



TOTAL AND SUB-TOTAL MAXILLECTOMY THROUGH LIP SPLIT APPROACH: A CLINICAL STUDY AND REVIEW

Oncology

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ABSTRACT

Purpose: The objective of this retrospective review was to evaluate the accessibility of conventional lip split approach for excision of maxillary tumors and access its effectiveness, benefits and post-operative outcomes. **Patients:** Ten consecutive patients with primary maxillary tumors underwent maxillectomy through lip split approach with supraomohyoid neck dissection. Patient details including the tumour site, extension and neck node involvement were recorded. Postoperative complications such as neural morbidity and problems relevant to the procedure were evaluated along follow-up period. **Technique:** The Lip split incision involved midline division lower lip and chins. The incision extended posteriorly in inferior gingivobuccal sulcus and continued laterally from retromolar trigone in upward direction from maxillary tuberosity. The flap was elevated under periosteum towards angle of the mandible with detachment of masseter muscle. Further releasing maxillary gingiva posteriorly with or without mandibulotomy, the posterolateral region of maxilla was exposed. **Conclusion:** The conventional lip-splitting approach is an acceptable and optional approach for maxillectomy because of wide exposure, satisfied function, inconspicuous scar, and preservation of facial nerve. The advantage of good cosmesis makes it superior to the conventional approach for maxillectomy. This article highlights the benefits of this procedure and discusses conventional approaches with review of literature.

KEYWORDS

Maxillectomy, Lip Split Approach, Mandibulotomy, Retrospective, Clinical Study

INTRODUCTION:

Tumors of the maxilla and adjacent anatomic sites require maxillectomy¹. Surgeons face numerous challenges for surgical clearance of tumour-free margins due to difficulty in accessibility. Malignancy of maxilla and its adjacent structures usually requires partial or total maxillectomy depending on the extent of the tumour, that are frequently assessed through Weber-Fergusson incision with sublabial degloving incision, which is and has been the classic gold standard approach for surgical management of maxillary tumors².

The disadvantages of this technique are 1) an inability to gain access to the pterygomaxillary region for en-bloc resection, 2) limited surgical access in the presence of trismus, and 3) morbidity associated with scarring near the nose, upper lip, and ectropion of the lower eyelid³⁻⁵. Incidence rates of wound dehiscence, skin necrosis, and artificial material exposure do not decrease in patients with adjuvant radiotherapy and defect reconstruction⁶.

Roux, in 1836, invented an approach by dividing the lower lip and mandible for gaining surgical access to the oropharynx⁷. The mandibulotomy approach with lower lip splitting has been repopularized and is widely used for more than 20 years to promote the access to the tumours in the posterior aspects of the oral cavity, oropharynx and parapharyngeal space⁸.

Over the years, several modifications of the original midline lip-splitting incision have been proposed in an attempt to improve postoperative function and appearance. In general, conventional midline lip-split incisions avoid injury to the mental or facial nerve branches, thus reducing the risk of functional deficiencies. But, can result in excessive scarring, vermilion notching, and reduced lip mobility secondary to pronounced scar contracture⁹.

The lateral lower lip incision was introduced by von Langenbeck¹⁰ which was further explained by Ko nig¹¹, Robson¹², and others. With the lateral lip-split mandibulotomy approach, there is improvement in the accessibility and exposure to the structures which are in close vicinity which also helps in preserving the important anatomic structures¹³.



Figure 1: Pre-operative picture of patient

The objective of this retrospective study was to review patients who underwent maxillectomy by the lip-splitting approach, with or without mandibulotomy, followed by supraomohyoid neck dissection. The benefits of this conventional lip-splitting technique along with some modifications over the conventional Weber-Fergusson technique and other approaches to the pterygomaxillary region have been discussed and the postoperative outcomes were evaluated; the results were compared with those of recent reports.

MATERIALS & METHODS:

Patients:

A retrospective study was conducted on 10 patients, intervened for malignancy involving maxilla and its nearby structures, accessed by conventional lip split with or without mandibulotomy approach. Maxillary tumors clinical and pathologic stages were determined according to the Tumor-Node-Metastasis classification of the American Joint Committee on Cancer. Patient demographics in terms of age, gender, site of lesion and type of lesion with treatment details were reviewed from the electronic medical records.

