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EVALUATION OF ESTHETIC AND FUNCTIONAL OUTCOME FOLLOWING RECONSTRUCTION OF PERIORAL DEFECTS - A PROSPECTIVE AND RETROSPECTIVE STUDY

Dental Science

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ABSTRACT

SUMMARY : The purpose of this study was to review and evaluate various flaps and techniques employed for the reconstruction of complex perioral defects following resection for oral squamous cell carcinoma with particular emphasis on cosmetic and functional outcomes.

MATERIAL AND METHODS: Evaluation of both 19 prospective and 35 retrospective study patients who underwent any perioral defect reconstruction were done based on aesthetic, functional and subjective criteria.

RESULTS: No statistically significant difference was found between the aesthetic and functional outcome of different techniques used for perioral defect reconstruction and no statistically significant difference was found in the aesthetic or functional outcome after reconstruction of cheek or lip defect.

CONCLUSION: The study suggests that reconstructive method varies for each patient undergoing tumor resection taking into consideration other factors like the patient's age, gender, past medical history, treatment of the primary lesion, site and size of defect, surgeons skill and comfort with the technique and patient's compliance.

KEYWORDS

Oral SCC, Flaps, Reconstruction.

INTRODUCTION

Surgical management of oral squamous cell carcinoma (SCC) typically involves resection of the carcinoma with a 1 cm margin of normal appearing tissue. The goals of perioral reconstruction are esthetics and function, with oral competence and good lip control[1].

There are many different methods of reconstruction of the lip: local flaps advanced from the remaining lip, such as with the “stairs” by Johanson's technique reported by Blomgren et al; flaps taken from the cheek tissue with the excision of a triangle to help the advancement, such as with the Webster et al, Bernard, Fries, and Meyer techniques; flaps using the upper lip such as with the Abbe-Estlander technique; fan-shaped flaps such as with the Gillies and Millard, McGregor, and Wang et al, techniques and the so-called “gate flap” by Fujimori and rotation flaps, such as with the technique of Karapandzic, the rotation-advancement island flap by Colmenero et al, and the rotation-advancement flap by Yu. In addition to local flaps, distant flaps may be pedicled like pectoralis major flap and the trapezius flap or the free flaps like antebrachial and peroneal flaps[2].

For the reconstructive surgeon, lip defects are best divided into three groups: small, medium, and large. Small defects of less than either one third of a lower or one fourth of an upper lip can be closed primarily. Medium defects, usually between one half and two thirds of a lip in width, are those that can be closed using one of the standard lip-sharing flaps such as an Abbe, Estlander or Karapandzic flap. Large defects that are too wide to close with a single standard flap will need either a combination of flaps or the use of distant tissue to successfully repair the wound. For normal appearance, lips should have symmetry between the upper and lower lips and between the left and right sides. For function, they must have both an adequate aperture (for eating and dental hygiene) and the ability to close and seal (lip competence) to avoid drooling[3].

A number of options exist for the reconstruction of full-thickness cheek defects, such as skin grafts, folded forehead flap, folded trapezius flap, pectoralis major myocutaneous flap, rectus abdominis free flap, distal forearm flaps, anterolateral thigh flap, and double flaps[4]. Normal function is achieved by obtaining a healed wound that does not leak and by maintaining sufficient tension on the cheek so that it does not sag or develop pockets that can collect food debris. Normal appearance is approximated by matching the color and texture of the repair to that of the surrounding skin and, when possible, by hiding the scars in borders between adjacent facial aesthetic units[5].

OBJECTIVES

1) To review and evaluate various flaps and techniques employed for the reconstruction of complex perioral defects following resection for oral squamous cell carcinoma with particular emphasis on cosmetic and functional outcomes based on objective parameters.
2) To select the most appropriate techniques by combining subjective evaluations by the patient and the surgeon with the objective evaluation.

