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Comprehensive Prosthetic Strategy Through a Staged Approach to Postoperative Obturator Fabrication until Definitive Obturator for Hemimaxillectomy Patient: Case Report

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ABSTRACT

Hemimaxillectomy is a surgical procedure that involves the removal of part of the palatal and maxillary bones, which results in disruption of the oral cavity structure. This defect causes an abnormal relationship between the oral and nasal cavities, accompanied by abnormalities in the palate and tooth loss. This case report aims to examine the rehabilitation using an obturator of a patient after a hemimaxillectomy procedure. A 32-year-old male patient came to the Dental and Oral Polyclinic of Dr. Sardjito General Hospital, a referral from the Ear, Nose, and Throat Polyclinic with a diagnosis of nasopharyngeal angiofibroma. The treatment management was that the patient underwent a post-surgical obturator before undergoing a hemimaxillectomy. The next stage was the hemimaxillectomy procedure followed by post-surgical obturator insertion. Prosthetic treatment was carried out in stages, including interim and definitive obturator insertion. Objective examination of retention, stabilization, occlusion, phonation, and aesthetics showed they were in good condition after obturator insertion. Obturator prosthesis in this case restored patient's chewing, swallowing, speech, and aesthetic after hemimaxillectomy.

Keyword : *Hemimaxillectomy; Obturator; Hollow Bulb; Post-surgical; Interim*

Introduction

Hemimaxillectomy is often performed to treat malignancies and abnormal growths in the oral cavity. The effects of this procedure can alter the shape and function of the stomatognathic system and facial contours [1]. Defects resulting from hemimaxillectomy can affect the patient's ability to speak, chew, and swallow, and cause nasal discharge [2]. These functional problems can impact quality of life [3]. Changes in appearance caused by the loss of tissue and underlying structures can also lead to emotional stress and depression. Social phobia and anxiety are more

common in patients who lose part of their maxillofacial tissue than in those who lose other body parts, such as arms and legs. Rehabilitation of patients with malignant maxillofacial tumors requires a multidisciplinary approach, including surgical treatment, radiotherapy/chemotherapy, phonetic rehabilitation, physiotherapy, and prosthetic care [4]. If a large maxillary resection occurs, the defect can be covered with a dental or maxillofacial prosthesis. The primary role of a prosthodontist in treating maxillary defects is to rehabilitate the intra- and extra-oral structures to restore normal masticatory function, phonetics, swallowing, and aesthetics. Support for these

prostheses can be provided by the remaining teeth and tissues, or by using dental implants. Hemimaxillectomy reconstruction with an obturator offers several advantages [5].

The advantages of an obturator over other obturators include replacing lost soft and hard tissue, maintaining maximum arch width and tooth alignment, allowing the patient to swallow, chew, and speak normally without nasal sounds, and creating a barrier between the nasal and oral cavities [6]. Other advantages include removing the obturator from the mouth, which facilitates visualization and early detection of recurrent tumors. Obturators can also improve facial appearance by providing support to facial tissues [7].

Methods

The method used is a case report. This case report uses a single patient with patients diagnosed with angiofibroma who were given staged obturator creation treatment after hemimaxillectomy. This case is fully documented including clinical examination, radiographic examination, to prosthesis design which can provide a comprehensive picture. The SOAP (Subjective, Objective, Assessment, Management) method was used to write this report. Interviews, physical and supporting examinations, observation, documentation studies, and literature review were the methods employed to gather data.

Results and Discussion

A 32-year-old man visited the Dental and Oral Polyclinic of Dr. Sardjito General Hospital. was referred from the Ear, Nose, and Throat (ENT) Clinic for the construction of a post-surgical obturator. Clinical and radiological examinations were performed (Figure 1 & Figure 2). The complaint had been felt for 5 years and was getting bigger. The diagnosis was angiofibroma. The patient's general condition was compos mentis. The patient's blood pressure was 120/80 mmHg, pulse 88 x/minute, respiration 18 x/minute, and afebrile. Extraoral examination revealed an asymmetrical face with swelling around the nose (Figure 1A). Intraoral examination revealed swelling on the left palate with the condition of the tooth in region 2 being pushed to the median.

