Post-operative Morbidities Associated with Oral Cavity Carcinoma: A Retrospective Review

Ritika Agrawal¹, Ashok Mehta²
¹Consultant Maxillofacial Surgeon, Assistant Surgeon, Department of Head and Neck Oncosurgery, Brahmakumaris’ Global Hospital and Research Centre Managing BSES Municipal General Hospital, Andheri West, Mumbai, Maharashtra, India, ²Medical Director & Consultant Cancer Surgeon, Brahma Kumaris’ Global Hospital managing BSES MG Hospital, Andheri West, Mumbai, Maharashtra, India

Oral carcinomas have been one of the main causes of mortality and morbidity. Tobacco chewing and cigarette smoking being the most common etiological factors management of these oral cavity cancers must take into account many factors; T1 lesions can be effectively removed using surgical removal, laser destruction or radiation therapy, while hallmark for intermediate stage oral cavity cancers is combined surgical resection with reconstruction and post-operative adjuvant radiation therapy. Treatment of these carcinomas adversely affects oral competence, ability to speech and deglutition, patient specific factors such as strong support system and patient independence must be considered, thus in this article we would review the morbidities-related post-operatively to the oral carcinomas.

Keywords: Adjuvant radiation therapy, Morbidity, Surgical resection

INTRODUCTION

Oral cavity is anatomically defined as extending from the skin vermilion junction anteriorly to the junction of the hard palate and soft palate posterosuperiorly and the line of the circumvallate papillae below and is further subdivided into anterior 2/3rd of the tongue, floor of the mouth, buccal mucosa, hard palate, retromolar trigone (retromolar gingival), mucosal lip, lower alveolar ridge and upper alveolar ridge.¹ Functions are oral competence, salivation, mastication, speech, swallowing, bolus formation and propulsion and taste, etc. Oral carcinomas are generally distributed as pre cancer such as leukoplakia, oral submucous fibrosis, etc. and anatomical sites tongue carcinoma, carcinoma of the lip, upper or and lower alveolus, retromolar trigone, floor of the mouth, etc. Available treatment options depend on the tumor, nodes, metastases staging are wide local excision, chemotherapy, radiotherapy, surgical resection with adjuvant radiotherapy and with or without reconstruction. Surgery remains the gold standard and the most reliable treatment modality. We would discuss the various morbidities affecting the function and physiology and available measures to overcome them in association to oral carcinomas.

ORAL COMPETENCE

Overview

The primary function of the lips and the corresponding musculature is to provide oral competence, the orbicularis oris forms a seal,²,³ prevent food from exiting the oral cavity anteriorly, and prevent drooling,⁴ performs finer movements of the lips.

Morbidity faced

1. Sacrifice of the mental nerve (lower lip) or inferior alveolar nerve (upper lip) might occur with resection of soft tissue alone or with resection of the mandible or maxilla, respectively. With the loss of the mandibular nerve, one loses function of the depressor musculature of the lower lip, resulting in elevation of the ipsilateral lower lip and consequent asymmetry of the smile. Marginal mandibular with mental nerve loss results in significant incompetence

2. Another issue affecting oral competence is that of lip height. When malignancies of the anterior mandibular arch involve the mucosa and soft tissue of the lower lip, our reconstructive efforts must allow the re-establishment of lower lip height.

Reconstruction options

In contrast, advancement of lip tissues with an intact neurovascular pedicle, like the Karapanzic flap, is preferred because sensory and motor functions are preserved.

Where we lack?? Giving an adequate lip height and sensate lip reconstruction is still a factor we haven’t been able to achieve.

SALIVATION

Overview

The role of saliva is to moisten and protect oral and pharyngeal mucosa, lubricate, transmit taste information,
buffer chemicals, initiate carbohydrate digestion, act as an antimicrobial agent, prevent dental caries, and participate in enamel formation. Both sympathetic and parasympathetic nerve stimulation cause salivary secretion.5-7

Morbidity faced
Although, resection of major salivary glands does negatively impact overall saliva production, in most patients, there will be few complaints of xerostomia with resection alone. In contrast, those who have undergone either primary or post-operative radiotherapy to the oral cavity will usually complain of some degree of xerostomia.8,10 The serous gland acini are affected more than the mucous gland acini.5,6,10 Therefore, with radiation treatment the oral secretions become thick and sticky. If the salivary glands are in the field of radiation treatment, permanent damage can be caused to the salivary glands.9 There may be some regeneration of the salivary glands months after radiation treatment.9,10 With xerostomia, the saliva becomes more acidic, and there is an increase in the number of cariogenic bacteria.

