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Utility of Loco-Regional Flap in Head and Neck Reconstruction

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Abstract
Aim and objectives: *To assess the utility and complications of various locoregional flap in the reconstruction of surgical defect in the head and neck region.* ***Material and methods:*** *It is a retrospective study carried out in the department of head and neck oncology, Dr B Borooah Cancer Institute from 2005 to 2010. Patients undergoing surgery for head and neck malignancy, who required local flap for reconstruction were taken up for the study.* ***Results and Observations****: A total of 214 cases,155 male and 59 female, were taken up for the study. Commonest age group was in the fourth and the fifth decade constituting 61.68 % . The most common involved site was buccal mucosa (40.46%) followed by alveolus GBS complex (30.76%). The most commonly used flap was the tongue and floor of mouth flap in 31.96 % followed by nasolabial flap in 31.05%, forehead flap in 13.69% and cervico-facial flap used in 6.84%. The complication of the various flaps were assessed.* ***Conclusion****:The overall aesthetic results of local flaps were satisfactory in majority of cases. It is ideally suitable for small & moderate size effect. The knowledge and application of the local flap is a must for any Otolaryngologist who practices Head and Neck surgery.*

Keywords:*Loco regional Flap, oral defects, nasolabial flap, reconstruction*

I. Introduction

Head and neck cancer is the sixth most common cancer worldwide. Worldwide head and neck cancer statistics indicate that there are about 640,000 cases of head and neck cancer per year, resulting in approximately 350,000 deaths per year. Cancers of the oral cavity and pharynx are the most common type of head and neck cancer with approximately 480,000 cases per year. [1]Itis one of the leading causes of cancer-related death and disfigurement, particularly in the Indian subcontinent. Although there has been quite significant progress in the management of head and neck cancer such as the introduction of organ-sparing strategies using concurrent chemo-radiotherapy and biological modulation of cancer with epidermal growth factor pathway interruption, none of the strategies has come close to the contribution made by reconstructive surgery[2].

Operative treatment of head and neck cancer requires radical resection of the tumor with not only severe impairment of important functions like swallowing, speech, and respiration but also aesthetic mutilation because of the exposed character of the head and neck region. Local skin flaps are commonly used in reconstruction of facial defect by both otolaryngologist and plastic surgeons.The choice of method of reconstruction depends on a lot of factors like the size and the site of the defect, the projected functional morbidity, the cause of the defect, the medical history of the patient and the patient's wish.

II. Aim And Objective

To assess the utility and complications of various locoregional flap in the reconstruction of surgical defect in the head and neck region.

III. Materials And Method

This is a retrospective study carried out in the department of head and neck oncology, DrB Borooah Cancer Institute from 2005 to 2010. Patients undergoing surgery for head and neck malignancy who required local flap for reconstruction were taken up for the study. Only patients who had adequate information in their case record were taken for the study.

After proper clinical and radiological examination and staging,the definitive diagnosis was made and treatment plan was formulated. Reconstructive options were selected depending on tumour size, location and patients general health status. Length of hospitalization and the presence of local postoperative complications were accessed.

IV. Results And Observations

In this study a total of 214 cases from 2005 to 2010 were taken up for the study.Out of which, 155 were male and 59 were female, a ratio of 2.6: 1

4.1Age distribution :The highest number of patient belong to fourth and the fifth decade (range 20-90 years)that constituted 61.68 % of the surgeries. The oldest patient was an85 year old male patient.
Table 1 age distribution

20-30	10
31-40	20
41-50	57
51-60	75
61-70	37
71-80	14
81-90	1

4.2Distribution of primary tumour.The location of primarytumour is shown in table 2. The most common location of tumour was in the Buccal mucosa with 40.46% followed by alveolus GBS complex constituting 30.76% followed by angle of mouth 12.7 and lip (upper, lower or both) 11.37 %.

Table 2: Distribution of primary tumour

Buccal Mucosa	121	40.46%
AOM	38	12.7%
Lip	34	11.37%
GBS complex	92	30.76%
Parotid	3	1%
Scalp	3	1%
Nose	4	1.33%
Neck node	4	1.33%

4.3 Neck metastasis and staging.79.8% patient had no neck node metastasis. Majority of the patient were in T 2 and T3 constituting 45.79% and 21.96 %.

Table 3: T stage

T1	39	18.2
T2	98	45.7
T3	47	21.9
T4	30	14

4.4 Type of tumor resection. Wide excision with adequate margin was done in all the cases. Segmental mandibulectomy was done in 39.71% and marginal mandibulectomy in 14.01%.Specific type of procedure done are indicated in table 4.

