Case Report

Implant-assisted removable prosthetic rehabilitation after maxillary segmental resection in a patient with ameloblastoma: a clinical report

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Abstract

The Kennedy Class I and II distal extension removable partial dentures (RPDs) present a challenge to the prosthodontist since they require support from the underlying alveolar ridges' teeth and mucosa. This difference in compressibility between the periodontal ligaments of natural teeth and the alveolar mucosa also results in the RPD's rotation around a horizontal axis extending between the terminal abutments' distal rests, destabilizing the prosthesis. Distal placement of dental implants in the edentulous regions converts Kennedy Class I or II configuration to a Kennedy Class III situation, improves the prosthesis's stability, and enhances patient satisfaction. This case report describes using this approach to restore a Kennedy Class II partially edentulous situation after segmental resection of the maxillary arch due to ameloblastoma.

Key words: dental implant; distal extension removable partial denture; ameloblastoma.

Introduction

Ameloblastoma is an uncommon tumor of the oral and maxillofacial region that occurs most often in the mandible and less commonly in the maxilla[1]. It is histologically benign but locally invasive. It has reported recurrence rates as high as 92% with conservative treatment[2] and 15%–25% with radical treatment[3-4]. Therefore, wide resection of the jaw is typically recommended to prevent recurrence.

Wide resection results in an unfavorable soft tissue profile for retention, reduced stability for prostheses supported by soft tissue, and a loss of load-bearing tissues available for support. These outcomes may pose challenges to restoring normal speech, masticatory ability, and quality of life.

Implant-supported fixed dental prostheses have successfully been used to restore masticatory function[5]. However, anatomic limitations (e.g., proximity to the vital organ, poor bone quality, and lack of bone volume) and financial constraints may preclude sufficient implants from supporting a fixed dental prosthesis. In such situations, the removable partial denture (RPD) is indispensable for patients.

However, the inadequacy of hard and soft tissue at the wide resection site may compromise the RPD's retention, stability,

and support and worsen its distal extension[6]. To overcome this challenge, placing the implant on the distal edentulous ridge effectively converts Kennedy Class I to Kennedy Class III. Therefore, the implant can improve the ridge's support, minimize the potential for the denture 's dislodgement, and maintain the residual alveolar bone[7].

This clinical report describes the treatment planning and restoration procedure of implant-assisted RPD in maxillary rehabilitation after segmental resection.

Case report

A 55-year-old man had undergone segmental resection of the left maxilla due to follicular ameloblastoma in the Department of Oral & Maxilla-facial Surgery, Chi-Mei Medical Center (Liouying, Taiwan). The patient's chief complaint was an unaesthetic appearance and difficulty chewing due to multiple missing teeth. His medical history revealed no major systemic problems except follicular ameloblastoma in the left maxilla.

Clinical examination showed an asymmetrical face due to insufficient lip support. Intraoral examination showed multiple missing teeth, including the upper left central incisor, lateral incisor, canine, first premolar, second premolar, and first molar ; insufficient keratinized tissue; reduced vestibular sulcus depth; fibrous scar tissue; and compromised soft tissue contour in the area to be reconstructed (Fig. 1). After radiographic examination, the maxillary left second molar was to be extracted due to poor periodontal support (Fig. 2). The antagonistic arch was relatively sound. The patient was unaware of parafunctional activity, such as grinding or clenching. Three treatment options were presented: unilateral implant-supported fixed partial denture, implant-assisted RPD, and conventional RPD. The patient chose the second option due to financial limitations, fewer surgical procedures, and better denture stability.

Initially, maxillary and mandibular impressions were taken with regular set alginate (Cavex, Netherlands) and poured with dental stone (Neo Primestone; Mutsumi Chemical, Japan) to obtain

Figure 1. Frontal view of the patient's dentition.