MATERIALS AND METHODS

The study carried out was a prospective analysis of patients undergoing any perioral defect reconstruction from January 2008 to December 2009 and retrospective analysis of patients who were operated prior to December 2007 at Craniofacial Surgery and Research Centre, Department of Oral & Maxillofacial Surgery, S.D.M. College of Dental Sciences and Hospital, Sattur, Dharwad. All the patients who had previously undergone radiotherapy were excluded from the study. Patients with any chronic systemic medical condition that would alter the healing and uptake of the graft were excluded from the study.

The prospective study sample compromised of 19 patients. Preoperative, intraoperative, and postoperative intraoral and extraoral photographs were obtained of all patients for documentation of the size of the defect and for evaluation of postoperative esthetic deformity. Biopsies were carried out in all patients and were histologically proven as squamous cell carcinoma of oral cavity. Preoperative roentgenography and ultrasonography were performed to determine the type (soft tissue, hard tissue, or composite) & extent of the lesion and to assess the expected type, site & size of perioral defect, based on which various flaps and techniques were employed for reconstruction. The patients were reviewed and followed up after 1, 3 & 6 months post operatively.

Various local and regional flaps used for reconstruction in prospective study cases were Abbe-Estlander flap, split thickness or full thickness skin grafts and pectoralis major myocutaneous flaps.

The retrospective study compromised of 35 patients. Various local, regional and distant flaps used for reconstruction in retrospective study cases were Abbe-Estlander flap, local rhomboidal flap, split thickness or full thickness skin grafts, pectoralis major myocutaneous flaps, temporalis myucutaneous flap, forehead pedicled island flap, antero lateral thigh flaps, osteocutaneous free fibula graft.

Evaluation of both prospective and retrospective study patients was

based on following criteria:

A) Esthetic criteria:-
i) Length of the new orifice.
ii) Symmetry of oral aperture at rest and at function.
iii) Lip competence at rest.
iv) Color match and texture of flap with adjacent tissues.
v) Cheek fullness and symmetry.

B) Functional criteria:-
i) Sensitivity of the reconstructed site.
ii) Sphincteric function of the stoma.
iii) Mouth opening.
iv) Ability to suck through a straw or blow a balloon.

In both the esthetic and functional evaluations, there are subdivisions that correspond to a numerical value, 1 being the lowest and 3 being the highest.

C) Subjective evaluation:-By means of a visual scale, both the patient and the observer, evaluate the general appearance of the reconstruction, marking a point on the line between 1 (lowest value) and 5 (highest value).

After collection of data, the data was subjected to suitable statistical procedure and significance set at 5% level of significance($P<0.05$).

PROFORMA
DEPARTMENT OF ORAL & MAXILLOFACIAL SURGERY, CRANIOFACIAL UNIT & RESEARCH CENTRE, S.D.M. COLLEGE OF DENTAL SCIENCES AND HOSPITAL, DHARWAD

NAME: ***AGE/SEX:***

CASE NO: ***PHONE:***

ADDRESS:

DATE OF OPERATION: ***FOLLOW UP:***

DIAGNOSIS: ***OPERATION & RECONSTRUCTION:***

I. Aesthetic evaluation:

A. Length of new orifice: ☐
Severe microstomy - 1
Light/moderate microstomy - 2
Normal - 3

B. Symmetry of oral aperture at rest & at function: ☐
Asymmetry at rest - 1
Symmetry at rest/asymmetry at function - 2
Symmetry at rest & at function - 3

C. Lip competence at rest: ☐
Total incompetence - 1
Acceptable competence - 2
Total competence - 3

D. Color & texture match of flap with adjacent tissue: ☐
No match - 1
Acceptable match - 2
Well matched - 3

E. Cheek fullness & symmetry: ☐
Gross asymmetry - 1
Moderate symmetry - 2
Symmetrical - 3

Ii. Functional Evaluation:

A. Sensitivity of reconstructed site: ☐
Gross difference - 1
Moderate difference - 2
No difference - 3

B. Sphincteric function of stoma: ☐
Saliva loss at rest - 1
Liquid loss while drinking - 2
Normal - 3

C. Mouth opening: ☐
Minimal - 1
Moderate - 2
Normal - 3

D. Ability to suck through a straw/blow a balloon: ☐
Unable to do - 1
Done with difficulty - 2
Done easily - 3

III. Subjective evaluation: (1-lowest value, 5-highest value)
Patient- 2
Observer- ☐

1 2 3 4 5

RESULTS

PROSPECTIVE STUDY:

Of the 19 patients who underwent the surgical procedures, maximum number of patients were operated in age group of 51- 60 years. Male gender had higher incidence of perioral defect accounting for 73.68%. No significant difference between mean age group in males and females seen. Out of 19, 8 of them had the lesion on right side accounting for 42% while 11 of them had on left side making upto 58%. All patients had lesions involving mandible. Out of which in 3 patients maxilla was involved accounting for 15.78 %.