There are remnants of the roots of teeth 15 and 36 (Figure 1B). The treatment plan for this case is to create a post-surgical obturator, an interim

obturator with a two-piece hollow bulb acrylic material, and then continue with the definitive obturator with a two-piece hollow bulb from a combination of acrylic resin frame materials.



Figure 1. (A) Asymmetrical face with swelling around the nose. (B) Swelling on the left palate resulting in the teeth being pushed to the median.

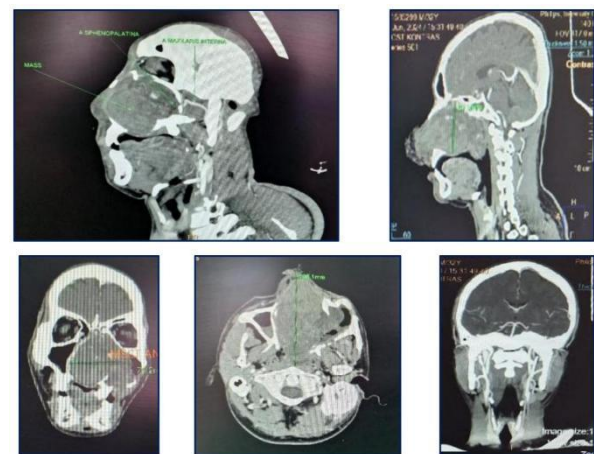


Figure 2. Radiographic examination results

Case management begins with making impressions of the upper and lower jaws using irreversible hydrocolloid impression material with a mucostatic technique and filled with plaster stone to obtain study models and prepare for the manufacture of post-surgical obturators (Figure 3). A resection design is made on the model. The postsurgical obturator is made using polypropylene material by previously contouring the model. Debridement was performed thoroughly on the lesion under general anesthesia.

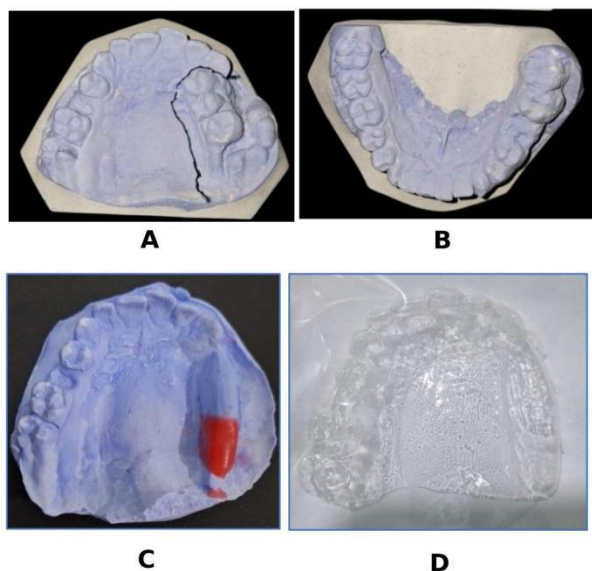


Figure 3. (A) Maxillary study model with resection design. (B) Mandibular study model. (C) Contouring of the study model. (D) Post-surgical obturator

Maxillary resection is performed on a part of the left side of the palate and teeth. The tissue pieces are collected in a formalin pot for anatomical pathology examination (Figure 4A). The post-surgical obturator was inserted, and sutured through the obturator hole to the surrounding soft tissue in several locations (Figure 4B). Miniscrews were placed in the palate to enhance retention

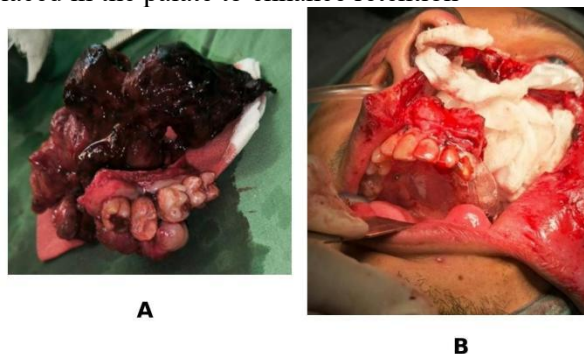


Figure 4. (A) Post-resection tumor, (B) Obturator installation.