Reconstruction options
Head and neck radiation patients are more prone to caries, and lifelong daily neutral sodium fluoride should be applied to the teeth to reduce the risk of dental caries. Furthermore, baking soda rinse can help dissolve mucous. Pilocarpine tablets (salagen) may be used prophylactically or to treat xerostomia caused by head and neck radiation. It is a cholinergic parasympathomimetic agent increasing secretion not only to salivary glands but to other exocrine glands such as the pancreas, sweat, gastric, intestinal glands, and mucous glands of the respiratory tract.

Where we lack???? After all the treatment options give only symptomatic relief and there no permanent reconstructive method available to treat salivary gland dysfunctions.

Mastication

Overview
Mastication is defined as the process of chewing food in preparation for swallowing and digestion. Four pairs of muscles in the mandible make chewing movements possible. These muscles along with accessory ones together are termed as “muscles of mastication.” Mastication involves coordination of complex movements of the mandible, tongue, and teeth11,12 during composite resection of the mandibular carcinoma all or some of these muscles are sacrificed depending on the extent of the disease.

Morbidity associated
Discussion of abnormal mastication will be limited to impairments in the movement of the mandible. In this setting, scar contracture can result in significant limitation in temporomandibular joint (TMJ) range of motion with resultant trismus.13-15 This is particularly true with larger resections of the buccal soft tissues and muscles of mastication. The amount of scar contracture that forms is governed by multiple issues, including the volume of resection, the amount and location of pterygoid or masseter muscle loss, the addition of post-operative radiotherapy, and the type of reconstruction employed.16

Reconstruction options
For contractures; one would expect the maximal amount of contracture with healing by secondary intent, some improvement with a split-thickness skin graft, more with a full-thickness graft and the best result with vascularized tissue such as a free fibula free-tissue transfer. Heavier and thicker flaps will produce excessive bulk, which can prevent adequate mastication by placing soft tissue between the occlusal surfaces of the mandibular and maxillary alveolus. Often, even with a well-planned and ultimately successful reconstruction, the temporary swelling associated with the inflammatory phase of healing will produce this difficulty with mastication.

Although, replacement with a vascularized flap is helpful, a second important component of minimizing trismus is the use of aggressive post-operative physical therapy. Most difficulties with mastication are the result of segmental resections of the mandible. Resection of the lateral mandible creates an unbalanced set of forces in the pterygoid and masseter muscles.

Heavier bone flaps such as the iliac crest or fibula will also allow for implant-borne dental restoration.17,18 Occlusion with iliac crest bone grafts and free fibula vascularized grafts by using osseointegrated implants has improved results but still studies indicated that the mandibular positions in occlusion of these patients were extremely unstable as compared with those of the normal subjects and were considerably different from each other when the opening distance or the biting force was changed during mandibular movements.18

Where we lack????? In most cases, these osteocutaneous flaps also bring in a cutaneous soft tissue component, which remains largely asensate and adynamic. Mandibular prognathism is seen, and correct occlusion with balancing forces to achieve on both sides is very difficult thus causing the malocclusion and difficult mastication.

Hypoglossal Nerve Palsy

Overview
The hypoglossal nerve is the 12th cranial nerve, leading to the tongue. It supplies motor fibers to all of the muscles
of the tongue, except the palatoglossus muscle, which is innervated by the vagus nerve (cranial nerve X). It controls tongue movements of speech, food manipulation, and swallowing.20-21

Swallowing to clear mouth of saliva and other involuntary activities completed by the tongue are controlled by the hypoglossal nerve; however, most functions are voluntary. The function of the hypoglossal nerve in manipulation for speech contributes to learning languages.22-24

Morbidity associated
Weakness of the tongue manifests itself as a slurring of speech and by “wasting” of the side of the tongue which has the palsy. The patient complains that their tongue feels “thick,” “heavy” or “clumsy.” Lingual sounds (i.e. l’s, r’s, d’s, n’s, r’s etc.) are slurred, and this is obvious in conversation even before direct examination.25,26

Treatment options
Microsurgical reconstruction like end to end anastomosis of the nerve using greater auricular or sural nerve graft for reconstruction.25-28

Where we lack???? Reanimation, reconstruction and reconnection options have not been able to regenerate absolutely fine functionally sensate nerves and long-term paresthesia with skeletal results remains a challenge.

