

A Novel Approach in Rehabilitation of Maxillary Defect: A Clinical Case

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Abstract

A substantiate defect in midface is visible after surgical resection of benign tumor or infection involving the maxillary sinus and its adjacent structures. Atrophic maxilla if not reconstructed, results in functional and esthetic problems. Osteomyelitis is a pyogenic, progressive and destructive process that begins as an infection in the medullary bone. In spite of emergence in overwhelming antimicrobial and surgical therapy, it still stands as challenging clinical entity. Nevertheless, an admirable outcome can be accomplished through complete removal of infected and devitalized soft tissue and bone. This case report presents reconstruction of atrophic maxilla in 65-years-old male patient with large oronasal and oroantral communication with severe disturbed phonetics, speech intelligibility and nasal regurgitation. Due to extensive defect of bone and ailing condition of patient a prospective titanium frame was designed. Patient complaint of functional deficient and quality of life has improved after rehabilitation over a follow-up period of 1 year.

Keywords: Osteomyelitis; Atrophic maxilla; Reconstruction; Titanium

osteomyelitic occurrence and resolution [3]. The Waldrogl and Cierny-Mader classifications are the two most commonly used staging systems for Osteomyelitis [5]. Clinically four types of osteomyelitis of jaws observed namely Acute suppurative, Secondary chronic, Primary chronic and Non suppurative with characteristic features of deep intense pain, high intermittent fever, paresthesia and deep caries of involved teeth [5]. A well retained user- friendly, removable prosthesis is the key to successful prosthetic rehabilitation. Restoring the defect by means of pre-fabricated Alloplastic Material, can avoid need of secondary surgical intervention for autogenous bone graft and complications such as resorption and failure of graft especially in patients with co-morbidities like the presented case. The preliminary workup required a Live stereolithographic model for implant frame planning and design before its surgical emplacement. The Present case report describes the surgical and prosthetic rehabilitation in patient with mid-face defect resulting in improved phonetics and reduced nasal regurgitation.

Case Report

A 65-year-old male patient registered medical practitioner by occupation presented to our department of oral and maxillofacial surgery at Mamatha dental college, Khammam 2017 with chief complaint of difficulty in eating, nasal regurgitation and speech, since 3years. Patient's past medical history revealed chronic suppurative osteomyelitis involving complete maxilla with existing comorbidities such as hypertension, diabetes and asthma who was surgically operated 3 years back under the same unit. Patient has also undergone craniotomy 1 year back for defect in upper third of face (Potts puff tumor) at the same hospital by neurosurgeon team. Later patient was given with a prosthetic obturator for the maxillary defect, which was not properly used and maintained by the patient. On Local examination, there is facial asymmetry involving middle third and frontal region of the face. Deficiency is seen involving the middle third of face with flaccid and inward displacement of nasal soft tissue and upper lip. On intraoral examination, oronasal and oroantral communication is present with normal mucosa over all walls of the defect. Mandibular arch is dentate with generalized attrition and poor oral hygiene. Mandibular movements are within normal range. Mouth opening was adequate with altered speech. Provisional diagnosis of Post Maxillectomy defect with oronasal and oroantral communication

Introduction

Although, reconstruction of mid-face after complete Maxillectomy is more complex and controversial, it is essential to anticipate esthetic and functional problems [1]. Bone grafts are unique in reconstruction of anatomical defect [1]. As indicated by American medical association, rehabilitation of maxillary defect helps in restoring functional and esthetic impairment [2]. In a Prospective study conducted with acoustic, physiologic, and perceptual bases of speech the nasometer and aeromechanical data has been shown success in restoring speech with maxillary rehabilitation in resection cases [2]. With concurrent accessibility and availability of antimicrobial therapy, declination in prevalence and excrecence of osteomyelitis have been reported [3]. Osteomyelitis, defined as an inflammatory condition of the bone, which begins as an infection of the medullary cavity, rapidly involves the haversian systems, and extends to involve the periosteum of the affected area. With a gender predisposition of 5:1 in male and female population [4]. None has such profound impact of vascular integrity as in

under James Brown classification type II d was given (Figures 1-4).