One day after surgery, a post-operative examination and dental health education to patient were performed. One week after surgery, the patient returned for a re-examination to ensure there were no complications and to ensure the obturator was in good position (Figure 5). The patient presented with a hemimaxillectomy defect extending from the left side of the palate to the canine. Intraoral examination revealed a cavity in the area, with the remaining teeth, gingiva, and palate within normal limits. The patient's oral hygiene was observed. Extra-oral examination revealed an asymmetrical facial profile, no mandibular deviation, no

lymphadenitis, and a normal temporomandibular joint (TMJ). Radiographic examination showed that the remaining supporting bone and crown-root ratio were within normal limits. The defect was classified as a Class II Aramany defect.



Figure 5. Patient's condition during control.

Two weeks after surgery, the patient returned to the clinic. The sutures and miniscrews were removed. Intraoral and extraoral examinations showed good initial healing at the defect site. The patient was shown how to insert, remove, and clean the obturator, as well as maintain good oral hygiene. One week later, the nasogastric tube was removed.

One month after surgery, the patient underwent an interim obturator fabrication procedure. The general steps in fabricating a conventional acrylic partial denture were performed. The defect site was covered with gauze to prevent the impression material from entering the nose. An irreversible hydrocolloid impression was taken using a perforated stock tray and filled with plaster stone for the working model. Retention for this type of obturator was obtained from the remaining teeth with C-clasps on teeth 14 and 23, and C-clasps with occlusal rests on tooth 16 without artificial teeth (Figure 6).

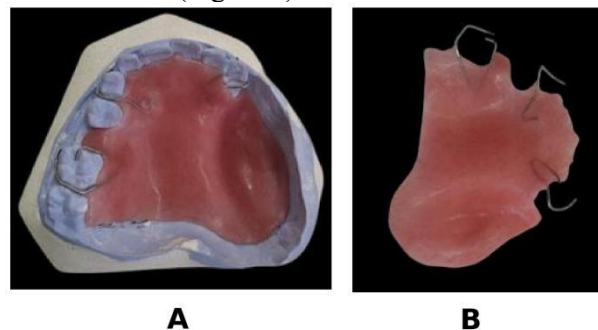


Figure 6. (A) Interim obturator on the study model. (B) C clasp on teeth 14, 23, and a C clasp with an occlusal rest on tooth 16 without an artificial tooth.

The next visit involved inserting an obturator without a hollow bulb (Figure 7). The patient was instructed to use the obturator properly and to have a checkup every 2 weeks. During the checkup, an examination was performed and both intraoral and

extraoral conditions were found to be in good condition. The roots of teeth 15 and 36 were then extracted.



Figure 7. Obturator insertion without hollow bulb.

One month later, the patient was followed up and underwent intraoral and extraoral examinations (Figure 8). An impression was made with irreversible hydrocolloid using a perforated stock tray to create study models and working models (Figure 9). An acrylic interim obturator with a hollow bulb was fabricated. The acrylic resin interim obturator design used an acrylic resin obturator major connector in the form of a full acrylic plate on the palatal side with a distal base extension. The direct retainer used a C-clasp on teeth 14 and 23, and a C-clasp with an occlusal rest on tooth 16.



Figure 8. Patient condition during one month check-up.

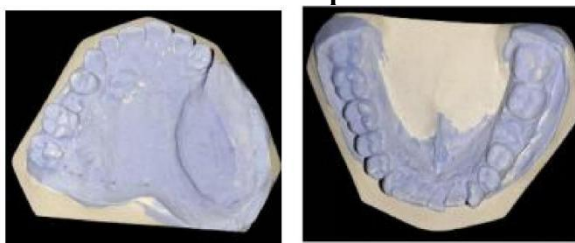


Figure 9. Study model.

The fabricating process of an obturator baseplate from acrylic resin was followed by a trial of the acrylic resin baseplate. The adaptation between the plate and mucosa, as well as retention and stabilization, were examined. The plate adapted well. It does not cause pressure, irritation, or pain to the oral tissues, and retention and stabilization are

adequate. Next, the patient's bite is determined (Figure 10A). The color and shape of the teeth are selected based on the patient's facial shape, skin color, age, and gender (Figure 9B).



Figure 10. (A) Determining the patient's bite. (B) Selecting the color and shape of the teeth

After the centric occlusion recording was completed (Figure 11), the next step was to mount the cast on the articulator and arrange the teeth (Figure 12). At the next visit, the patient underwent a try-in of the teeth. Before the try-in, the upper part of the hollow bulb was sealed with wax to check phonetic function. Retention, stabilization, occlusion, esthetics, and phonetics were all in good condition.



