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Reconstruction Of Mandible Using Free Vascularized Fibula flap: Case Report

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Abstract:
Squamous cell carcinoma (SCC) of gingivae in the mandible is a relatively common type of intraoral malignancy. Resection and reconstruction of mandible is gold standard treatment procedure. The reconstruction of the mandible is a complex procedure and continues to be a challenge in reconstructive craniomaxillofacial plastic surgery. Vascularized bone grafts (VBGs) contain an intrinsic blood supply that adds the biological advantage of shortened union time.

Key-words: *Gingival, squamous cell carcinoma, fibula osteocutaneous flap, mandible, primary reconstruction, segmental mandibulectomy.*

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I. Introduction:

Squamous cell carcinoma (SCC) of gingivae in the mandible is a relatively common type of intraoral malignancy. It frequently invades the mandibular bone with a thin layer of gingivae not exceeding 2 to 3 mm covering the alveolar bone. Other reasons for mandibular defects are tumor, malignancy, radio necrosis, cystic

lesion, trauma, infection or congenital anomalies[1,2]. Indications for mandibular reconstruction are versatile, and include oncologic resections, traumatic injuries, and osteoradionecrosis. The mandible serves several important functions in the head and neck. The ultimate goal is restoration of both form and function, necessitating the evaluation of appearance, mastication, deglutition, speech, and oral competence. The reconstruction of the mandible is a complex procedure and continues to be a challenge in reconstructive craniomaxillofacial plastic surgery. This can be achieved through a variety of surgical techniques, mainly non-vascularized and vascularized grafts[4]. Before the introduction of vascularized bone-containing free flaps, segmental mandibulectomy defects were often left unreconstructed. Nonvascularized bone grafts (NVBGs) may be suitable in specific circumstances, like delayed reconstructions of small traumatic bony defects. They provide a framework for creeping substitution. Yet the lack of blood supply results in slow and incomplete healing, as well as increased rates of infection, non-union, and fracture. They are also prone to osteoradionecrosis in conjunction with radiation therapy[2,4]. The management of mandibular continuity defect has changed in the past years. The most frequently used technique for reconstruction of extended defect is the transfer of vascularized osseous free graft. The fibula, scapula, rib and the iliac crest are the preferred donor-sites for reconstruction[1]. In 1989, the first lower-jaw reconstruction with a fibular flap, using osteotomies to mimic the shape of the mandible, was described. Since then, the use of the revascularized free fibula flap as bone graft has become a cornerstone in the head-neck armamentarium[3].

Vascularized bone grafts (VBGs) contain an intrinsic blood supply that adds the biological advantage of shortened union time. Outcomes from free VBGs, most notably free fibula grafts, have proved markedly superior to non-vascularized options, including reconstruction plates and bone grafts, with defects of the mandible exceeding 6 cm in length and traversing the Para symphyseal and/or anterior border regions[4].

II. Case Report:

A 35 years old male came to the department of oral maxillofacial surgery of Al- Badar dental college and hospital with chief complaint of painful ulcer in the left buccal mucosa with severe trismus for past 6 months. Mouth opening was very minimum with ulceration in the left buccal mucosa and firm mass present in the left side of cheek (Figure-1). Lymph nodes were palpable in the left side of neck. On examination the lesion was approximately 2 x 3 cm in size. There was no intra oral or extra oral persistent sinus or discharge (Figure-2). The remainder of the oral cavity was unremarkable. Patient underwent investigations such as incisional biopsy, which confirms it as squamous cell carcinoma (SCC). CT scan reveals there was ill defined ulcero-proliferative lesion in left buccal mucosa, gingiva-buccal sulcus (GBS), superior and inferior vestibule. Lesion also extend into the left retromolar trigone and also causing erosion of angle of the mandible in the region of missing 3rd molar (Figure-3). There is also loss of fat plane between lesion and left medial pterygoid muscle. There was also evidence of reactive lymph node in level II region. No evidence of erosion of maxilla seen.

FIGURE – 1

FIGURE – 2

FIGURE - 3

SURGICAL PROCEDURE:

Under all aseptic condition skin preparation was done and GA intubated. Primarily tracheostomy was performed as endotracheal intubation interfere with surgical procedure and to avoid future complication with

nasotracheal intubation. Two teams were involved in the surgery. One team for resection the carcinoma of left buccal mucosa and mandible, and another team for harvesting fibula free flap.