For majority of patients i.e for 7 of them wide excision with radical neck dissection and hemimandibulectomy was performed accounting for 36.84%. Partial maxillectomy was carried out in along with that in 3 patients, marginal mandibulectomy and segmental mandibulectomy in 2 patients. Only radical neck dissection was carried out in 3 patients, one patient underwent supraomohyoid neck dissection and for one patient functional neck dissection and marginal mandibulectomy was performed. In 68.42% of patients i.e in 13 of them site of reconstruction was cheek while in 3 patients lip was reconstructed and in other 3 both cheek and lip was reconstructed. Majority of cheek defects were reconstructed using pectoralis major myocutaneous flap i.e in 6 patients. In 3 patients split thickness skin graft(STSG) was used, in 2 full thickness skin graft(FTSG) and in other 2 a combination of pectoralis major myocutaneous flap and split thickness skin graft was used. For all 3 cases with lip defect Abbe- Estlander flap was used. Out of 3 patients with both cheek and lip defect pectoralis major myocutaneous flap was used for one and other 2 were operated with combination of Abbe- Estlander.

It was found that there was no statistically significant difference between the aesthetic and functional outcome of different techniques used with KRUSKAL-WALLIS and MANN-WHITNEY test.

It was found that there was statistically significant difference in the outcome between months of follow up with FRIEDMAN test. Even the total scores of all three evaluation for cheek defect reconstruction in 1st, 3rd and 6th month follow up showed significant difference.

RETROSPECTIVE STUDY:

Of the 35 patients who underwent the surgical procedures, maximum number of patients were operated in age group of 51- 60 years. Out of 35 patients the involvement of perioral region was more in males i.e about 82.85%. No significant difference between mean age group in males and females seen. The group of 35 patients included 5 patients operated in the year of 2001, 4 in 2002, 7 in 2003, 4 in 2004, 6 in 2005, 5 in 2006 and 4 patients in the year 2007. The patients operated in the years prior to the above mentioned failed to turn up for follow up. Out of 35 , 21 of them had the lesion on left side accounting for 60%. All patients except for one had lesions involving mandible accounting for 71.42% of the study. Out of which in 9 patients even maxilla was involved accounting for 25.71 %.

For 14 of them wide excision with radical neck dissection and hemimandibulectomy was performed accounting for 40%. Marginal mandibulectomy in 6 patients and segmental mandibulectomy in 4 patients. Partial maxillectomy was carried out along with hemimandibulectomy in 3 patients, along with marginal mandibulectomy in 4 patients and along with segmental mandibulectomy in one patient. Out of 2 patients who underwent supraomohyoid neck dissection one had partial maxillectomy and the other underwent segmental mandibulectomy. Only one patient

underwent radical neck dissection with hemimaxillectomy. In 62.85% of patients i.e in 22 of them site of reconstruction was cheek while in 8 patients lip was reconstructed and in rest 5 both cheek and lip was reconstructed. Majority of cheek defects were reconstructed using pectoralis major myocutaneous flap i.e in 10 patients accounting for 45.45%. It was used for lip defects in 2 patients and for combined defects in 2 patients. Anterolateral thigh flap was used for cheek defects in 2 patients, for lip defect in one and for combined defect in one. Split thickness skin graft was used for cheek defects in 3 of our patient, forehead island flap in 2, osteocutaneous free fibula and sternocleidomastoid island was used in one each of patients. For 50% of lip defect Abbe- Estlander flap was used and for one patient rhomboidal flap was used. Temporal island with Z-plasty and temporal island with fan type flap was used for rest 2 patients with combined cheek and lip defect.