Figure 11. Centric occlusion recording.

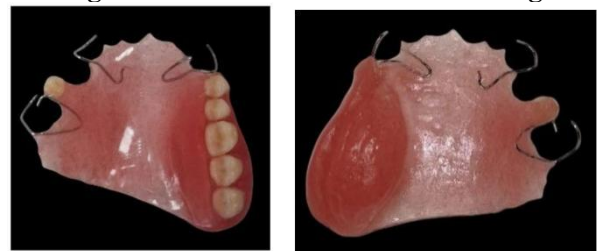


Figure 12. Obturator with hollow bulb.

The next visit, an acrylic resin obturator was installed. The obturator was fitted and a clinical examination was performed (Figure 13). Retention and stabilization of the fitting surface of the obturator base showed good adaptation, while the hollow portion covered the defect area. The precision obturator clasps on the abutment teeth and the labial flange covered the labial gingival defect. During jaw movement, the obturator remained stable, the occlusion did not interfere, it did not interfere with swallowing, the tooth color matched the adjacent teeth, speech clarity improved, and nasal sounds were eliminated.



Figure 13. (A) Insertion of obturator with hollow bulb. (B) Patient profile after insertion

Patients were instructed on how to use and care for the obturator, including how to remove and insert the prosthesis, adapt to the prosthesis, clean the prosthesis after meals, remove the prosthesis while sleeping, and maintain oral hygiene. A follow-up visit was performed one week after installation. Subjective examination revealed no complaints of pain or discomfort while using the prosthesis, and no food residue on the fitting surface. Objective examination revealed no mucosal tissue irritation, good prosthesis retention and stabilization, normal occlusion, and clear pronunciation. Patients were instructed to have monthly check-ups. Five months after surgery, the patient underwent intraoral and extraoral examinations and showed good healing. A definitive obturator was fabricated.

The next visit involved taking impressions of the upper and lower jaws with a perforated stock tray using irreversible hydrocolloid impression material. Gauze was placed on the defect side to prevent the impression material from entering the nasal cavity. The impression was filled with plaster stone. The interim acrylic obturator was reinstalled. The defect classification in this case was Class II Armany defect with Class II modified I Kennedy edentulousness in the maxilla and Class III Kennedy in the mandible (Figure 14).

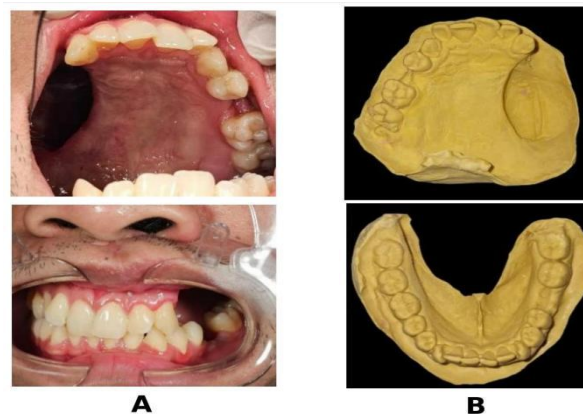


Figure 14. (A) Intraoral condition before taking an impression (B) The impression is filled with plaster stone

The indication for the prosthesis is a definitive obturator made of a metal frame combined with acrylic resin and two-piece hollow bulb. The support used is a combination of teeth and mucosa. The retainer used is a double akers on teeth 16 and 17, an aker on tooth 14. The RPY clasp on tooth 23. The cingulum rest on teeth 23 and 13 and the mesial occlusal rest on tooth 14. The connector used is a full palatal plate with a hollow bulb on the palate defect. The lower jaw uses a thermoplastic nylon plate (lucitone) with a wrap-around clasp to support the tooth element 36. The survey was carried out digitally, and undercuts were observed (Figure 15).