SPINAL ACCESSORY NERVE INJURY/SHOULDER SYNDROME/NECK RIGIDITY

Overview
The spinal accessory nerve is a motor nerve, innervating the sternocleidomastoideus muscle and the trapezius muscle. Resection of the spinal accessory nerve leads to denervation of the trapezius muscle. The trapezius muscle exists of an upper, middle and lower part and has two major functions, shrugging the shoulder and stabilizing the scapula on the thorax. Paralysis of the trapezius muscle will lead to a lateral gliding of the scapula and a lateral rotation. As a consequence of the changed scapula position its possibility to move during shoulder movements decreases. As a consequence a reduced range of motion of the shoulder, abduction and forward flexion, appears.29-32

Morbidity associated
Neck dissection is performed in the treatment of carcinoma of head and neck. In radical neck dissection (Crile, 1906)33,34 all lymphnodes at one side of the neck are resected, plus the spinal accessory nerve, the internal jugular vein, and the sternocleidomastoid muscle. Morbidity following radical neck dissection includes, disfigurement, sensory changes, shoulder pain, reduced strength of the trapezius muscle, reduced range of motion of the shoulder, disability in activities of daily life, and even loss of work (Ewing and Martin, 1952).35-38 Shoulder morbidity is probably the result of sacrificing the spinal accessory nerve, resulting in paralysis of the trapezius muscle (Remmler et al., 1986). The latter results in a reduction of active abduction, forward flexion of the arm, shoulder pain and disability in daily activities. The incidence of morbidity after radical neck dissection varies between 60% and 100%.39,42 This is why Bocca et al. (1980) introduced the “functional” or “modified radical” neck dissection in which at least one of the nonlymphatic structures is spared; the spinal accessory nerve, internal jugular vein, or sternocleidomastoid muscle.43-45

Treatment available
In most cases, the spinal accessory nerve is spared to prevent the shoulder morbidity. However, the incidence of shoulder pain and disability following modified radical neck dissection were still high, varying between 36% and 77%.46,47 Functional neck dissection sparing the spinal accessory nerve is the best treatment modality.48-52

Where we lack????? After all the selective dissection and anatomical variations well described still shoulder syndrome45,53-55 stands as one of the most important complication and morbidity with neck dissections with a high rate of spinal accessory nerve injury and no proper treatment or a 100% treatment option, which would show full recovery.

OSTEORADIONECROSIS (ORN)

Overview
ORN of the jaw bones is a well-known complication following tooth extraction patients who have received radiotherapy to the head and neck region. In 1983, Marx identified the specific pathophysiology of ORN as being a defect of wound healing following tissue breakdown (trauma-induced or spontaneous) in hypovascular, hypocellular-hypoxic tissue.56-58 The process not only affects irradiated bone, but radionecrosis of the soft tissue occurs concomitantly.

ORN can be a serious complication of high dose head and neck radiation treatment. Radiation decreases the blood supply to the bone and soft tissues by vascular thromboses and fibrosis. Therefore, wound healing is compromised after high dose head and neck radiation treatment. Invasive dental procedures such as extractions in the areas of irradiated bone after high dose head and neck radiation treatment can result in ORN.59
Morbidity associated
ORN healing inability and wound infection: Bone destruction, bone pain and swelling mouth pain, jaw swelling and difficulty opening the mouth fully (trismus). These symptoms are generally severe and would require a long-term treatment.

Treatment
ORN is due to the hypovascularity and hypoxia of the bone. It is extremely important that patients undergoing high dose head and neck radiation treatment undergo a thorough dental exam and all the necessary dental treatment including extractions be completed prior to beginning head and neck radiation hyperbaric oxygen (HBO), surgical debridement and antibiotics can be used to treat ORN. If patients require extractions after head and neck radiation treatment, prophylactic antibiotics as well as HBO may be required before and after the extractions to reduce the risk of ORN HBO to be administered on the basis of Marx’s protocol consisting of three treatment stages of advancing clinical severity.

Where we lack Preventing a condition like ORN, which can be prevented easily, if only dentists and surgeons were alert about proper history taking and patients would fully cooperate.

TRISMUS

Overview
Trismus is defined as a tonic contraction of the muscles of mastication. In the past, this word was often used to describe the effects of tetanus, also called “lock-jaw”. More recently, the term “trismus” has been used to describe any restriction to mouth opening, including restrictions caused by trauma, surgery or radiation. When the masticatory muscles and/or the TMJ are involved in the field of radiation, trismus can develop due to muscle fibrosis. Trismus is usually noticed 3-6 months after radiation treatment.