RESECTION OF MANDIBLE:

As the pathology involves the masticatory space and sever trismus makes the surgery more challenging. Lip split approach was used for segmental resection of the mandible. The skin incision was continued till intraoral vestibular incision and lower cheek flap was reflected and elevated. Accordingly, segmental mandibulectomy was performed from 36 region to missing 38 Region along with ramus region. The enbloc resection was performed with a 1cm safe margin because tumour extending retromolar trigone, angle of the mandible, lower vestibule and gingivo-buccal sulcus. In addition, a prophylaction modified radicular neck dissection was carried out from level 1-5 (Figure 4). Frozen section was performed to evaluate the tumour margin for confirmation, which gave negative for malignancy.

FIGURE – 4

HARVESTING OF FIBULAR FREE FLAP:

The left fibula was harvested in order to extend it into the left neck. The left leg was raised and a thigh tourniquet was placed and inflated to 350mg mercury. Line drawn from fibular head to the lateral malleolus. Anterior flap incisions were made 7 cm inferior to the fibular head to 8 cm superior to lateral malleolus. The incision carried down to and through the fascia overlying peroneous longus muscles (Figure-5). One obliquely oriented septo-cutaneous perforator was noted in the distal third of the fibula. The peroneus longus muscles were elevated off of the medial aspect of the fibula bone. Dissection proceeded deeper and the extensor hallucis muscle fascia and inter-osseus membrane were divided with a stab incision into the fascia and continuation along the fibula. The posterior incision was made through the skin and soleus fascia, and the skin paddle raised subfacially until the perforator was seen. Blunt finger dissection was used to identify in the avascular plane along the flexor hallicis muscle (Figure-6), and the fascia of the muscle incised to separate the posterior tibial neurovascular bundle anteriorly. The peroneus vascular pedicle was identified distally and suture ligated with a stick-tie. The common peroneal nerve was identified superiorly and preserved. The periosteum overlying the fibula 7 cm inferior to the fibular head and 8 cm superior to the lateral malleus was raised. A motor driven sagittal saw was used to cut the fibula at these points. The fibula bone was retracted laterally and the pedicle was traced proximally, dividing the tibialis posterior muscle at the apex (Figure-7). The flap was eventually pedicled solely on the peroneus vessels including two venae comitantes and a single artery. An arterial and venous branch to the soleus muscle were ligated to increase pedicle length. The tourniquet was released and the flap washed with warm saline and allowed to reperfuse. The graft was then trimmed and adapted to the defect as per size and shape and stabilized with help of miniplate with screws (Figure-8). The periosteum of the flap was stripped to match the dimensions of the mandibular defect. Two osteotomies planned (one for body and another for ramus of the mandible). The periosteum was raised in these areas and a thin dental malleable used to protect the pedicle while bone cuts were made with the sagittal saw. The excess bone at the ends was removed. The flap was placed into the oral cavity. The skin paddle was inset into the oral cavity defect with interrupted 3-0 Vicryl. The stability of the fibular bone in anterior mandibular region was achieved by 4-hole interrupted plate and screws where in the ramus region with L shaped plate and screws. The flap vessels as well as left facial artery and left facial vein were freed from the surrounding tissue and the adventitia trimmed. An arterial anastomosis was performed using the frame and running 9-0 nylon. A venous anastomosis was performed using a 4mm venous coupler system. The flap was reperfused and noted to be bleeding appropriately from the skin edges. Haemostasis was achieved in the wound bed with bipolar cautery. Drains were placed and secured with silk suture. The anterior flap skin paddle was inset to the buccal and lip mucosa with horizontal 3-0 Vicryl sutures. The wet lip was closed with Vicryl and dry with 4-0 chromic. The platysma was closed in interrupted fashion with 3-0 Vicryl. The skin was closed in running fashion with 4-0 nylon. A split thickness skin graft was

harvested from the left thigh with a Zimmer dermatome. The skin graft was sutured into the donor skin paddle defect and secured with 4-0 chromic suture.