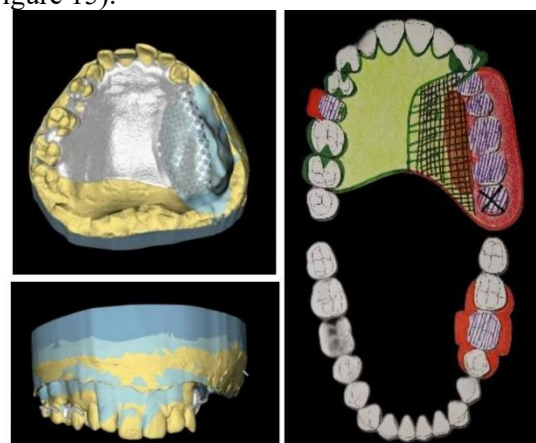


Figure 15. Design of the definitive obturator.

The second visit involved a try-in of the metal frame plate (Figure 16). Several things to consider include retention, stabilization, and ensuring the plate does not press or cause pain to the underlying mucosa. A bite rim is created at the level of the remaining teeth in the edentulous area (Figure 17A). The maxillary-mandibular relationship is recorded. The bite record is performed using elastomer (Figure 17B). Shade matching is performed to select

the artificial teeth. Mounting in the articulator is performed in preparation for tooth alignment. An interim acrylic obturator is reinstalled until the next visit.

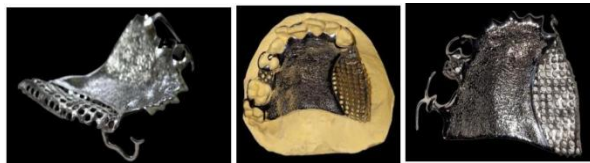


Figure 16. Metal frame plate.



Figure 17. (A) Fabrication of the upper and lower jaw biterim. (B) Recording the maxillary and mandibular relationship using elastomer.

The third visit involved a try-in of the prosthesis and tooth alignment (Figure 18). Retention, stabilization, phonation, occlusion, esthetics, and the presence of pressure points in the defect area were all important considerations. The interim acrylic obturator was reinserted until the next visit, while the final obturator was being processed in the laboratory (Figure 19)



Figure 18. Try in prosthesis and tooth arrangement.

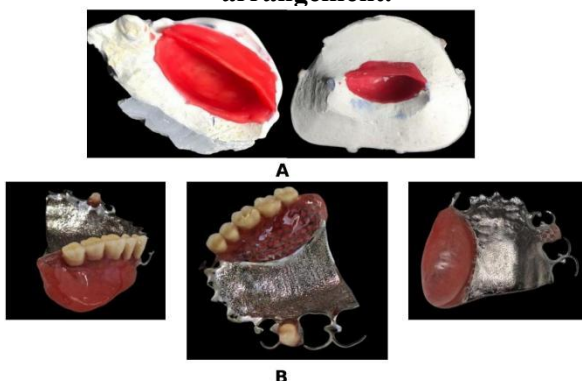


Figure 19. (A) Hollow bulb fabrication (B) Definitive obturator with a hollow bulb.

At the fourth visit, the definitive obturator with a metal-acrylic framework was inserted. Several aspects were considered, including retention, stabilization, phonation, occlusion, and aesthetics. Retention was assessed by checking the accuracy of the fitting of the base surface of the

prosthesis to the mucosa and the hollow part of the defect. Both the direct and indirect retainers were positioned correctly (Figure 20A).

Stabilization is performed when the obturator jaw function remains stable. Occlusion is checked using articulating paper. Aesthetics are assessed by observing the patient's dental and facial appearance, which is supported by the use of the obturator (Figure 20B). Phonation is examined by having the patient pronounce letters and speak.

Some letters such as p, s, f, th, r, and m are checked for clarity of intonation. Post-prosthetic insertion instructions were also provided, including how to wear and clean the prosthesis, and the patient was advised to maintain oral hygiene. The obturator insertion results were good, including retention, stabilization, aesthetics, and phonation. The patient was very satisfied and gained confidence due to the improved and comfortable condition. The patient was advised to return for follow-up visits one week and one month later.

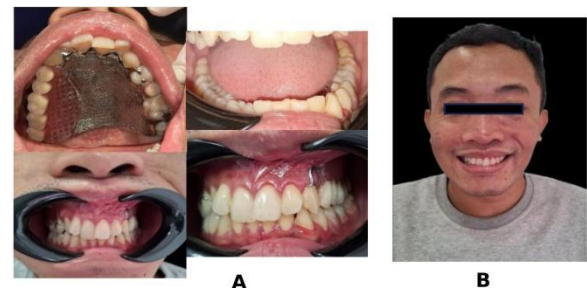


Figure 20. (A) Insertion of the definitive obturator. (B) Facial profile of the patient after insertion of the definitive obturator.