Morbidity associated
Eating issues
Limited mouth opening frequently results in reduced nutrition. Limited mouth opening may also result in compromised airway clearance and make proper mastication of food more difficult. A normal swallow requires an individual to manipulate the food into a cohesive bolus prior to propulsion. If the tongue cannot move properly due to limited mouth opening, the bolus may not be formed properly leading to post-swallow excess residue.

Oral hygiene issues
Limited mouth opening can result in compromised oral hygiene, which can lead to infection. Infection of the mandible can lead to further complications, including ORN.

Swallowing and speech issues
Many persons with limited mouth opening also present with difficulty in swallowing and speech. Speech is compromised when the mouth is unable to open sufficiently to create normal sounds. Swallowing is compromised when, due to muscle damage, surgery or radiation, the larynx is unable to be properly elevated, or when the timing of the elevation does not coincide with the passage of the bolus.

Treatment available
Post-surgery and radiation although a varied options are available for release of trismus the only available option only palliative care with good physical therapy is possible, intraoperatively temporalis myotomy and coronoidectomy helps in the release of trismus. Coronoidectomy is effective at improving trismus refractory to physical therapy in head and neck cancer patients.

Where we lack Achieving Grade 1 i.e., around 35 mm of mouth opening and maintaining the same is highly difficult, all surgical options are limited for post radiation patients.

SPEECH

Overview
Patients who undergo radiotherapy associated with the surgical removal of the tumor, have late-stage tumors (III-IV), or have tumors located in the floor of the mouth should be informed of the greater risk of persistent severe speech and swallowing problems.

Morbidities faced
Limited lip and tongue mobility are resulting in imprecise speech. Resonance changes secondary to weakness or removal of the soft palate (hyper/hyponasality).

Management options
Speech/voice therapy post treatment for head and neck cancer range of motion and strengthening exercises. Target training for specific speech sounds, intraoral prosthesis, voice training.

Where we lack We have been able to achieve only palliative speech, with therapy.

OBSTRUCTIVE SLEEP APNOEA

Overview
Obstructive sleep apnea is the most common type of sleep apnea and is caused by obstruction of the upper airway. It is characterized by repetitive pauses in breathing during sleep, despite the effort to breathe, and is usually associated with a reduction in blood oxygen saturation.
Morbidity associated

Anterior mandibulectomy can result in the development of sleep apnea. All patients with head and neck tumors who have had extensive anterior oral cavity resection should be evaluated before decannulation of the tracheostomy tube. Back fall of the tongue occurs resulting in partial airway blockage as a result of macroglossia, low muscle tone etc.

Treatment options

Many patients with documented sleep apnea require more than conservative therapy. Continuous positive airway pressure (CPAP) is the most consistently successful and extensively studied treatment for obstructive sleep apnea.

Palatal surgery

Patients who cannot be treated adequately with CPAP or other conservative measures and who have clinically significant disease may want to consider more invasive treatment. Uvulopalatoplasty is a surgical or laser procedure that removes part of the uvula and soft palate in an attempt to alleviate snoring and sleep-disordered breathing.

Jaw surgery

Patients with maxillomandibular anatomy that predisposes them to airway obstruction may be considered for jaw surgery, but they are not a treatment option in the carcinoma patients.83-86

Where we lack??? Sleep apnea once seen as a complication in a patient; for a permanent treatment patient has to undergo one more surgery or else be dependent on oral appliances or CPAP machine for a lifetime.

MALOCCLUSION

Overview

• A malocclusion is a misalignment of teeth or incorrect relation between the teeth of the two dental arches which refers to the manner in which opposing teeth meet. In patients undergone head and neck cancer, involving the alveolus maxilla and/or mandible and mandibulectomy (hemimandibulectomy, marginal mandibulectomy), maxillectomy, bite composite resections, etc. the occlusion is disturbed.

Morbidities faced

1. Malocclusion may even result after free fibula flap reconstruction of the mandible, because of inadequate positioning of the TMJ, inaccurate contouring of the reconstruction plate, or subsequent fracture of a miniplate.
2. Factors that alter the vascularity of the transplanted fibula may also result in a delayed presentation of malocclusion.

Treatment available

Dental implants with free vascularized flap is the only available treatment. Where we lack???? Our only treatment option also has drawbacks due to instability and jaw shift.

CONCLUSION

We have discussed each aspect separately but as far as the overall view of morbidities is we lack with giving patient a functional and cosmetic, reconstructive options with the limiting drawbacks of induced nerve injuries thereby altering the overall standard of living of the patient.

REFERENCES


34. Crile GW. Excision of cancer of the head and neck. With special reference to the plan of dissection based on one hundred and thirtytwo operations. JAMA 1906;47:1780-60.