Table 4: Type of resection of tumour

Segmental mandibulectomy	84
Marginal mandibulectomy	30
Parotidectomy	3
Extended RND	2
Orbital Exenteration	1
Upper alveolectomy	3

4.5 Type of neck dissection. The neck was addressed in 85.04% cases. Supra-omohyoid neck dissection was the most commonly done procedure constituting 54.94 % of all the neck dissection followed by Modified neck dissection type II in 21.97 % cases.

Table 5: Neck Dissection

None	32	14.95%
SOHD	103	46.72%
MND I	25	11.68%
MND II	40	18.69%
MND III	7	3.27%
RND	6	2.80%
LND	1	.46%

4.6 Types of locoregional flap used . These are shown in table 6. The most commonly used was the tongue and floor of mouth flap in 31.96 % followed by the nasolabial flap in 31.05%. Another flap that was commonly employed was the forehead flap that was used in 13.69%. This was followed by the cervico-facial flap used in 6.84%.

Table 6: Types of locoregional flap used

Flap	No of case	Percentage
Tongue/FOM flap	70	32.7
Naso labial	68	31.7
Forehead	30	14.01
Cervicofacial	15	0.07
Abbe Estlander flap	8	0.03
Karapundzic	6	0.28
Rotation flap	6	0.02
Sternocledomastoidmyocutaneous flap	2	0.01
Submental flap	2	0.01
Median Forehead	3	0.01
Gillis flap	3	0.01
Abbe lip switch	2	0.01
Transposition flap	2	0.01
Temporalis muscle flap	1	-
Rhomboid flap	1	-

4.7 Flap specific site distribution

4.7.1 Nasolabial flap:The Nasolabial flap was most commonly used for defect of buccal mucosa followed by angle of mouth and lip.It was used for reconstruction of both upper and lower lip. Most of the nasolabial flaps used were inferiorly based nasolabial. Only a very few superiorly based nasolabial were done for nasal defects.

Nasolabial flap	
Buccal mucosa	42
AOM	19
Lip	15
Forehead flap	
Buccal mucosa	22
AOM	12
Lip	3
Cervicofacial	
Buccal mucosa	5
AOM	2
Lip	2
GBS complex	7
Neck Node	3
Tongue /FOM flap	
Buccal mucosa	45
GBS	54
AOM	2

4.7.2 Forehead flap: The forehead flap, an axial flap based on the superficial temporal artery was also commonly used for reconstruction of larger defects of buccal mucosa, angle of mouth and lip. It was mostly used for defects where the Lower GBS was free of disease and as such a PMMC flap reconstruction was not possible for such defects.

4.7.3 Cervicofacial flap: This flapwas also used for bigger defect of buccal mucosa and GBS. It was also used for defects following extended RND where the skin had to be excised.

4.7.4 Tongue /FOM flap. This was the commonest flap used. This was used for defect in tumors of buccal mucosa, lower GBS, where there was sufficient disease free floor of mouth mucosa and tongue mucosa aftertumour excision.

Besides the above mentioned flap we have also use other local flaps like the pedicledbuccal pad of fat for reconstruction of mucosal defect on oral cavity. There were no complications or functional disorders during follow-up. Buccalfatpad grafting appears to be feasible for the reconstruction of surgically induced defects, and can be extended to the palate, mandible, mouth angle, and temporomandibular joint region. [3,4]

Other muscle flap like the sternocleodomastoid and the digastric muscle has also been used in reconstruction and reinforcement of the floor of mouth area where there is insufficient mucosa in the floor of mouth or tongue to use them as a flap. Another muscle flap used in reconstruction of the oral cavity defect is the

masseter muscle flap, that is used mainly for reconstruction in the region of palate, RMT andtemporomandibular joint region. There was no complication or functional defect during the follow up of this pedicled muscle flap.

4.8 Complication . The complication are shown in relation to the flaps used as different flap are susceptible for different types of complication although some of the complication, like infection, haematoma, edge necrosis etc are common to all flap

Table 8: Showing complication

Nasolabialflap:	
Tip necrosis	3
Superficial necrosis	4
Bleeding	1
Orocutaneous fistula	2
Ectropion	1
Forehead flap	
Edge/ superficial necrosis	4
Complete loss of buccal portion of flap	2
Haematoma	2
Oral incompetence	2
Tongue/ FOM flap:	
Gaping	5
Cervicofacial flap:	
Superficial necrosis	10
Tip necrosis	5
Seroma	6
Fibrous band formation (Delayed)	3
Wound gaping	2
Orocutaneousfistula	3
Submental	
Loss of flap	1

There was no major complication in the other locoregional flaps. The average duration of hospital stay was around 7 days for most of the flap except for the forehead flap that required flap division after 21 days and for the flap failure cases that required revision surgery after wound healing.