On the fifth visit, the patient came for a check-up a week after using the definitive obturator. Subjective examination results revealed no pain. The patient felt very comfortable wearing the obturator and reported following all instructions. Objective examination revealed good retention, stabilization, occlusion, phonation, and esthetics.

The oral cavity is one of the vital organs in human bodies [8]. Obturator prosthesis has an important role in the restoration of oral function in congenital or acquired maxillary defects [9]. Maxillofacial prosthesis is made to relieve patient complaints. Retention is one of the things that is emphasized in determining success so that the functions of chewing, swallowing, speaking, and aesthetics can be restored [10]. The manufacture of maxillofacial prosthesis in this case goes through three stages, namely post-surgical obturator prosthesis, interim, and definitive obturator in the form of a metal frame maxillofacial prosthesis combined with acrylic and hollow bulb.

Post-surgical prostheses are fabricated before surgery and inserted during surgery [4]. This post-surgical obturator serves as a tampon holder, accelerates wound healing, reduces bacterial contamination, and provides a barrier between the oral cavity and the wound during the initial healing process, allowing the patient to speak and swallow more effectively. The postsurgical obturator can also be more tolerable to the patient's psychological well-being. Polypropylene is used in this case because it has several advantages, such as being BPA-free, having a higher melting point, and being more impact-resistant. In the fabrication of a surgical obturator, the posterior portion must be freed from occlusal contact and only serves to close the defect and shape the palatal. This design is continued until the surgical wound is healed and ready for the interim obturator [11].

One month post-operative the patient underwent an interim obturator fabrication procedure [11]. The initial step was to fabricate an obturator in the form of an acrylic plate with claspwire retention without any dental elements and a hollow bulb. Periodic checks were carried out every two weeks to monitor the progress of wound healing [4]. One month later, an interim obturator was fabricated with a hollow bulb and claspwire retention with dental analysis according to the patient's occlusion needs. Efforts must be made to address large defects to obtain substantial requirements for subsequent retention and support of the prosthesis [12]. The function of initially fabricating a simple acrylic plate is to provide sufficient time so that patient awareness and adaptation to wearing a foreign object will be optimal over time [13].

An interim obturator can be fabricated to prepare healthy tissue for full stomatognathic function through a definitive obturator prosthesis. Interim obturators promote rapid recovery of speech and swallowing, and their construction provides greater patient comfort [14]. The definitive obturator is fabricated once the defect has completely healed and is dimensionally stable [4]. This typically takes 3 to 6 months after surgery, depending on several factors, such as tumor prognosis, defect size, healing rate, and the presence or absence of teeth. The design for this type of obturator can vary based on the defect classification system and the nature of the defect. In this case, a tripodal design is used. Support is provided by the remaining teeth and mucosa. Rests are placed on the molars, first premolars, and canines. A full palatal plate is used to ensure maximum functional load

distribution [15]. The patient's lower jaw denture uses a flexible denture. The patient desired a metal-free denture in the lower jaw. Flexible dentures made of thermoplastic nylon have several advantages, including biocompatibility, aesthetics, light weight, and comfort. Wrap-around clasps used a tissue-bearing retento-grip technique for retention. The gingival-colored clasps were placed buccally around the cervical abutment teeth next to the edentulous area [16].

The success of this maxillofacial prosthesis is also determined by the accuracy of the peripheral seal. Extension into the defect increases retention, and hollowing is done to make the prosthesis lighter [17]. Controlling the wall thickness of the hollow obturator is important to provide adequate strength and weight of the prosthesis [10]. Hollow obturator prostheses show significant weight reduction, ranging from 6.55% to 33.06% while still considering the size of the restored defect [18]. The quality of life of patients with maxillary defects can be improved by making a well-designed obturator [19]. The obturator can restore chewing, swallowing, aesthetics especially the midface, resonance and speech [20]. Patients with maxillofacial defects who undergo rehabilitation can resume their normal social habits [21].

Conclusion

Prosthetic rehabilitation of post-hemimaxillectomy allowing dentist to restore oral functional and facial aesthetic predictable while helping patients regain confidence, social interaction, and daily functional activities.

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