ABSTRACT

Background: Squamous cell carcinoma of the head and neck is a challenging disease to both surgeons and radiation oncologists due to proximity of many important anatomical structures. Surgery could be curative as these cancers usually metastasize very late by blood stream.

Aim of the Work: This work addresses the oncologic, functional and aesthetic factors affecting reconstruction of large orofacial defects involving the lip following tumor resection.

Patients and Methods: The study reviews the surgical outcome of one hundred and twelve patients with invasive tumors at, or extending to, the lip(s), treated at the Mansoura University - Surgical Oncology Department, from January 2000 to January 2005. Tumor stage were T2 (43), T3 (56) and T4 (13). Nodal state was N0 in 80, N1 in 29 and N2 in three cases. AJCC stage grouping was II (T2N0) in 33 patients, stage III (T3N0 or T1-3N1) in 64 cases and stage IV (T4 due to bone erosion or N2) in 15 cases.

The technique used for lip reconstruction was:

- Unilateral or bilateral myocutaneous depressor anguli oris flap (MCDAOF) for isolated lip defect (n=63).
- Bilateral myocutaneous depressor anguli oris (MCDAOF) plus local cervical rotational flap chin defects (n=3).
- Pectoralis major myocutaneous pedicled flap for cheek defects involving the lip together with a tongue flap for mucosal reconstruction (n=35).
- Sternocleidomastoid clavicular myo-osseous flap for concomitant mandibular defects (n=12).

Results:

- Aesthetic and functional results are evaluated regarding appearance, oral incompetence, disabling microstomia and eating difficulties.
- Depressor anguli oris reconstruction allowed functioning static and dynamic oral function in all cases in contrast to the Pectoralis major flap.
- There were 18 cases of oral incompetence (46.1%), nine cases of speech difficulty (23%) and five patients with poor cosmetic appearance within the second group.
- Total flap loss was not encountered. Partial flap loss affected thirteen depressor anguli oris flaps (21.3%) and six pectoral flaps (15.3%).

Key Words: Lip carcinoma - Depressor anguli oris flap - Lip reconstruction.

INTRODUCTION

Squamous cell carcinoma of the upper aerofacial region is a significant problem in our patient population due to occupational and socioeconomic factors. The disease usually presents in a relatively advanced stage. Surgery could be curative as the biological behavior of these cancers is usually locoregionally invasive [1]. Here we discuss the interplaying oncologic, functional and aesthetic challenges affecting reconstruction of the defects following tumors resection.

Oral squamous cell carcinoma is the sixth most common malignancy, and is a major cause of cancer morbidity and mortality worldwide. Globally, about 500,000 new oral and pharyngeal cancers are diagnosed annually, and three quarters of these are from the developing world [2]. In Egypt, head and neck cancers represent 3.3% of all cancers [3].

Most head and neck cancers are of the squamous cell variety and may be preceded by various precancerous lesions. Minor salivary gland tumors are not uncommon in these sites [4]. Specimens removed from the lesions may show the carcinomas to be noninvasive, in which case the term carcinoma in situ is applied. An invasive carcinoma will be differentiated, moderately
well differentiated, poorly differentiated or undifferentiated.

Early cancers (stages I and II) of the lip and oral cavity are curable by surgery or radiation therapy, and the choice of treatment is dictated by the anticipated functional and cosmetic results of treatment for the individual patient and by the availability of the particular expertise required of the surgeon or radiation oncologist [1].

As regards, stage III; Surgery and/or radiation therapy are used, depending on the exact tumor site [16]. Neoadjuvant investigational chemotherapy, as given in clinical trials, has been used to shrink tumors and thereby render them more definitively treatable with either surgery or radiation.

Neoadjuvant chemotherapy is given prior to the other modalities, as opposed to standard adjuvant chemotherapy, which is given after or during definitive therapy with radiation or after surgery. Randomized prospective trials, however, have yet to demonstrate a benefit in either disease-free or overall survival for patients receiving neoadjuvant chemotherapy [17].

For stage IV; chemotherapy has been combined with radiation therapy in patients who have locally advanced disease that is surgically unresectable [18].

**PATIENTS AND METHODS**

The study reviews one hundred and twelve patients with invasive tumors at or extending to, the lip(s). Median age was 43 years (range 23-76). Males to females ratio was 1.5:1.

**Tumor stage was:**

T$_2$ (43),
T$_3$ (56),
And T$_2$ (13).

**Nodal status was:**

N$_0$ (80),
N$_1$ (29),
And N$_2$ in three cases.

AJCC stage grouping was II (T$_2$N$_0$) in 33 patients, stage III (T$_3$N$_0$ or T$_1$-T$_3$N$_1$) in 64 cases and stage IV (T$_4$ due to bone erosion or N$_2$) in 15 cases.

Tumor pathology was 105 squamous carcinomas, five basal carcinomas and two melanomas. Of the squamous tumors: there were thirteen verrucous type lesions, twenty-two grade one non- verrucous, sixty grade II, and ten grade III tumors.

