# Reconstructive surgery in oral cancers

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## ABSTRACT

Surgery forms the mainstay of treatment of cancers in involving oral cavity. Unfortunately the functional and aesthetic outcomes of surgical treatment can be unacceptable depending on the extent and site of the resection. Immediate reconstruction, by the use of local and distant flaps and implants can mitigate these problems to a great extent. The anatomical and functional requirements for reconstruction vary according to the subsite, which is involved in the oral cavity. This article attempts to review the current understanding about the reconstructive requirements and the methods available according to the oral cavity subsites namely tongue, floor of mouth, buccal mucosa and floor of the mouth

## KEY WORDS

Head and neck reconstruction, oral cancer



Oral cancers form a major bulk of the cancers seen in head and neck cancer services. Surgical excision of the primary lesion and the cervical lymph nodes form the mainstay of treatment in most instances with the addition of radiation or chemotherapy as an adjuvant depending on the stage of the disease at presentation. The cosmetic, functional and psychosocial results of oral cancer treatment may combine to produce devastating effects on the patient, especially if the tumour is extensive or the treatment particularly aggressive. A variety of functions can be affected, including speech, deglutition, management of oral secretions and mastication, requiring well-planned reconstructive techniques and extensive rehabilitative management. In recent years significant advances have taken place in some of the strategies for the postsurgical rehabilitation of the oral cancer patient. These include advances in reconstructive surgical techniques, especially the advent of microvascular free flap tissue transfers and qualitative improvements in biomaterials permitting use of osteointegrated implants. The ability to give standard care demands a simultaneous reconstruction of the defects and ensuring good quality of life after the cure of the cancer.

## ANATOMICAL AND FUNCTIONAL ASPECTS OF ORAL CAVITY

Cancer of the oral cavity is particularly challenging because there are many different types of tissue located in this relatively small area. The oral cavity begins at the lips and extends backwards to the anterior tonsillar pillars. Inside the mouth, the entire region is lined by a specialized mucosa to provide lubrication of the oral cavity. The subsites in this region include the upper and lower alveolus, with the lining of the mouth becoming thick overlying these bony structures where they are firm and attached. The floor of the mouth is another subsite, which occupies the gutter between the mandibular alveolus and the tongue. The anterior two-thirds of the tongue is included within the oral cavity subsites and is lined by specialized thick epithelium on the top and sides with specialized muscles in the deeper plane that provide the movement of the tongue. The retromolar trigone is the firm area just behind the back of the molars which is notorious for cancers that are difficult to treat.

The oral cavity has numerous functions. Oral competence is the ability to hold food and saliva in the mouth without

drooling. The salivary secretion of the major glands aided by those situated in the oral mucosa provide lubrication which aid in speech, swallowing and in the digestion of food. The grinding and crushing of food, which occurs in the oral cavity, is also important for digestion. Within the oral cavity the swallowing of food is helped by the movements of the lips, tongue and the cheek. The unique and highly coordinated human speech would not be possible without the integrity of the structures of the oral cavity.

## INCIDENCE AND PATHOLOGY

Head and neck cancers account for 23-25% of all cancers occurring in different sites and oral cancers account for 50% of these or 12.5% of the whole body. The most common cancer of the oral cavity is squamous cell carcinoma. Data from the Tata Memorial Hospital (TMH) tumour registry 2001[1] shows the prevalence in subsites of the oral cavity as lower lip 0.01, upper lip 0.32, anterior tongue 2.81, lower alveolus 1.84, upper alveolus 0.25, floor of mouth 0.44, buccal mucosa 4.82, hard palate 0.32 %, retromolar space 0.51% and base tongue 1.36 (these figures are a % of all cancers in the body). Apart from squamous cell carcinoma, the commonest oral cancer is mucoepidermoid cancer arising out of the minor salivary glands.

