Case Report

Maxillofacial prosthodontic management of an ablative maxillary surgical defect using a combination of conventional obturator prosthesis and an early loading implant supported high-strength full ceramic fixed dental prosthesis

Ansgar C. Cheng\textsuperscript{a,b,c,}\textsuperscript{n}, Ho Kok-Sen\textsuperscript{a,b}, Andrew Loy\textsuperscript{d}

\textsuperscript{a}Specialist Dental Group, Mount Elizabeth Hospital, Republic of Singapore
\textsuperscript{b}National University of Singapore, Republic of Singapore
\textsuperscript{c}University of Hong Kong, Hong Kong
\textsuperscript{d}The Ear Nose Throat-Head & Neck Centre, Mount Elizabeth Hospital, Republic of Singapore

\textbf{ARTICLE INFO}

Keywords:
Prosthodontic rehabilitation
Maxillary defect(s)
Obturator prosthesis
Dental prosthesis

\textbf{ABSTRACT}

Prosthodontic rehabilitation of maxillary defects and early loading of endosteous implants has been widely published. The combination of the aforementioned treatment modalities are seldom reported in peer reviewed journals. This article describes the clinical presentation, management and prosthodontic rehabilitation of the maxillary defect of a patient. Clinical and scientific concerns are discussed.

\textcopyright{} 2012 Published by Elsevier (Singapore) Pte Ltd.

\textbf{Contents}

1. Introduction ................................................................. 13
2. Case report ............................................................... 14
3. Treatment sequence .................................................... 15
4. Discussion ................................................................. 17
5. Summary ................................................................. 18
References ........................................................................ 18

1. Introduction

Prosthodontic rehabilitation of maxillary defects always involves the usage of immediate surgical, interim and definitive obturator \cite{1}. When there are multiple missing teeth, the choices of strategic abutment teeth are limited. In addition, the increase in weight and size of the prosthesis is approximately inversely proportional to the number of

\textsuperscript{n}Corresponding author at: Specialist Dental Group, 3 Mount Elizabeth #08-10, Singapore 228510, Singapore. Fax: +65 67336032.
E-mail address: drcheng@specialistdentalgroup.com (A.C. Cheng).

0377-5291/\$ - see front matter \textcopyright{} 2012 Published by Elsevier (Singapore) Pte Ltd.
http://dx.doi.org/10.1016/j.sdj.2012.08.001
remaining teeth [1]. In general, a more intact maxillary dentition, curvilinear abutment alignment, and the presence of teeth over the defect side are beneficial in the obturator prosthesis design, retention, function and prognosis [2].

Under most circumstances, the retention of an obturator prosthesis is derived from the tissue undercuts over the defect. In cases where there is insufficient soft tissue undercuts, it is generally considered to be an unfavorable defect and prosthesis retention will be relying mainly on the residual dentition [3,4].

Application of endosseous implants in maxillofacial cases has been long documented [3,4].

The original endosseous implant protocol required a period of a few months for osseointegration before the connection of a definitive dental prosthesis [5–7]. Recently, early loading of endosseous implants has been accepted as a viable treatment protocol to the conventional 2-stage delayed loading protocol.

New developments in implant surface treatments have resulted in the reduction of healing time and the clinical concept of immediate loading [8–13]. In selected clinical situations, immediate implant loading is a predictable protocol [14–16]. Flapless surgical implant placement has also been shown to produce predictable treatment outcomes, and postsurgical discomfort is seldom encountered [17,18].

Overdenture studies have suggested that newly placed endosseous implants should be splinted together within a short period of time to prevent implant axial rotation and micromotion [19–21].

It has been shown that longer implants [22–25], higher primary implant stability [26–28], and flapless surgical implant [17,18] placement may enhance the prognosis of early loading of endosseous implants.

The usage of high strength full ceramic base fixed prosthodontic materials has gained more popularity in recent years. However its usage in combined fixed and removable prosthodontics situation has been rarely reported [29].

