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Case Report

Fabrication of obturator using intraoral scanning impression technology: A clinical report

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ABSTRACT

This article presents a digital technique for the fabrication of surgical obturator for patient with decreased mouth opening planned for hemimaxillectomy. Here fabrication of obturator was done without conventional impression. Obturator was placed in position intra-orally post tumor resection to complete obturation. Procedure followed led to an accurate fit of the prosthesis.

1. Introduction

When tumors of hard palate, maxillary sinus and sometimes buccal mucosa or nasal cavity require surgery is defined as maxillectomy or maxillary resection. Violation of hard palate creates an automatic defect that allows oral cavity, maxillary sinus, nasal cavity, nasopharynx to become one confluent chamber. Lack of anatomic boundaries create disabilities in speech and deglutition and liquids and food bolus escape from oral cavity into nares making inadequate nutrition supply. Speech becomes unintelligible due hypernasility. Prosthetic intervention with an obturator is necessary to restore contours of resected palate and to recreate functional separation of oral cavity and sinus and nasal cavities. Common problems encountered in patients undergoing rehabilitation with maxillary obturators are lack of retention, stability, and support. Size of defect, number of remaining teeth, amount of remaining bony structures, and the ability of patient to adapt to prosthesis are few factors that affect prognosis of treatment.[1]

Trismus, xerostomia, and mucositis are well-known side effects of surgery, radiotherapy, and chemotherapy of oral cavity.[2] Fibrosis of masseter and lateral pterygoid muscles can lead to severe limitation in mouth opening, making prosthodontic procedures such challenging for dentist but also insertion of the obturator extremely difficult for patient.[3]

In cases of reduced mouth opening, it is advantageous to complete impression-taking procedures with as little discomfort to patient as possible. Various techniques have been described in literature to help overcome limitation in mouth opening including multiple impression stages, sectional, and flexible impression trays.[4]

In recent years, dentist has shift to digital impression taking for implemented into maxillofacial rehabilitation of oncology patients. Accuracy of digital impression technique compared to traditional impression procedures has been investigated with favourable results.[5]

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Intraoral digital impression techniques have gained in popularity, and their use in fixed and removable prosthodontics has increased. Intraoral scanning (IOS) is clinically acceptable alternative to conventional impression methods in fabrication of crowns and short fixed dental prostheses (FDPs). Digital impression systems also result in clinically acceptable fit for fabrication of crowns and FDPs. Digital impression techniques compared to conventional impression are faster and can shorten operation time.[6]

Obturator fabrication by digital impression required 3 clinical appointments that include digital impression, fit verification followed by teeth trying compared to 5 or more appointments as in conventional impression. In field of computer-engineered complete dentures, reduction in number of necessary visits and electronic archiving are considered advantages; however, patients' dissatisfaction with final result has been reported, which may be due to lack of trial placement appointment.[7]

In this case report, we present digital technique for fabrication of surgical obturator for a patient with decreased mouth opening planned for maxillectomy using IOS impression.

2. Case Report

A 50-year-old male patient visited for rehabilitation of a 2 months old maxillary defect after maxillectomy due to cancer surgery. Intraoral examination revealed a maxillectomy defect on the right side. The palatal defect showed complete healing with a band of scar tissue on the lateral margin. Patient had difficulty in mastication, speech, and nasal discharge and had only 2cm of mouth opening. The prosthesis was thus planned as cast partial obturator attached to a removable partial denture. Intraoral scanning was performed using an intraoral CEREC OMNICAM scanning system. [Figure 1]

Figure 1: Digital impression using cerec omnican

The data collected from the digital scan was then united by using software and the virtual maxillary dentition digital cast was fabricated in the standard triangulation language file format. [Figure 2A,B]

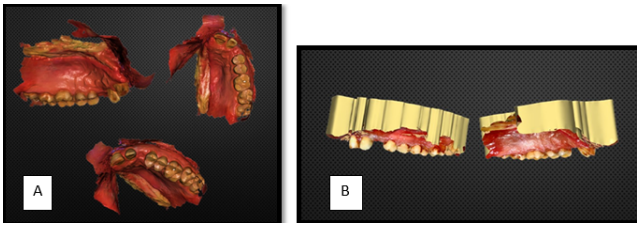

Figure 2: A,B: Digital scan file of maxilla

This information is enough to construct the final digital maxillary cast [Figure 3].

Figure 3: Printed maxillary model

Figure 4: Maxillary obturator

Using dental CAD software (EXOCAD, GERMANY), a maxillary obturator was designed on a computer. For the base material of the maxillary obturator, PEEK (Polyetherketoneketone) was used as it offers high rigidity

Figure 5: Final delivery of obturator

and compressive strength and allowed the weight of the prosthesis to be reduced. The retainer was designed to have an undercut of 0.5 mm, a clasp arm width of 1.5 mm, and a clasp arm thickness of 1.1 mm. This data, was send to lab for the fabrication. Designing was done and software program [Figure 4] was export. Obturator base file in the standard tessellation language (STL) file was format. STL file has been imported into an open source CAD software.

The obturator base was manufactured additively with light-polymerizing denture base resin. Seal the vent holes with gingiva coloured light-polymerizing resin. Apply the conditioning agent on the denture and lute the denture. Obturator prosthesis were finished and polished for trial insertion and delivered. Follow up was done every month. [Figure 5]

3. Discussion

Large and exophytic tumors of maxillectomy traditionally have required packing of wounds and delayed obturator placement when tissue transfer is not used. Immediate rehabilitation is always preferred. Obturation has shown benefit to quality of life, form, and function of patients. Ideally surgical obturators are fabricated pre operatively and require minimal intraoperative adjustments. However, to fabricate these obturators, either digital or physical impressions must be taken.[8]

Maxillary obturator prosthesis is most frequent treatment option for management maxillectomy defects. Obturator designs for partial and total maxillectomy defects include open and closed hollow obturators inflatable obturators and two-piece hollow obturator prosthesis. Heavy weight of obturators is often dislocating factor. Hollowing prosthesis to reduce its weight is well-established fact. But it becomes more problematic when there is an added limited mouth opening.[9] Wu et al. reported that correct scanning strategy and adequate digital impression of supporting hard and soft tissue in maxilla is a prerequisite for an accurate fit. Emerging use of 3D technology can aid in management of such complex situations. Previous studies have shown fabrication of surgical obturator using (CAD and RP) Computer Aided Design and Rapid Prototyping using DICOM data.[10]

In this case report, we present digital technique for fabrication of surgical obturator for a patient with decreased mouth opening planned for maxillectomy using both IOS impression and a CAD-CAM produced obturator.

4. Conclusion

One of primary objectives of an obturator is recreation of partition between intraoral and nasal cavities. This improves deglutition and enhances speech intelligibility. In addition to this if there is condition of limited mouth opening then digital impression technique can be helpful. IOS of hemimaxillectomy patient and implementation of CAD/CAM techniques for obturator fabrication are a viable option for less tissue irritation and more patient comfort.

5. Conflict of Interest

None.

6. Source of Funding

None.

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