As the study evaluated patients amongst the author's surgical experience, no ethical clearance from the medical practices board of the hospital was required. The preoperative imaging studies like conventional radiographs, computed tomography scans and magnetic

resonance imaging were used to assess the location, expanse of tumours & neck node estimation. The methodology of neck dissection was planned and performed. The status of surgical resection margins was determined from the histopathology report. The disease status was obtained from patients' follow-up visit records. The morbidity of the technique was assessed prospectively in terms of patient's new complaints, complications related to incision site as well as mandibulotomy site in terms of scar formation and infection, osteotomy healing, occlusal disturbances, neural disturbance (mental, lingual and inferior alveolar nerve), transient facial palsy and trismus post-operatively. We selected one illustrative case of right maxillary squamous cell carcinoma (Figure 1), where we used this technique to demonstrate the advantage of the optimal exposure of the maxilla and associated anatomical structures.

Surgical Technique:

1. Incision:

After nasotracheal intubation of the patient, the patient was prepared followed by marking the conventional lip split with submandibular incision involving the malignant site (Figure 2). The surgery is initiated with the submandibular incision, which is normally used for (selective) neck dissection of level I-III (Figure 3).



Figure 2: Incision marking of lip-split and submandibular incision

Following supraomohyoid neck dissection, a skin flap is raised in a subplatysmal plane, until lower border of the mandible is visible. Posteriosuperiorly, the platysma muscle is absent and contains both greater auricular nerve and external jugular vein which serves as indicators for the extension of posterosuperior dissection plane over the parotid fascia upto an imaginary line drawn from the lower border of mandible in posterior direction. Retraction of the skin flap further allows the identification of the marginal mandibular nerve which runs over facial artery and vein close to the lower rim of mandible. In prior to the ligation of facial artery and vein, the nerve branch is

posteriorly dissected towards the tail of parotid to cause cranial mobilization of it beyond the lower mandibular border. Based on the metastasis of lymph nodes the type of dissection is carried out.



Figure 3: Supraomohyoid neck dissection followed by submandibular incision

Moving on with the surgical procedure, the horizontal neck incision is extended superiorly to meet a midline lower lip incision of paramedian curved incision. Additionally, the extra oral incision is continued intraorally through the midline mucosal incision. This incision is prolonged posteriorly into inferior gingivobuccal sulcus and proceeded to upward direction lateral from the maxillary tuberosity and retromolar trigone.

The incision is given approximately 5 mm below from the attached gingiva to facilitate adequate closure after surgery. The flap is

subperiosteally dissected and elevated forwardly from the midline of mandible to its angle. The mental nerve is transected as it cannot be preserved. The masseter muscle is detached from the ascending branch of the mandible until the lower border of the mandibular notch. The attachment of the temporalis muscle to the coronoid process is transected. After the lower flap is mobilized the mucosal incision is continued laterally in the upper gingivobuccal sulcus in an anterior direction towards the midline or with elongation to the contralateral side depending on the involvement of tumor (Figure 4).



Figure 4: Conventional lip split incision with its extension in the maxilla

2. Maxillectomy:

Subsequently, standard maxillectomy was performed and the lesion was excised with proper surgical margins (Figure 5, 6). In cases where the tumour includes the pterygoid plates, the posterolateral attachments of the maxilla are to be further exposed. This is done by transection of pterygoid muscles near their attachments to obtain adequately increased surgical margins. Inadvertent injury to maxillary artery has to be taken care of during such elaborate procedures.



Figure 5: Adequate exposure of the maxillary tumour

3. Mandibulotomy (if Required):

According to the amount of exposure needed for resection of the lesion mandibulotomy is planned preoperatively. Usually osteotomy is planned anterior to mental foramen between the canine and first premolar. It is mostly performed in a step fashion with the use of straight fissure bur followed by oscillating saw. Completion of osteotomy is done by osteotome. Pre-plating of the segments is executed to achieve accurate anatomic reduction and also prevents asymmetry. Mandibulotomy segment is separated from the lingual mucoperiosteum during elevation. The lingual nerve and inferior alveolar nerve are identified and preserved. Succeeding to this a lateral mandibular swing is achieved for adequate exposure. After the excision of the lesion fixation of mandible is done using 2 miniplates and screws. In the above illustrated case, mandibulotomy was not needed as the cheek flap was sufficient for exposure.