## AIMS OF RECONSTRUCTION

Reconstruction after oral cancer resections should aim at maintaining the functional integrity of the different structures of the oral cavity. It should be able to replace the pliable buccal mucosa, which allows adequate mouth opening. Jaw should be stable for mastication as well as for allowing dental rehabilitation. Tongue of adequate size, shape and mobility is essential for speech and swallowing. Floor of mouth should be able to hold food or saliva without leak. And also the reconstruction should be tailored to the patient's ability to cope with a long operation and the risk of substantial morbidity. The tissue requirement at the time of reconstruction can be broadly looked at in terms of the quantum of soft tissue required and the skeletal framework that needs to be reconstructed. The methods of import of tissue into the defect have to follow the established plastic surgery practices. The reconstructive ladder starting from skin grafts and ending with free flaps may not always be able to be followed due to anatomical and functional requirements of the defects. Skin grafts may be useful in only select cases and defects like the small and shallow defects in the floor of the mouth or cheek. Local flaps such as nasolabial flaps provide thin reliable skin tissue suitable for repairing, only again, in small defects. Most often tissue will need to be brought into the region in order to repair larger defects with the use of pedicled or free flaps. The pedicled flaps commonly used for oral reconstruction include pectoralis major myocutaneous flap, forehand flap and platysma myocutaneous flaps[2] and skin flaps like submental artery flap,[3] buccal pad of fat flaps and infrahyoid skin flap.[4] Microvascular free flaps have allowed great flexibility to the reconstructive surgeon to import composite tissues matching the requirements at the site better than other methods[5] and has become the method of choice in a great number of defects. This becomes more significant in reconstructing bony defects.

The reconstructive requirements at each subsite are different and hence should be looked into separately.

## TONGUE

Tongue is the most important structure involved in speech, bolus formation and initiation of swallowing. The restoration of the function of the highly specialized tissue of the tongue is one of the great challenges for the reconstructive surgeon. Functional outcome for speech and swallowing after tongue resection and reconstruction is related to the reconstruction method used and to the extent of tongue resection.[5] Any reconstruction should be aimed at maintaining volume, shape, mobility and sensation. The single most important determinant of reconstructive method is the size of the defect. A very superficial lesion can be allowed to heal by itself especially when laser has been used as a tool of ablation. This may be covered with split-thickness skin grafts, but in general skin grafts fare badly in the tongue mainly because of the secondary contracture that occurs. If excision is less than 20%, it is possible to close the defect primarily without compromising the functions of the tongue. Excision of over 20% of the tongue needs replacement of tissue in order to preserve the mobility and hence the function. There is no doubt that whatever the method of reconstruction used the functional result for the patient will depend upon the amount of residual functional tissue remaining following resection.[6]

The choice of flap includes pedicled flaps (pectoralis major muscle or myocutaneous flap or submental flap)

and free flaps, but in general free flaps tend to be more accepted since they are devoid of the tethering effects of pedicled flaps.[5] The radial forearm flap [Figures 1a, b] fills the defect very well and is suitable because of its various virtues. These include provision of soft, thin, pliable skin, adequate length of the pedicle which will reach the neck very easily and the ability of simultaneous harvest, thereby reducing anaesthesia time. There is an additional benefit, that it can be used as a sensate flap by including the lateral or medical cutaneous nerve of the forearm.[7] Sensory recovery seems better when these nerves are connected to the lingual or inferior alveolar nerve.[8] Sensory recovery does occur over a period of time even in flaps which are not sensate but further study is necessary in determining whether better sensation translates into improved functional outcome.[7,9,10]

The other flaps that are useful for reconstruction of partial or hemiglossectomy is the lateral arm flap and the perforator-based anterolateral thigh flap. The lateral arm flap has a very short pedicle and cannot be raised simultaneously. The anterolateral thigh flap is a bit bulky but it scores over the radial forearm flap as regards donor site morbidity leaving back an inconspicuous scar in a hidden location.[10-12] Donor site morbidity of the radial forearm flap can be reduced by suprafascial elevation of the flap.[13]

When reconstructing a total or near total glossectomy defect provision of bulk becomes important to get a better swallowing function.[5,14] The flaps of choice in these would be bulky free flaps like the anterolateral thigh flap[15] and rectus abdominis myocutaneous flap[14] [Figures 2a-c]. There is still place for pectoralis major musculocutaneous flap in this since it provides necessary bulk and avoids more complex operation but the mobility of the reconstructed tongue may be relatively more restricted due to the downward pull of the bulk of muscle.[16]

There have been a few reports of functional muscle transfer to have a dynamic reconstruction after total or near total removal of tongue[17] with the use of gracilis muscle either vertically or horizontally placed or rectus abdominis muscle motorized by joining respective nerves to the hypoglossal nerve.[18] But they have not been universally practised and the low incidence of cure due to the aggressive nature of the disease prevents large longitudinal studies.