Figure 1 Intra oral view (pre-operative view).

Implant designing

On CT (computed tomographic) scan examination, there is a complete destruction of maxillary alveolar process, hard palate with no maxillary sinus and minimal residual bone. So, we have planned for a custom made implant fabrication on life size stereolithographic facial model of patient. The implant frame was designed such that a single implant can provide a slot for anchorage from zygomatic -maxillary and nasomaxillary buttress superiorly with a rigid bar in arch pattern for cross arch stabilization inferiorly. Four attachments were planned over titanium frame. The virtual Implant design was implicated in manufacturing a single titanium frame from a uniform block of titanium alloy.

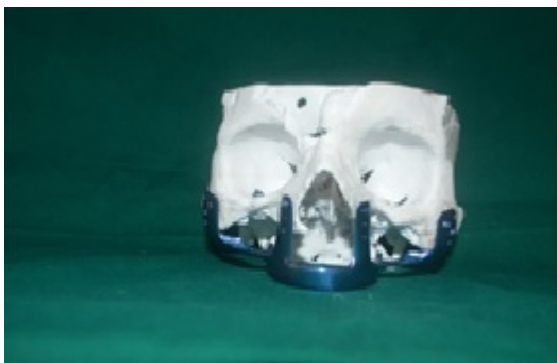


Figure 2 Stereolithographic model with pre-fabricated titanium graft.

Surgical procedure

Patient was started with oral antibiotics twice daily, for one week along with patient regular medication for diabetes, hypertension and asthma. Patient was operated electively under general anesthesia. With all aseptic precautions, oral intubation was done, 2% lignocaine with adrenaline administered at surgical site using no. 6-15 scalpel and electrocautery an

intraoral vestibular with releasing incision was given, which may be helpful for flap development and retraction, giving a sufficient enough visualization of zygomatic buttress and nasomaxillary buttress. Entire lateral surface of zygomatic buttress is exposed using a palpating finger extra orally at zygomatic notch to ensure that dissection is not directed into orbital floor. A drill bit in a straight hand piece used to make a slot exposure vertically in zygomatic buttress, preparation is carried through body of zygoma soft tissues over superior portion of preparation are protected by zygoma retractor.



Figure 3 Post-Intra operative view operative pantomogram view.

Then the titanium frame was fixed using 2×10 mm screws and 2×8 mm titanium screws over zygomatic buttress region and 2×8 mm screws over nasomaxillary buttress region bilaterally followed by closure of surgical site. Post operatively patient was given intravenous amoxicillin and clavulanic acid 1.2 gm twice daily along with analgesics for one week. Four to six weeks later after soft tissues are healed, impressions are made and definitive prosthesis are constructed. Post-operative follows up of 6 months and 1 year showed no evidence of implant exposure or extrusion.



Figure 4 Post-operative denture prosthesis of lateral view, pre and post-operative comparison.