This clinical report describes the prosthetic management of a patient who received a partial maxillectomy using a combination of early loading endosseous implant supported fixed prosthesis and conventional obturator prosthesis.

Fig. 1 – Intra-oral frontal view showing a recent biopsied area on the maxillary right buccal sulcus.

Fig. 2 – Intra-oral occlusal view showed a swelling on the right maxillary area. Noted that only 5 maxillary teeth in an unfavorable linear configuration could be used as potential abutments.

Fig. 3 – Panoramic radiograph clearly showing the lesion. The estimated resection would remove all the maxillary right teeth, the supporting dentoalveolus, hard palate and only 5 maxillary teeth would be left on the left maxillary area.

2. Case report

A 37-year-old gentleman was referred to the Specialist Dental Group, Mount Elizabeth Hospital, Singapore. He is a professional speaker in a religious organization. His main concern was that he has an asymptomatic swelling over the right side of his face for more than 3 years.

Panoramic radiography and cone-beam computer tomography (CT) scan examination revealed a large bony lesion over his right maxillary sinus (Fig. 1). There were multiple missing teeth on his maxilla (Fig. 2). A biopsy confirmed that the lesion was an ameloblastoma. The cone-beam CT scan confirmed the lesion was eroding all his remaining teeth in the right maxilla. Sufficient bone volume was identified for the placement of endosseous implants in the anterior maxilla. Approximately 25 mm superoinferior and 8 mm buccolingual bone volume was measured on his maxillary incisal area (Fig. 3). The patient was seen by the Otorhinolaryngologist (ENT surgeon) on the same day.
3. Treatment sequence

A pair of maxillary and mandibular casts was made on the day of the consultation using irreversible hydrocolloid (Orthoprint, Zhermack, Italy). The diagnostic casts were poured in Type V dental stone (Noritake Dental Stone, Kyoto, Japan).

An interocclusal record was made using an interocclusal registration material (Regisil; Dentsply International). The casts were mounted on a semi-adjustable articulator with a facebow record (Hanau Wide-vue; Teledyne Waterpik, Fort Collins, CO).

After a clinical discussion with the ENT surgeon, the surgical margins were outlined on the dental cast. It was confirmed that the anterior maxilla area will be spared from the surgical excision. An immediate surgical obturator was planned.

In the laboratory, the maxillary teeth on the right side were removed from the cast according to the surgical margin. Artificial teeth (Dentacryl SA; Dentsply International) were arranged in wax (NeoWax; Dentsply International) to replace his maxillary incisors and posterior teeth on his right maxilla in the anticipated resection area. After the denture teeth were set up, the immediate surgical obturator was processed using heat-polymerized acrylic resin (Lucitone 199; Dentsply International) (Fig. 4).

1 day before the planned surgical resection of the ameloblastoma, 3 endosseous implants (4.0 mm × 18 mm, 3i Certain, Biomet 3i) were placed in the maxillary right lateral, central and left lateral incisor areas using a flapless procedure under the guidance of a prosthodontist (Fig. 5). No surgical template was used (Fig. 6).

A definitive impression of the implants was made in polyvinyl siloxane impression material (Imprint 3 regular Body, 3M Espe AG, Germany) immediately after the implant placement. Maxillary definitive cast was made of type IV dental stone (GP Fujirock EP, GC America Inc., USA). The cast was mounted on a semi-adjustable articulator (Hanau Wide-vue; Teledyne Waterpik, Fort Collins, CO).

A 4 units splinted cement-retained fixed dental prosthesis was made of zirconia base material (Zeno Zr bridge, Wieland Dental-Technik GmbH & Co. KG, Pforzheim, Germany) to restore the missing maxillary incisors using a double scan technique [29].

Surgical resection of the ameloblastoma was performed on the second day. Under general anesthesia, the maxillary right canine was extracted prior to the surgical resection and the anterior bone cut was made through the center of the canine extraction socket. The rest of the maxillary resection was carried out as per usual technique. The immediate surgical
obturator was inserted right after the completion of the surgical procedure (Fig. 7).