The techniques used for lip reconstruction were:

A- Unilateral or bilateral myocutaneous depressor anguli oris flap (MCDAOF) for isolated lip defect (sixty six patients):

We used unilateral MCDAOF in twenty patients to cover a defect ranging from 30-50% of lip loss. Five island transposition flaps, two jump flaps (were used to replace the remaining lip tissue that was transposed to the excisional defect) and thirteen rotational flaps.

Thirty patients with total lip loss were managed with bilateral MCDAOF. (Fig.1).

The typical myocutaneous flap extends from the commisure to the margin of the mandible and was used in most cases. Extension beyond the mandibular margin was performed in thirteen unilateral cases (two of island flaps and eleven of rotational flaps).

Additional three bilateral MCDAOF were supplemented with random platysmocutaneous rotational flaps for adjacent chin defects. (Fig. 2).

B- Pectoralis major myocutaneous pedicled flap was used in thirty four patients to cover cheek defects involving the lip. The flap was raised with a skin paddle enclosed between the parasternal and midclavicular lines vertically and between the fourth and seventh ribs horizontally. The thoracoacromial pedicle was identified and protected. Subcutaneous tunnel was created and the flap was inset in the recipient defect. The mucosal surface was bridged to the donor skin through a posteriorly based longitudinal tongue flap.

C- Sternocleidomastoid clavicular myo - osseous cutaneous was used in twelve patients for concomitant mandibular defects with a skin island on the caudal part of sternocleidomastoid (two patients). Whenever there was more than a minor skin loss and/or soft tissue loss, no reliance was put on the skin island of the sternocleidomastoid flap and a pectoralis flap is used in conjunction with a pure myo-osseous flap (ten patients).
We fixed the bone segment using a figure of eight stainless steel wiring with stepping of the bone edges to resist the pulling action of muscle tone. Care was taken to make the central mandibular segment overrides the clavicle and the clavicle overrides the lateral segment of the mandible. The flap was based on the superior pedicle from the occipital artery in cases with concomitant neck dissection.

Nineteen modified neck dissections and thirteen supraomohyoid dissections were done in node positive cases. Median and paramedian lip lesions received bilateral supraomohyoid dissections (seven cases) besides three bilateral modified neck dissections.

Secondary adjustment surgery was needed in eight cases of bilateral MCDAOF for total lip replacement in the form of minor debriement/secondary closure of the suture line between the distal ends of both flaps to avoid notching of the lip edge. Most of these procedures were performed under local infiltration anesthesia.

Fig. (1): Male patient aged 63 years presented with extensive, ulcerating squamous cell carcinoma of the lower lip (A) treated with total lip excision and bilateral myocutaneous depressor anguli oris myocutaneous flaps (B).

Fig. (2): Male patient aged 37 years presented with large ulcerating squamous cell carcinoma of the lip extended beyond the mandibular margin (A) treated with total lip excision, bilateral myocutaneous depressor anguli oris myocutaneous flaps, and supplemented with random platysmocutaneous rotational flaps for adjacent chin defects (B).
Adjuvant protocol adopted in our hospital entails providing postoperative irradiation to 56 cases (50%); including cases with T4 tumors, infiltrated safety margin with no vulnerability for further resection, and nodal disease with pericapsular extension.

Myocutaneous flap tolerated irradiation very well with no need for adjustment of irradiation timing or altering of the dose/fractionation.

**RESULTS**

This review consists of 112 patients with carcinomas involving the lips. Tumor characteristics are shown in (Table 1).

No operative mortality was recorded in the studied group.

Overall survival for the whole group of patient was 100% after 44 months, and median disease free survival of 29 months is shown in (Fig. 3).

Twenty nine local recurrences and sixteen nodal recurrences occurred within a mean follow up period of 38 months. Re-excision and/or radiotherapy of the local recurrences were done

Aesthetic result was acceptable in the (MCDAOF) group. Of the pectoralis major flap reconstruction group, color mismatch, blunting of the commissure and obvious scars caused significant dissatisfaction in 80% of these patients.

Depressor anguli oris reconstruction allowed a functioning static and dynamic oral function for all cases in contrast to the pectoralis major flap.

There were 18 cases of oral incompetence (46.1%) and nine cases of speech difficulty (23%) among the pectoralis major flap reconstruction group.

Total flap loss was not encountered.

Partial flap loss took place in thirteen depressor anguli flaps (21.3%) and six pectoral flaps (15.3%). All but two of these cases were suture line disruption managed as out patient procedures. Of the depressor flap affected, ten were extended flaps and three were typical flaps.

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<th>Table (1): Patients characteristics.</th>
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**DISCUSSION**

Many reconstructive options are described for reconstituting the excised lip.

*The parameters of a successful technique [7] are:*  
- Restoration of lip function.  
- Acceptable cosmetic appearance.  
- Minimal donor morbidity.  