FIGURE – 5

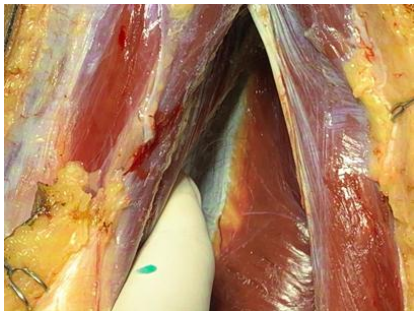

FIGURE – 6

FIGURE – 7

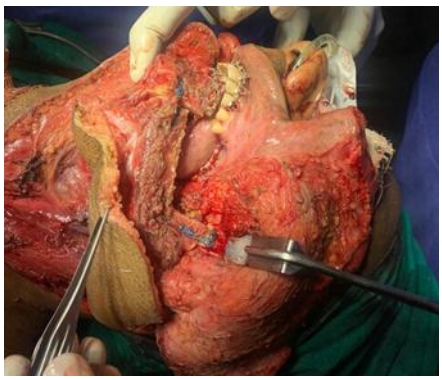

FIGURE- 8

FOLLOW UP:

The patient showed good postoperative course without any abnormal clinical and laboratory findings. Decannulation of tracheostomy tube was done after 7 days. He had an excellent recovery both functionally & aesthetically. Postoperative computed tomography (CT) scan shows no abnormality after 15 months of follow up. He was apparently better with no donor and recipient site complication post operatively.

III. Discussion

The mandible is an important aesthetic and functional organ in the oral and maxillofacial region[1]. Mandible plays an important role in airway protection, support for the tongue, muscles of the floor of the mouth, lower jaw dentition, articulation, deglutition, speech, respiration and facial aesthesis[2]. Surgery for malignancies aims primarily to resect the tumour with safety margins and to reconstruct the defect thereby created. Treatment of gingival carcinoma should provide the maximal probability of cure and quality of life[1]. In mandibular reconstruction addressing of both Functional and aesthetic objectives are important[3]. Many radiographic and histopathologic studies have been focused on the patterns of invasion of the mandible by gingival carcinoma[6,7]. Some studies, suggested various routes of entry of tumour into the mandible: the attached mucosa, access to the mandible through the foramina, cortical bone defect pathway in the edentulous mandible, periodontal membrane pathway in the dentate mandible, and the periosteum. Carter et al suggested an osteoclastic phase (erosive pattern) developing into a non-osteoclastic phase (invasive pattern) as the way of mandibular bone invasion by oral cancer. According to brown, he proposed that attached mucosa as the major entry of gingival tumour for both edentulous and non-edentulous patients. Histopathologically, Takesbi et al, invasion of tumour cells into the periosteum, cortical bone, or bone marrow was confirmed in 114 (65%) of the 176 patients and preferred segmental mandibulectomy in these conditions. Totsuka et al[10], reported that there were 2 patterns of bone involvement in mandibular gingival SCC, namely the expansive and infiltrative patterns. The infiltrative pattern usually invades the mandible through defects in the cortical bone or periodontal space, destroys the bone and cancellous space, and invades the periosteum and inferior alveolar nerve. Marginal mandibular resection always carries a risk that some tumour tissue might remain in the unresected portion of the mandible. Based on these observations, marginal mandibular resection primarily for lesions with erosive bone defects, which do not extend beyond the inferior alveolar canal. Tumours with invasive bone defects are treated by marginal resection only if the defects are confined to the superficial area of the alveolar bone. When lesions have more advanced

bone defects, segmental or hemi-resection of the mandible is performed[10]. Patients having obvious involvement of the medullary space are best managed with a segmental resection. In this case the lesion was infiltrative in nature, so we did segmental resection of mandible. The goal of the reconstruction is an establishment of mandibular continuity with acceptable cosmetic results. The surgeon has to balance his procedure to Achieve best cosmetic appearance with reliable function. In order to achieve it one must restore bony continuity, facial contour, tongue mobility and speech. For restoration, the use of autogenous bone is the preferred option. In recent years, a number of surgeons preferred the use of vascularized bones in the reconstruction of the mandible, including the rib, ilium, clavicle, metatarsal and phalanges, scapular, sternum, radius, calvaria, fibula, femur, and humerus. Each of these has inherent advantages, disadvantages, and specific indications[11]. The free fibula flap was first used in mandibular reconstruction by HIDALGO in 1989. It is the only micro surgically transferrable tubular biocritical bone which has anatomic and vascular characteristics allowing a reasonable adaptability of the graft to the mandibular shape by means of osteotomies[5]. In this case 2 main problems were dealed 1) soft tissue defect cover and appropriate thickness match to oral mucosa, 2) restoration of mandibular continuity simultaneously with soft tissue reconstruction. The fibula offers an adequate length of good quality bone with sufficient blood supply favourable for stable osteosynthesis, together with the overlying skin, suitable in thickness and without limitation of skin flap size for intraoral reconstruction especially after ablative surgery. This provides the oral and maxillofacial surgeons with the means to meet both hard and soft tissue needs in a one-stage procedure after extensive resection of gingival SCC in the mandible.

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