It was found that there was no statistically significant difference between the aesthetic and functional outcome of different techniques used even in retrospective study with KRUSKAL-WALLIS TEST.

No statistically significant difference was found in the aesthetic or functional outcome after reconstruction of cheek or lip defect with MANN-WHITNEY TEST.

DISCUSSION

The present study carried out on both prospective and retrospective patients showed that majority of patients were in the age group of 51 to 60 years. Male gender was alarmingly effective. This is not surprising because the habits that are predisposed to oral cancer are found more commonly in men.

It was found that left side of the face was most commonly affected for unknown reasons. Owing to etiology almost all patients included in this study had carcinoma of the mandible. Around 40% of the patients have undergone wide excision of the lesion with radical neck dissection and hemimandibulectomy. 65-70% of the patients underwent reconstruction of the cheek. 15-25% of the patients underwent reconstruction of the lip, 5-10% of them had combined cheek and lip defect reconstruction.

The observation from this study is that for approximately 50% of the cheek defect reconstruction, pectoralis major myocutaneous flap (PMMC) was used. A single paddle PMMC alone can be used to reconstruct the mucosal as well as the skin defect. The cheek defect is reconstructed with the skin pedicle and the mucosal defect is reconstructed by the inner surface i.e. the myofascial layer of the flap[6]. There are many advantages of this flap: it is a one stage reconstruction, there is no need to change the patients position, the cutaneous island is large enough to cover most defects and it can be used for defects involving two epithelial surfaces. The flap with its tissue bulk corrects the neck and face contour and also, with its muscular part, covers neck structures protecting the carotid artery, especially in irradiated patients. Like every other flap it has a few disadvantages i.e evidence of recurrence in the neck area is difficult to identify as the flap conceal the region and in women, there is breast asymmetry and often the flap might also include breast tissue while in males hair growth over the skin paddle used to line the oral cavity are evident.

Since majority of the patients underwent radical neck dissection with hemimandibulectomy or segmental mandibulectomy, this flap was the choice for reconstruction. In 3 of the patients it was used for reconstruction of oral commissure also. However based on the scores it was not aesthetically and functionally compliant.

In 13% of the patients temporal fasciocutaneous island flap(TFCIF) was used for reconstruction of cheek defects. The TFCIF acts only as a cover flap. This flap is of small volume and therefore is not suitable for reconstruction of a complex tissue loss after major surgery. It is for this reason that we use it to fill in tissue defects limited to the internal aspect of the cheek or after partial maxillectomy. As was noted, the cutaneous paddle is relatively rigid. If this constitutes an advantage for reconstructions of the maxilla, however, it is a disadvantage for partial lingual reconstruction as its use limits tongue mobility. The rotation arc of this flap limits its use to the posterior region of the oral cavity and to the maxilla. Therefore, the TFCIF is not indicated for reconstructions of the floor of the mouth or the chin. The hairiness of this flap is also a disadvantage[7].

Skin grafts was used in around 15-20% of the patients. Skin grafts are indicated in large defect more that 4cm. However, discrepancies in skin color/texture and significant wound contracture limit the effective use of this technique either to wounds in which tumor surveillance outweighs cosmetic outcome or to those that cannot be repaired by any other method[8]. Full-thickness skin grafts on the cheek generally produce an inferior aesthetic result because they are poorly matched in skin color, skin texture, and hair quality.Moreover, they usually cannot fill the deep subcutaneous defect created after tumor extirpation in a convex area.

The success rate of STSGs is higher than the success rate of FTSGs. STSGs are more likely to contract and are less likely to match the color of the defect site than FTSGs. Both STSGs and FTSGs can leave a considerable contour deficit if the wound is deep. Small slit incisions in the graft and absorbable tacking sutures that essentially spot weld the graft to the recipient base can be used to improve graft attachment to the site. An FTSG can be expected to contract 10-15%. An STSG is likely to contract up to 25-30% over time[9].