Discussion

Conventional treatment options may vary with complexity of defect. Even though, recent studies have offered many procedures like Free Flaps and Rotation Flaps they may not be preferred in all cases of maxillofacial reconstruction. Also because of the complexity of the defect and multiple surgical sessions the use of local or microvascular flap could not be indicated in elderly patients or patient with comorbidities [15]. Osseous pedicle flaps constituting of vascular bone were described in literature for reconstruction of midface, also these flaps can be used in conjunction with maxillofacial prosthesis with some limitations [11]. Even when traditional prosthodontic prosthesis become impractical, Osseo integrated implant becomes alternative, in cases where adequate bony support is not present [9]. Mid faced efficiency in Maxillectomy patient may exist due to absence of central arch and collapse of the nose with no columella support at anterior nasal spine resulting in obturator support, unless zygomatic implants used [1]. Use of zygomatic implants, have shown to result good support for denture even in larger defects where natural undercuts and anatomic structures are lost [12]. For the present case, which corresponds to class II vertical and class D horizontal defect according to James Brown classification of maxilla and mid face defects [13] placement of zygomatic implants may, result significant biomechanical disadvantage with the long lever arm from minimal bone support. Nelson et al. [6] in his retrospective study demonstrated advantage of rigid fixation of implant supported prosthesis in minimizing technical and biological errors. Clinical report, by Leles et al. [9] had showed reconstruction of defective maxilla using normal diameter implants, where the implants were splinted together along with a posterior trans-palatal strap with a healing period of 6 months. As in our case, we have planned for a single surgical session thereby avoiding another surgery prefabricated titanium made model on a stereolithographic model to mimic implant overdenture. Titanium material has shown excellent corrosion resistance, biocompatibility with high mechanical strength and its low density allows it to fabricate light and in resistant prosthesis. Biomechanical studies on zygoma implants in conjunction with normal/short implants analyzed the zygoma implants which can withstand physiologic loading even in atrophic maxilla by load-sharing mechanism provided with a rigid framework along with two normal diameter implants placed anteriorly, which would avoid lateral rotational forces. Similar to it, our implant frame was designed, such that it get fixed in zygomaticomaxillary and nasomaxillary buttress as two zygomatic implants with two standard anterior implants, avoiding a lengthy surgical procedure with less cost- effective and less time –consuming. Since a rigid bar is required to join implants across the arch in preventing off-axis forces [7]. In present case, custom made titanium implant was designed with cross bar resulting in stabilization through arch pattern of frame also providing vertical path of insertion for denture. Consequently, a prospective metal frame was designed anatomically in form of ridge enhancing the facial form to mimic original maxilla and to give three dimensional anchorages with considerable non axial forces acting on it. Retention and clinical outcome of an implant retained overdenture purely depends on

type of attachments and bar designs selected [8]. Different types of retention appliances have introduced for implant retained overdentures such as magnets, clip-bar and milled–bar system [9]. In our case, the implant overdenture was retained with aid of clip-on retention aiding in easy removal for maintaining oral hygiene by patient. Apart from its form, function and cosmetic management, it is complicated by age and comorbidity of patient. whereas in some, avoiding reconstruction is optimal than morbidity due to surgery which is of paramount in overall management. Recently, customized pre-fabricated prosthesis is made using (RP)rapid prototyping and (RE)reverse engineering software in producing (CAD)computer-aided Design model for effective method in reconstruction of maxillofacial defect [14]. Although, it results in exact symmetry of prosthesis, it is found to be advantageous in unilateral defects and requires pre-op scans (exposure of patient to high radiation) for template generation where the prosthesis margins are derived from the border of the defect [14]. Above all, importance has to be given to type, design and timing of implant placement since reconstructing maxilla is still a flourishing skill. The importance of involvement of surgical and prosthetic teams in explaining the options and its outcome to patients and providing informed consent cannot be overemphasized [8]. Although there are several different types of objective outcome measures for speech available, there are relatively few reports that include such measures for patients having undergone a Maxillectomy. For this particular case custom made titanium frame was fixed such that it accomplish teeth arrangement in denture base, avoiding undercuts with a clearance of 1mm over soft tissues to enhance oral hygiene and easy removal of denture prosthesis by the patient. Patient complaints of defective phonetics, speech and nasal regurgitation has resolved to normal with satisfactory outcome and comfort gradually over 1-year follow-up.

Conclusion

The frame design has yielded a satisfactory retention and gratification to the patient with good retention provided by prosthesis during its function, placement and removal time. Reconstructing the Functional and esthetic loss in a patient with maxillofacial defect affects not only the productivity, confidence rather overall health of the person is regained.

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