*Lip function is described as [6]:*  
- Static competence: occlusion of oral sphincter at rest without drooling.  
- Dynamic competence during eating solid and liquid diet.  
- Phonation.
Cosmetic parameters are defined mainly to include the integrity of vermilion surface, even-ness of red margin and acceptable size and contour of the mouth.

Options described for reconstruction include [5]:
• Redistribution of remaining lip tissue.
• Local myocutaneous (mucosal) flap.
• Distant flaps.

Of the first option, a trial was described using the lip tissue as random flaps in the report of Hatoko et al., who supplemented the technique with a lip switch to fill the donor gap [5]. We used jumping techniques to transpose the remaining lip tissue into the excisional defect and brought the flap into the secondary defect. This aims at distributing the defect and obviating commissural kinking that may otherwise occur. However, lip redistribution alone without an extra labial tissue supplementation is inadequate to maintain tension free repair in almost all cases.

Local myocutaneous (mucosal) flaps are mainly cheek advancement or depressor muscle flaps. Cheek advancement is popular and recently reported with satisfactory results. However, cheek advancement does not preserve the flap innervations. Wechselberger and group affecting 80-90% of lip and treated with modified Webster technique utilizing tissue from the cheeks. Follow up was ten months and the authors reported no drooling, healing problems or unsightly scars [6].

Depressor anguli oris flap and orbicularis oris flap of Karapandzic [7] are the two available options for sensate flaps that could maintain oral sphincter integrity. (MCDAOF) is preferred being relatively free of the microstomia effect.

Tobin and O’Daniel described depressor anguli oris flap in 1990 [8]. It is an axial myocutaneous flap formed of the of the depressor anguli oris (trangularis) muscle, which originates from the oblique line of the mandible and inserts into the angell of the mouth and is based on a muscular artery from the inferior labial branch of the facial artery. Neto et al. described the flap in twenty patients and reported satisfactory aesthetic results in all cases and inadequate lip function in one patient [9].

Yotsuyanagi et al. described eight patients treated by this procedure including three total lip reconstructions and five defects more than one half of the lower lip. All of their patients were using dentures. The complications in their series included one case of inadequate sphincter action and one case of postoperative sialorrhia accompanied by sensory loss, which persisted for six months. They described adequate vascularity, healing, cosmetic appearance and good stomal size to wear denture in all patients [10].

Depressor muscle flap may also be augmented with extension based on the platysma. Moschella et al., reported their extended experience with the wider variety of the depressor "system" flap that includes the depressor anguli oris muscle and/or part of the platysma. They used the technique for the more extensive cases of lip malignancies that may encroach upon the depressor muscle pedicle. They described 70 cases over ten years’ period and reported two events of diastasis of the vermilion and one case of unsuccessful revision surgery for pinching of the lip border [11].

We used (MCDAOF) to replace lip defects varying in extent from one third to total lip loss. The flap had provided a tension free and rapid in all cases. Functional and aesthetic results were adequate after (MCDAOF) reconstruction.

The typical flap restricted to the boundaries of the depressor muscle was always free of necrosis. Most of the cases that suffered partial loss were of the extended variety. Depressor anguli oris flap in general proved to be a reliable flap with no more than marginal necrosis in spite of the fact that lip carcinoma patients are usually old age smokers. We used the flap in a novel fashion as an island flap in five cases. This variant extends the unity of the flap to replace upper lip defects although the sensory nerve supply from the mental foramen is inevitably sacrificed.

Distant flaps (e.g. the radial forearm free flap) was utilized alone in the report of Jeng et al. [12], combined with local advancement by the same group [13], combined with masseter by Shinohara et al. [14], and with depressor oris by Kushima et al. [15].

We used the pectoralis myocutaneous flap to cover wider facial defects being encouraged by its versatility and donor site tolerability. However, it couldn’t restore the muscular sphincter essential for oral sphincteric action. Ability of MCDAOF to replace up to total lip defect
makes it unnecessary to resort to less satisfactory options as long as the depressor muscle itself is not violated by the tumor.

Our results together with other published data document the satisfactory outcome of using MCDAOF for reconstructing major lower lip defects.

We believe that depressor oris muscle transfer is the most reliable method of the above-mentioned techniques being:

1- Based on reliable blood supply being a facial tissue.
2- Free of the microstomia effects as no tissue is burrowed from the oral sphincter perimeter as in cheek or lip based techniques.
3- Allow the maximal functional recovery being a muscle of expression controlled through the facial nerve nucleus, which gives the maximal possibility of rehabilitation of the muscle in these almost always old patients.
4- Respects the lines of facial creases and minimizes the possibility of hypertrophic scars.
5- Does not violate the potential sites of other flap options, as the possibility of second primary is appreciable in sq.c.c. of upper aerodigestive tract.
6- Almost always no donor morbidity.

Conclusion:

Reconstruction of major defects of lip innervated myocutaneous flap from the facial musculature that can protect from the incapacitating symptoms of oral sphincter resulted in acceptable functional and aesthetic outcome in this group of patients. However associated chin defects necessitated large distant or local flaps to complete the reconstructive process.

REFERENCES