Free flaps like anterolateral thigh flap, osteocutaneous fibula flap was tried in 3 of the patients, but the aesthetic or functional results were not greatly appreciable. The advantages of the ALT flap are: (1) no major artery is sacrificed, (2) the donor site scar is inconspicuous, (3) multiple islands can be harvested, thus allowing for complex reconstruction with 1 major vascular pedicle, (4) flap thinning is possible, (5) a long pedicle length, (6) most donor site defects can be closed primarily, and (7) a 2-team approach. The major disadvantages of this flap are: (1) difficulty to create complex folded flaps, (2) it can be bulky for intraoral reconstruction, and (3) its variable vascular anatomy[10].

Large, full-thickness lip and chin defects after head and neck surgery remain a challenge for reconstruction. Lower lip defects of less than 2/3 of the width of the lip can be reconstructed effectively with local flaps[11]. In our study lower lip defects were involving the commissure in almost all patients. 100% of lip defects in prospective study and around 50% of lip defects in retrospective study were reconstructed using Abbe-Estlander flap. In this flap care should be taken not to damage the pedicle and the only major problem with this technique is that it results in a rounded commissure which often leads to postoperative asymmetry. Vascular compromise, vermillion notching and scarring beyond sublabial crease are the drawbacks of this technique. Full commissure reconstruction requires either double rhomboid cheek flaps with vermilion advancement or free tissue transfer. Because of the difficulty in creating a new commissure, every attempt should be made to retain the angle of the mouth[12]. But it is seen through our study that flap has regained function by 6 months.

Other flaps like rhomboid flap, Z- plasty and fan type flaps were used in 3 patients with acceptable results.

The study was subjected to statistical analysis to compare between various flaps based on their aesthetic and functional outcome. It was found that there was no relatively significant difference between acceptance of the flap by the patients, be it the reconstruction of the cheek or may be the lip.

Out of 19 patients on whom the prospective study was conducted and 35 patients in whom retrospective study was conducted various techniques were used for perioral defect reconstruction. Patients were of different age groups. The etiology varies in these age groups. The general systemic condition of the patients was not taken into consideration which affects the prognosis a lot. The method of reconstruction of the perioral defect was based on the surgical plan for the treatment of the lesion which was quite variable. The peri operative size of the defect could not be taken into account due to lack of records. Moreover it is difficult to access it with a follow up of 6 months in prospective study. The wide distribution of the data indicated no specific procedure to be adopted for perioral defect reconstruction.

The study suggests that reconstructive method varies for each individual patients undergoing tumor resection taking into consideration other factors like the patients' age, gender, past medical history, treatment of the primary lesion, site and size of defect, surgeons skill and comfort with the technique, patients compliance.

Scope for further study:

1. The study requires larger sample size for each individual techniques of perioral defect reconstruction.
2. The study requires minimum of 3 years follow up to get a detailed statistically significant data to assess the functional and aesthetical outcome.
3. Other influencing factors mentioned under discussion should also be included as parameters for study for more defined and detailed outcome.

CONCLUSION

Perioral reconstruction following cancer resection can present a challenge for the Oral and Maxillofacial surgeon. Successful reconstruction of perioral defects following resection for oral cancer requires attention to oncologic principles, anticipation of functional outcome, and recognition of patients' cosmetics expectations. . Local advancement flaps are predictable and readily available. However, each flap has its indications, limitations, and complications.

In this study of perioral defect reconstruction, pectoralis major myocutaneous flap was the most commonly used flap for cheek defects. The pectoralis major myocutaneous flap is still an acceptable method. It has many advantages despite the increasing application of microvascular reconstruction. It is fast, reliable, provides safe repair and is indicated especially where bulk is needed. It continues to be one of the most universal flaps in head and neck reconstruction.

The Abbe –Estlander flap was used for reconstruction of almost all lip defects in the study. This flap provides a simple yet satisfactory method for repair of oral defects when only limited reconstruction is necessary. Its use has both cosmetic and functional advantages. Cosmetically, there is no better substitute for labial tissues than lip tissue itself. Functionally, it can fulfill the other prime requisite for successful substitution of tissues because normal or near normal function is reestablished after surgery.

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