Follow Up And Post-operative Assessment:

Patients were assessed post operatively according to their complaints and were examined for local and regional recurrence or distant metastasis every 3 to 6 months through clinical as well as radiological examination.

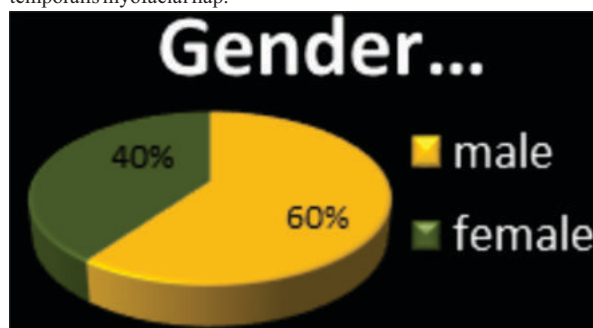


Figure 6: Excised specimen with adequate surgical margins

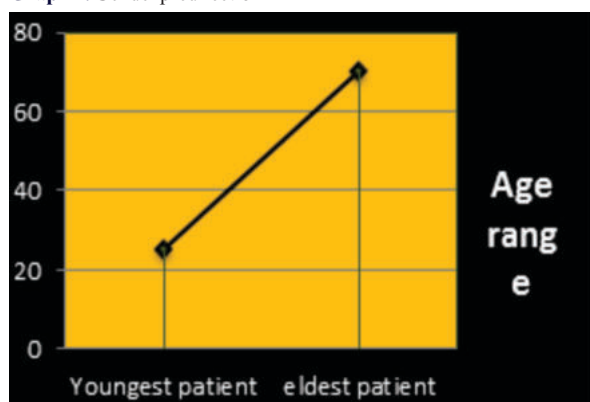
RESULTS:

Total of 10 patients were involved in the study out of which 6 were male (60%) and 4 were female (40%) and were operated through conventional lip split with or without mandibulotomy approach (Graph 1). The patient's age ranged from 25 to 70 years (Graph 2). Based upon the site of involvement, 5 (50%) patients right side of maxilla was involved, 4 (40%) patients left side of maxilla was involved and in 1 (10%) patient hard palate was involved (Graph 3).

Preoperatively, the pathology of each tumour was assessed using punch or incisional biopsy. The extension of the tumours and involved structures were accessed through preoperative PNS view, CT and MRI scans. The TNM classification of 10 patients with malignant maxillary tumors was from T2N0M0 to T4N2M0 according to the pathologic diagnosis. All the patients with squamous cell carcinoma of maxilla underwent supraomohyoid neck dissection with level III clearance following partial maxillectomy. Postsurgical adjuvant radiotherapy was required by patients with squamous cell carcinoma. Facial reconstruction was achieved with pectoralis major myocutaneous or temporalis myofascial flap.



Graph 1: Gender predilection

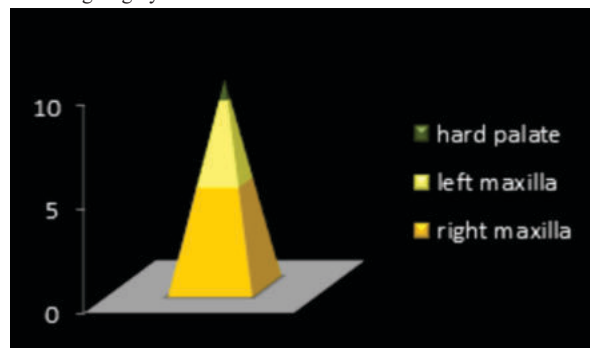


Graph 2: Age range

Treatment Outcome And Complications:

All the patients experienced supraomohyoid neck dissection with a level III clearance resulting in minimal complication. There was no incidence of damage to major vessels. One patient (10%) experienced wound dehiscence in neck which was managed with regular local dressings (Table 1). The resection and donor site morbidity was not seen in any of the patients. Need for mandibulotomy was seen intra-operatively only in 3 patients out of 10. Assessment of lingual and inferior alveolar nerve in such patients was performed using two-point discrimination test. No patients had nerve hypoesthesia in 6-month post-op period. One patient complained of infection at the osteotomy site post-radiation which was managed through regular dressings and appropriate antibiotics therapy (Table 1).