V. Discussion

In our study males were more commonly affected than female with a ratio of 2.6: 1. And the most commonly affected age group was in the 4^{th} to 6^{th} decade. Talabani*et al*.[5],in their study, found that females were generally less affected than males and the highest affected age groups were those above 60 years. Male to female ratio was 1.5:1. Kokemueller et al [8] found average age at diagnosis was 58.8 years, ranging between 19.2 and 96.5 years. There were 226 men and 115 women (male/female ratio = 2:1).

There are many different ways to reconstruct surgical defect in the head and neck region. In our studya gamut of locoregional flapwereused and wherever necessary distant flap werealso used. There are many advantages of a local flap. They cause less morbidity and less donor site defect.The color match of a local flap is better as compared to distant flap. The procedures are less expensive to the patient. Local flaps are less time consuming which is of added benefit for patient with morbidity. Another practical advantage of a local flap is that they can be used with distant flap whenever necessary and spares a distant flap for subsequent surgery if necessary in the future.

The most commonly use flap was the floor of mouth and tongue flap as because 30.76% of the primaries were involving the lower alveolus and GBS complex. In this region whenever the overlying skin is free and there is adequate disease free margin in the floor of mouth and tongue, this flap can be utilized. The complication rate in this flap is very low except for a few wound gaping. If tongue flap is used the mobility of the tongue may be hampered.

The nasolabial flap is a versatile, simple, easy to harvest local flapthat can cover a variety of defects in the face. It is ideally suitable for covering small to moderate sized defects in the eyelid, cheek, nose, the anterior floor of mouth and the lip. When it is used to resurface the nose it should be based superiorly on the anglular vessel. The flap can also be based inferiorly to repair small to medium size defecton the lip, angle of mouth, buccal mucosa and the floor of mouth with satisfactory aesthetic and functional results. In our study, it wasused in 30.35 % of the cases. Large nasolabial flap may be associated with post operativeectropion during the

healing. The complication rate was also very less. [6,7]Authors have reported complications (infection, minor or major,flap necrosis, wound dehiscence) occurring in a small minority of their patients. [6]

The third most commonly used flap was the forehead flap, used in 13-39% of case. It is based on the superficial temporal artery of either side. It is a robust flap that give enough tissue to give a skin lining on both mucosal and skin surface. This flap suffers from a big disadvantage-namely, the skin of the grafted donor site appear thin, shinny, slightly sunken and immobile. This flap has lost much of it application due to the associated cosmetic deformity and with the advent of microvascular free flap. We had major complication in only two cases, in the form almost complete loss of the buccal side of the flap. Other than that there was no major complication with acceptable cosmetic deformity and morbidity.

The cervicofacial is another flap that can give cover to large surgical defect. In our study it was used in 15 cases (6.69%). However, for large facial defects, these flaps typically require wide undermining with the final closure sometimes under tension. This was also the flap with maximum number of complications like superficial necrosis, tip necrosis, seromaand wound gaping and varying degree of microstomia. As such, it is recommended to be used only when there is no other viable flap to be used.

Reconstruction of lip is challenging. Parameters of successful technique are restoration of lip function, acceptable cosmetic appearance and minimal donor morbidity. [9] For reconstruction of lip flaps Abbe lip switch was use for defects greater than 1/3 rd of the lip where the angle was free. Abbe Estlander flap where the angle was involved. For larger defects greater than three quarter of lip, Karapundzic flap (unilateral or bilateral) or Gillies fan flap were used. All these flaps gave a good result except for cosmetic deformity and microstomia in the later two flaps.

In our study, tip and superficial necrosis was the most common complication. The maximum number of complication were seen in Cervicofacial flap. The incidence of perioperative complications was 58.9% in study conducted by Ribeiro *et al*. [10] Wound infection (32.5%) and dehiscence (26.2%) were the most frequent events.Postoperative mortality was 2.6%

VI. Conclusion

The overall aesthetic results of local flaps were satisfactory in majority of cases. Although local flaps are usually limited in size, mobility & location of the defect but they offer relatively simpler and safe wound coverage and spare the donor site for further reconstruction. It is ideally suitable for small & moderate size effect. Even though, microvascular flaps reconstruction is the standard of care, locoregional flaps play a crucial role at oncology centers which lack skilled plastic surgeon and most surgeries are carried out by Head and neck surgeons.The knowledge and application of the local flap is a must for any Otolaryngologist who practices Head and Neck surgery.

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Abbe Estlander Flap


Nasolabial Flap Superiorly Based


Inferiorly Based Nasolabial Flap


Karapundzic Flap


Median Forehead Flap

Cervicofacial Flap

Forehead Flap

Rotation Advancement Flap