1 week after the surgical resection, the obturator was removed and the surgical site was debrided. Definitive custom titanium implant abutments were placed on the maxillary implants and torque down to 30 N cm (Fig. 8). The definitive maxillary anterior fixed partial denture was inserted in resin-modified cement (Rely-X Unicem, ESPE, St. Paul, MN).
The maxillary incisor denture teeth in the immediate surgical obturator prosthesis were removed and the lingual contour of the baseplate was adapt to the new maxillary anterior teeth. The surgical obturator was relined in tissue-conditioning material (Coe-soft, GC America Inc., USA) to adapt to the surgical defect (Figs. 9–11).

Definitive impression of the maxillary removable prosthesis framework was made on the same day using irreversible hydrocolloid (Orthoprint, Zhermack, Italy). The definitive maxillary cast was poured in Type V dental stone (Noritake Dental Stone, Kyoto, Japan). A maxillary obturator framework was fabricated in cobalt–chromium alloy.

After a healing period of 3 months, the stability of the endosseous implant support prostheses was confirmed (Fig. 12). An altered cast impression was made on the healed surgical defect (Fig. 13). A definitive obturator prosthesis was made in the conventional manner (Fig. 14). At the insertion appointment, the prosthesis intaglio surface adjustments were performed with a pressure indicating paste (Pressure Indicating Paste; Mizzy Inc., Cherry Hill, NJ) (Fig. 15).

4. Discussion

Resection of head and neck structures without proper rehabilitation could have adverse effects on the patient, both physically and psychologically. Resection of head and neck lesions is ideally managed in a multi-disciplinary manner. In this case, an ENT surgeon, an oral surgeon and a prosthodontist were involved. It is crucial for all the team members to understand the intended treatment outcome at the planning stage. A clear understanding between group members in the treatment team forms a crucial base for the execution of the treatment and resulting successful rehabilitation.

Maximum bone preservation and strategic placement of endosseous implants ensured optimum rehabilitation outcomes. In this report, the anterior maxillary incision line was made at the center of the extraction socket of the right maxillary canine. The dental team ensured that a clear resection margin was defined for the ENT surgeon and sufficient bone volume was secured at the posterior area of the endosseous implant at the right maxillary lateral incisor area. Alternatively, if the prosthodontics rehabilitation effort was initiated only after the resection was completed, the functional outcome would be the sequel of the surgical treatment and the predictability of the treatment would be uncertain.

Implants are ideally placed with the aid of a surgical template. In this case, the implants were placed by an experienced oral surgeon under direct clinical supervision of an experienced prosthodontist without a surgical template. A total of 3 implants were used. 2 implants were placed on the side that is closer to the anticipated surgical defect to ensure sufficient prosthesis support while the remaining implant was placed over the distal end of the edentulous space to eliminate cantilevering [30].

The patient was rehabilitated in a timely manner. Based on the original clinical presentation, if the patient was rehabilitated following a conventional obturator prosthesis, the prosthesis would be only supported by less than 5 natural teeth abutments while there would be 10 pontics. The masticatory function may be compromised.

The usage of high strength full ceramic restoration in combination with removable prosthodontics is rarely reported in the literature. As far as the authors are aware of, the usage of these newer fixed prosthodontics materials in combination with maxillofacial prosthodontics has never been documented prior to this report.

In the manner in which this patient was rehabilitated, by using an implant supported fixed dental prosthesis in combination with his natural teeth over the maxillary left side, the curvilinear alignment of the maxillary arch was mostly restored [2]. This indirectly reduced the weight of the prosthesis [31,32] and only 5 pontics were needed to be placed in the defect side over the obturator prosthesis.

With proper fluid seal in defect obturation, the patient’s speech and swallowing were not compromised. Functional and esthetic elements were also enhanced using the
5. Summary

This report described the prosthetic rehabilitation of a partially edentulous patient after an ablative maxillary surgery. The usage of implant supported high strength full ceramic fixed dental prosthesis and an obturator prosthesis was discussed.

References