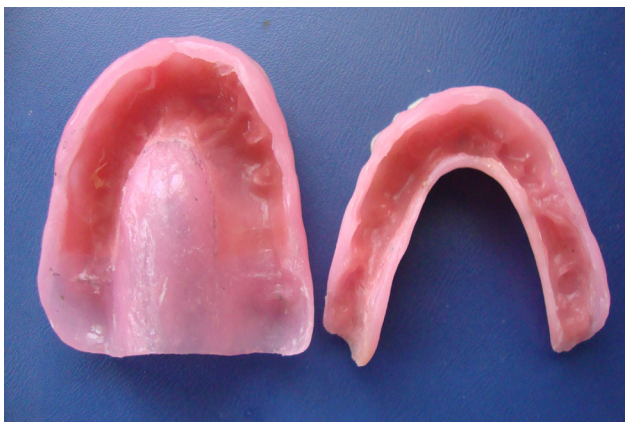

Fig. 6 Soft lined maxillary and mandibular denture

the space provided by the spacer (Fig. 5). The flask was then closed, curing, trimming, and polishing of the denture was done in the conventional manner. The impression surface of soft lined transitional denture was shown in Fig. 6.

During insertion proper home care instructions were given and regular recall appointments were carried out.

Discussion

The easiest interim treatment prosthesis for the replacement of all teeth during implant submerged healing is a removable denture. If bone augmentation is necessary, this prosthesis may need to be used for longer than 1 year before delivery of the final implant restoration. The force transmitted by the transitional denture may cause mucosal perforations or decubital ulcerations [8]. It may also cause movement of the implants. Orthopedic studies suggest that osteogenesis and osseous healing are favoured by minimizing movement at the site of new bone formation [9]. In order to avoid these complications a proper relining of denture is of significant importance. Dos Santos et al. evaluated the stress distribution by 3-D finite element analysis in the bone adjacent to submerged implants during masticatory function in complete dentures lined with soft liner. They reported that the use of soft liner decreased the levels of stress and microstrains in peri-implant bone and recommended the use of soft liner during the period of osseointegration [10]. The liner thickness has got a significant role. Studies have shown that optimum thickness of the liner is approximately 2–3 mm to equally distribute stresses to the underlying tissues [11]. Fatihallah [12] analysed the load transmitted by 1, 2 and 3 mm thickness soft liner to underlying mucosa and reported that 2 mm thick soft liner transmitted least stress to underlying mucosa. An acrylic fixed prosthesis supported by transitional mini implants, placed between the permanent implants, may also be given as a transitional prosthesis, but it involves additional cost and requires adequate bone to accommodate both transitional and permanent implants [13]. Relining transitional denture by chair side relining method may result in uneven thickness of soft liner, and uneven distribution of force.

The procedure described in this article has several advantages.

1. The spacer can be made very fast and very easy [14].
2. The design of soft liner spacer in maxillary denture would direct maximum load to the palate since the denture base was in direct contact with the underlying tissue in the palatal area, thereby minimizing the load transmitted to the area where implants were placed.
3. The bond strength of soft liner packed against the unpolymerised denture base resin would be greater than the soft liner bonded to polymerized acrylic resin [15].
4. The ‘boxed design’ of soft liner will not affect the peripheral seal in maxillary and mandibular denture and the posterior palatal seal of maxillary denture.
5. A uniform thickness of the soft liner can be obtained and this decreases the likelihood of the denture failing because of weakness of the denture base itself, caused by an uneven thickness of soft lining material [3, 14].

Conclusion

Resilient denture liner materials can be a useful source for the transitional complete denture in full mouth implant cases. The design of the soft liner described in this article will provide a uniform thickness of soft liner without affecting the peripheral seal and posterior palatal seal of transitional dentures. The uniform thickness of soft liner

provides a cushioning effect which reduces the load applied over the submerged implants and underlying mucosa thereby enhancing the osseointegration.

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