All patients were symptom free. Trismus was a common complaint which improved significantly over a period of time with mouth opening exercises and physiotherapy (Table 1). Mouth opening ranged from 25 mm to 35 mm. Occlusion was maintained in all the patients following surgery.



Graph 3: Site of involvement

Table 1: Evaluation of complications and recurrence rate

S. No.	COMPLICATIONS	NUMBER OF PATIENTS
1	Wound dehiscence	1
2	Infection at osteotomy site	1
3	Trismus	6
4	Local recurrence	1

Post-operative Assessment And Recurrence Rate:

All the patients were followed at 3, 6 months and one year follow-up period. One patient (10%) had a local recurrence within a year (Table 1). Four patients did not reported for follow-up after 2 years till then there were no recurrences. All the patients had aesthetically acceptable scar in conventional lip split incision region. All en bloc excised specimens were evaluated histopathologically, and diagnosis was confirmed. Tumour margins status was evaluated in which 1 patient (10%) had positive margins while 9 (90%) had negative margins.

DISCUSSION:

Various modified incisions of classic Weber-Ferguson incision resulted in unacceptable aesthetics in the form of scarring and ectropion of the lower eyelid. In 1981, Biller et al¹⁴ described a trans-mandibular approach to skull base which was later adopted by Krespi¹⁵ et al in 1984. This approach provided good exposure to the lateral and middle compartments of the middle cranial base and offered good vascular control in the neck. Alternative approaches to the infratemporal fossa described by Shaheen¹⁶ concluded that the route of access is determined by the position, extent, and nature of the disease.

Lip split incision for access to the maxilla and infratemporal fossa combined with sublabial degloving has been used successfully for resection of tumours of the maxilla including the infratemporal fossa.

The advantages of this technique include:

1. Disease-free surgical margins are achieved.
2. Vascular control is good from the external carotid artery feeders.
3. Access to the palatal aspect in patients with trismus.
4. Ease of transferring reconstruction flaps, eg, temporofacial or free flaps.

Various authors^{9,17} have proposed modifications, by breaking the midline lip-split incision to get better anatomic contours of the region and thus causing less muscle fiber disruption and scar contracture. At

the same time, more anatomic landmarks are offered for correct re-approximation during suturing, thus reducing the risk of vermilion stepping.

In our study, we have used conventional midline lip split approach to treat the malignancy involving maxilla and its nearby structures with or without mandibulotomy. Midline lip-splitting incisions have the advantage of avoiding injury to branches of the mental nerve or the marginal mandibular branch of the facial nerve, reducing the risk of functional deficiencies. Also, this approach helped to gain very good access to the maxilla, which provided enough space for en bloc resection, control of bleeding, and reconstruction with a free vascularized flap.

However, trismus was a common complaint given by all the 10 patients and this was improved gradually over a period with mouth opening exercises and physiotherapy. 3 patients required the need for mandibulotomy. No incidence of damage to any major vessels was seen and only one patient (10%) experienced wound dehiscence in neck.

From the present study, it can be concluded that a lip-splitting incision that carefully follows the anatomic contour of the lower lip and chin stays close to the midline to avoid nerve injury and if meticulously sutured will give the most satisfactory aesthetic and functional results. This includes suturing in layers and careful approximation of previously determined skin points. Special attention should also be paid to proper alignment of the vermilion border, which is a prominent and important aesthetic unit. If the need to extend the incision in the neck arises, standard precautions to avoid injury to the marginal mandibular branch of the facial nerve should be taken.

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Conflicts Of Interest:

1. Competing Interests and Funding: No funding was received for conducting this study. The authors have no competing interests to declare that are relevant to the content of this article.
2. Ethical approval: Ethical approval was waived by the local Ethics Committee of University A in view of the retrospective nature of the study and all the procedures being performed were part of the routine care.
3. Consent to participate and publish: Informed consent was obtained from all individual participants included in the study and to publish the data in journals

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