## FLOOR OF MOUTH

Small lesions of the floor of mouth without involvement of the alveolus lead to defects that can be closed primarily, skin grafted or left to heal by secondary intention. Even for small lesions requiring marginal mandibulectomy, mobilization of the buccal mucosa will allow primary closure of the wound. For moderate size defects different local flaps can be used like tongue flaps, nasolabial flap [Figures 3a, b] or facial artery myomucosal (FAMM) flap [Figures 4a, b]. There have been a few reports of submental artery flaps for these defects, but their main criticism is that they use the tissue in the submental area which may harbour lymphatic metastasis. For a large defect with mandible preservation, radial artery forearm flap or similar thin flaps like thinned ALT flaps are most ideal. But if the free flap option is not available then a pedicled flap like the platysma flap[2] becomes useful. If more tissue is needed a forehead flap or a deltopectoral flap can be done, this however needs a second stage of division and inset after three weeks.

## BUCCAL MUCOSA

For buccal mucosa, the reconstructive options depend upon the site and size of the defects. Small lesion up to 2 cm can be closed primarily. Very superficial lesions can be skin grafted or left to heal by secondary intention. In larger defects where buccal mucosa from the upper to lower gingivo buccal sulcus needs to be excised with or without alveolectomy a regional flap like forehead flap tunnelled in can be used. Ideal reconstruction in this situation would be with free flaps like radial forearm, lateral arm, thin ALT flap or jejunal patch [Figures 5a, b]. Jejunal patch provides like mucosa with secretory capabilities, but involves opening the abdominal cavity. If posterior segment mandibulectomy is done then pectoralis major myocutaneous flap may be easily tunnelled into the area. A special situation faced in the Indian surgical practice is the presence of submucous fibrosis along with small lesions of the buccal mucosa or retromolar trigone, where apart from excision of lesion, wide release of the contracted submucosal tissue, coronoidectomy and local flaps for cover may be necessary. The flaps that are useful in this situation include tongue flap, nasolabial flaps, pedicled superficial temporal fascia flap with spilt-thickness skin graft[19,20] or a radial forearm flap. Whenever mandibulectomy is required it is best reconstructed with vascularised bone graft like fibula or iliac crest, depending on the site of the defect and the state of dentition. This topic needs detailed discussion and has been addressed elsewhere in this issue.

**Figure 1a:** Hemiglossectomy defect

**Figure 2a:** Total glossectomy defect

**Figure 1b:** Reconstructed with Radial forearm flap

**Figure 2b:** Anterolateral thigh flap being inset



## HARD PALATE

Superficial lesions are allowed to heal by secondary intention, which they do very well, more than anywhere else in the oral cavity. Even the cases where palatal bone is exposed in small areas, it can be allowed to heal spontaneously, provided other conditions are congenial. For small defects which need cover, depending on the site of the defect palatal mucoperiosteal flap based on the opposite greater palatine vessels, buccal mucosal flap, tongue flap or a combination of these flaps can be used. In larger defects it may become necessary to transfer a radial forearm flap or use an ipsilateral temporalis muscle flap for cover.[16] If the patient is dentate an easier option is the use of an obturator with dental prosthesis.

Life expectancy is good if cancer is detected early and treated early. Patients find it difficult to accept the deformity after excision and therefore do not come forward for treatment early. A firm knowledge that simultaneous reconstruction is possible will make the patients accept the treatment that may be otherwise mutilating. It is

**Figure 2c:** Delayed years post-operative result

**Figure 3a:** Bilateral nasolabial flap being raised

**Figure 4b:** Post operative result

**Figure 3b:** Same covering floor of mouth defect

**Figure 5a:** Large defect of the cheek

**Figure 4a:** FAMM flap being raised to cover floor of mouth defect

**Figure 5b:** Defect covered by radial forearm flap

a general observation that with the option of primary reconstruction, compliance with adjuvant treatment is also good. The presence of a reconstructive surgeon in the initial discussion of the treatment plan will help to make the patient and family comply with the treatment regime as well as allow the reconstructive surgeon to plan the reconstruction in a better way. Lesions may involve one or more anatomical structures with diverse functional

impact of their ablation. Therefore, for a given defect it may be a combination of different flaps or modification of a single flap which will give optimum reconstruction restoring function with aesthetics with minimum donor area morbidity. Advances in reconstructive techniques and newer horizons in research in tissue engineering and transplantation technology may change the reconstructive scenario in future.

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