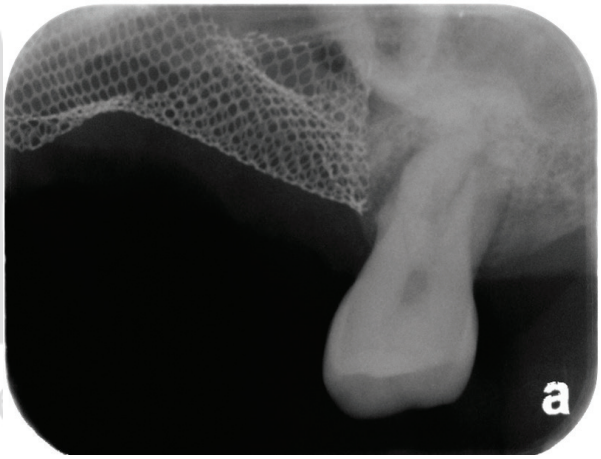

Figure 2. Periapical film of the maxillary left second molar.

Figure 3. Frontal view of the interim denture insertion.

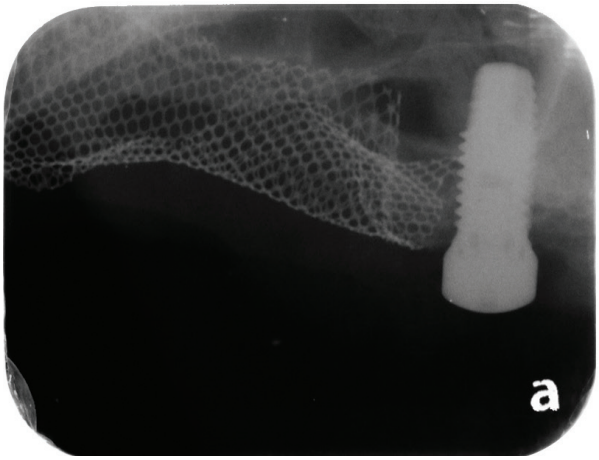

Figure 4. Periapical film of the implant with healing abutment.

study casts. The maxillary cast was surveyed for implant-assisted RPD to determine the favorable insertion path for the RPD and implant. An interim denture fabricated from the diagnostic wax-up with tissue surface relined with Soft Liner (GC Soft Liner ; GC, Japan) was provided to the patient (Fig. 3).

An implant-assisted RPD was planned. A cone-beam computerized tomography scan was performed with a radiographic guide, duplicated from the interim denture, to determine the implants' dimensions and locations.

One Brånemark System Mk III TiUnite implant (5.0 × 11.5 mm; Nobel Biocare, Sweden) was placed in the maxillary right second molar area with a submerged surgical procedure. The patient's maxillary interim RPD was relined with Soft Liner after sufficient room had been created between the wound and the denture's intaglio surface. The patient used the modified RPD during the osseointegration period. After the implant's six-month osseointegration, stage II surgery was performed to uncover the implant, and healing abutments were placed (Fig. 4).

Following four weeks of soft tissue healing (Fig. 5), a border molding of the maxillary left side was made with green compound (Impression Compound ; Kerr, Czech Republic), and a fixture-level impression was made with polyether impression material (Impregum; 3M ESPE). Dental stone (Neo Primestone; Mutsumi Chemical, Japan) was poured to create the definitive maxillary cast. The definitive casts were surveyed to confirm tooth preparation accuracy. Permanent abutments (Locator ; Zest Anchors, USA) were placed on the implant analogs and relieved with wax to provide room for RPD's metal framework. Wax patterns of the RPD's framework were fabricated according to the design. Following casting, finishing, and polishing procedures, the metal framework's fit was confirmed intraorally. After the occlusion rim had been tested on the framework, jaw relation records were made, then both maxillary and mandibular casts were mounted on an articulator. Artificial teeth (Orthotype; Ivoclar, Lichtenstein) were arranged, and heat-curing acrylic resin (Lucitone 199; Dentsply) was packed in the laboratory.

Figure 5. Occlusal view of the maxilla before final impression.

Figure 6. Occlusal view of the locator attachment.

Figure 7. After picking up the metal housing and changing the blue nylon on the removable partial denture's tissue surface of the removable partial denture. insertion.

Figure 8. Frontal view of the implant-assisted removable partial denture.

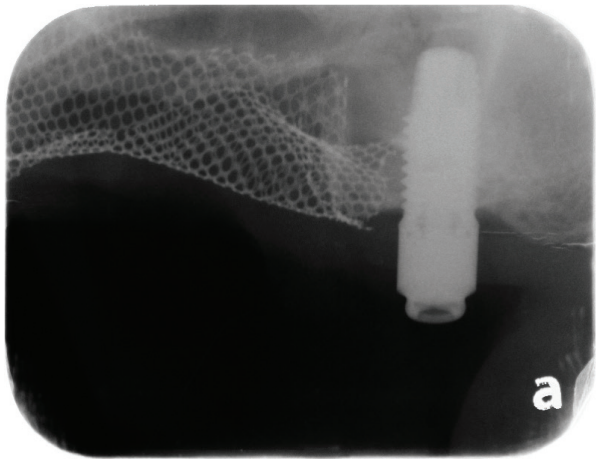

Figure 9. Periapical film of the implant at the three3-year follow- up.

The passive fit between the abutments and the RPD was evaluated intraorally. The healing abutment was removed, and the Locator was connected to the fixture with the tightening torques recommended by the manufacturers. After sufficient room space had been established between the Locator and the denture's interior acrylic surface, the definitive maxillary RPD was relined with acrylic resin (Rebase II; Tokuyama, Japan) to reflect the locator's patrix. After polishing and changing the processing clip to blue, the denture was delivered to the patient with proper home care instructions (Figs. 6, 7, and 8).

Following postinsertion appointments, the patient was recalled for tissue examination and appliance modification after one, three, and then every six months. The last follow-up was a three-year recall. The plastic retentive parts had become worn and were replaced with clear ones. Nevertheless, the implant's bone level was stable (Fig. 9), and the patient was satisfied with the denture 's retention, masticatory efficiency, and aesthetics.

Discussion

Because of ameloblastoma's high recurrence rate and local invasiveness, they are usually treated with wide resection. However, radical resection resulting in soft and hard tissue defects poses challenges to prosthetic rehabilitation with implant-supported fixed dental prostheses. When planning fixed-type prostheses in these patients, resected regions might need further augmentation surgery, such as sinus floor elevation and vertical and/or horizontal ridge augmentation. Due to the additional surgical procedure's complexity and concern about tumor recurrence, implant-assisted RPDs can be an alternative treatment.

The design and maintenance of bilateral and unilateral distal extension partial dentures pose challenges for clinicians due to the lack of an abutment tooth distal to the edentulous area to provide support and the difference in the displacement of the mucosa and the natural tooth under function[8]. Moreover, this is progressively challenging when poor peripheral soft tissue elasticity and reduced sulcus depth occur due to surgery since they might lead to greater denture instability, frequent adjustment, and decreased patient satisfaction.

Strategic placement of implants under the existing dental prostheses improves oral health-related quality of life in RPD treatment groups[9]. Previous studies have indicated that an implant placed posteriorly to the RPD's distal extension site reduces pressure on the alveolar ridge[10,11], maintains the residual alveolar ridge's height[12], reduces potential rotational movement[13], and results in better prosthesis stability and less frequent prosthetic maintenance visits.

Placing a single implant in the posterior region to change a Kennedy Class I or II arch configuration to Kennedy Class III appears to be a favorable treatment. Theoretically, the implants should be placed as distally as possible to provide maximal support and stability. However, pronounced anatomic limitations, such as proximity to the inferior alveolar nerve or maxillary sinus or insufficient bone volume, can restrict implant placement. Short dental implants may be selected for patients contraindicated for the advanced surgical procedure to improve distal extension RPD performance[14].

There is insufficient evidence on the relative

effectiveness of different attachment systems on the clinical outcomes of implant-assisted RPDs[15]. In this case, a Locator attachment was selected because it has a lower vertical height, a minimal interocclusal distance requirement, fewer prosthodontic complications, lower maintenance needs[16], higher retention and stability[17], and is easier to use with fewer reported complications than ball and bar attachments[18].

Summary

Implant-assisted RPDs are a cost-effective solution for partially edentulous patients who are not candidates for fixed implant-supported restorations and need to use distal extension RPDs. This case report described a segmental resected maxillary arch reconstructed with a single implant with a Locator abutment and a chromium-cobalt RPD. A freestanding, distal single implant aids support and retention and prevents dislodgement of the patient's distal extension RPD.

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