NEW MODIFICATION OF THE MANDIBULOTOMY APPROACH
WITHOUT LIP SPLITTING

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Abstract: Background. A lower lip-splitting incision has traditionally been performed with different types of mandibulotomy approaches for obtaining wide access to oral and oropharyngeal cancers. However, lip splitting can be associated with unfavorable aesthetic results. We describe our new modification of a traditional mandibulotomy approach without lip splitting to avoid these morbidities. This is a case series in a tertiary referral center.

Methods. The primary tumor site was the oropharynx in four cases, the oral cavity in two cases, and the parapharynx in one case. Each case was assessed for TNM staging, perioperative complications, status of the resection margins, tumor recurrence, and the aesthetic and functional results of the lower lip.

Results. All the tumors were safely removed by means of our modified non–lip-splitting mandibulotomy approach through the combined intraoral and transcervical routes with adequate resection margins. There were no troublesome difficulties in reconstruction of the surgical defects with various major flaps. The cosmetic results were excellent with intact lip function.

Conclusion. We believe this new modified non–lip-splitting mandibulotomy approach could replace the conventional mandibulotomy approach for some selected malignant lesions, with excellent cosmetic and functional results of the lower lip.

Keywords: mandibulotomy; lip splitting; cancer

Surgical excision of the posterior part of oral cavity and oropharynx is difficult without dividing the mandible. Roux in 1836 was the first to describe the approach of dividing the lower lip and mandible for gaining surgical access to the oropharynx. The mandibulotomy approach with lower lip splitting has been repopularized and has been most widely used for more than 20 years to facilitate the access to tumors in the posterior aspect of the oral cavity, oropharynx, and parapharyngeal space. With the mandibulotomy procedure, the need for better exposure and free access to these areas may conflict with the desire to preserve the important anatomic structures in the adjacent regions. Lower lip division has been considered an inevitable procedure that can be associated with unfavorable aesthetic results and with occasional lip deformities such as lip vermilion notching, stenosis of the labial sulcus, and fistula.

We modified the conventional mandibular swing procedure by omitting the procedure of lower lip-splitting incision for selected malignant lesions of oral, oropharyngeal, and parapharyngeal areas to improve the aesthetic results and to decrease the possible functional morbidities of the lower lip.
In this report, we present seven cases in which a new modification, non–lip-splitting mandibulotomy approach, was applied. This modification yielded a less wide but still adequately wide access for excision of tumors in these cases, and it allows for reconstruction with major flaps and improved cosmesis and less lip deformities. We advocate this technique for surgical access as an intermediate step that is short of a conventional mandibulotomy approach with a lower lip-splitting incision.

**MATERIALS AND METHODS**

A retrospective chart review was performed from July 2004 through May 2005 at the Samsung Medical Center, Seoul, Korea. Seven patients underwent the non–lip-splitting mandibulotomy approach for surgical resection of primary tumors of the oral cavity, oropharynx, and parapharynx. A single senior surgeon performed all operations. The primary sites included the tonsils in three cases, the tongue in two cases, and the parapharynx in one case. The tumor stage varied from stages II to IV. The patients ranged in age from 11 to 69 years (mean age, 50.1 years). Two of the six patients had preoperative radiotherapy, and the other three patients had postoperative radiotherapy. The postoperative follow-up period ranged from 4 months to 10 months, and all the patients were evaluated for tumor size, stage, surgical pathology, resection margin status, reconstructive technique, and the aesthetic and functional results of the lower lip. The patients evaluated the results subjectively by answering a questionnaire while they were clinically assessed by one of the authors at the 3-month follow-up. The evaluation parameters were the vermillion appearance (presence of notching), lip skin appearance, lip movement, sensation, and oral incontinence. The patients' responses were graded as good, fair, or poor.

**Surgical Technique.** The patient was placed on the operating table in a supine position with a shoulder roll to extend the neck. After a routine tracheostomy, the skin incision was usually made from the midline submental area to the hyoid bone, at which point the incision was extended to the lateral side of neck up to the mastoid tip. The vertical limb incision in a curvilinear fashion was added for achieving a comprehensive neck dissection in those cases with clinically palpable lymph nodes. Once the neck dissection was completed, the incision on the periosteum along the inferior border of the anterior mandible was performed. Then, an oral incision was made at the reflected labial mucosa just above the labiogingival sulcus on the anterior aspect of the mandible. Subperiosteal dissection was performed through the oral incision site down to the periosteal incision site at the lower border of the mandible. All the soft tissue attachments were elevated laterally from the ipsilateral mental foramen to the contralateral mental foramen, with care being taken so that there was no injury to the mental nerves. Once the midline tunneling between the anterior mandible and the soft tissue including the entire lower lip was created, an ipsilateral paramedian mandibulotomy was performed between the lateral incisor and the canine teeth in a vertical plane with a stepladder or wedge fashion. The submental skin incision could be extended to the inferior chin area to improve the surgical view.

Drill holes were made before dividing the mandible to ensure accurate alignment of the mandibulotomy site at the time of closure to avoid malocclusion. Two titanium miniplates were placed on the outer cortex and on the lower border of the mandible over the mandibulotomy site. The mandible was divided with a high-speed oscillating saw having a thin blade, with the lower lip skin left intact. Once the mandible was divided, the mucosal incision in the floor of the mouth was extended from the mandibulotomy site up to the anterior pillar of the soft palate according to extent of the tumor, the same as in a conventional

**FIGURE 1.** Surgical field with mandibulotomy approach without lip splitting.
mandibular swing procedure with retraction of the each side of the mandible. The mylohyoid muscle was then divided with electrocautery. Although the divided segments of the mandible were retracted in a lateral upward and lateral downward direction, the tumors were safely removed in an en bloc fashion by means of the combined transoral and transcervical routes with adequate resection margins (Figure 1). The surgical defect was reconstructed with a flap when necessary. After inset of the flap, repair proceeded anteriorly from the area of the tongue base and the posterior pharyngeal wall. Then, the mandibulotomy site was repaired with the previously tailored titanium miniplates. The oral incision and neck wound were repaired layer by layer after inserting a suction drain.

Case 3. An 11-year-old girl was referred with residual parapharyngeal rhabdomyosarcoma. She had undergone chemotherapy with doxorubicin and cytoxan, 12 cycles, and radiation therapy, 4500 cGy, for the previous 8 months. After chemoradiation therapy, follow-up imaging showed some response, but there was still a residual parapharyngeal mass. The cervicoparotid approach was used to remove the mass, which was extended to our non–lip-splitting mandibulotomy approach to get a better surgical field. Gross total removal of the mass was possible with negative frozen margins. The surgical wound was primarily repaired. Postoperative mild dysphagia with weakness of ipsilateral soft palate was noticed. She was discharged on the 18th postoperative day (Figure 2).
Case 6. A 69-year-old man, who had the history of cancer of the floor of the mouth, was admitted to our department for a newly apparent squamous cell carcinoma of the soft palate extending to the anterior pillar of left tonsil. He had undergone a marginal mandibulectomy, bilateral supraomohyoid neck dissection, and postoperative radiation therapy (6000 cGy) for the treatment of the cancer of the floor of the mouth (pT4N0M0) 2 years previously. He was diagnosed with a metachronous second primary soft palate cancer and underwent wide resection with our modified mandibulotomy approach without lip splitting; the surgical defect was reconstructed with a pectoralis myocutaneous flap. Biopsy showed a 3 × 2.7-cm invasive squamous cell carcinoma with negative resection margins. The postoperative course was uneventful (Figure 3).

RESULTS

Seven patients underwent mandibulotomy without lip splitting with the technique described previously for oncologic resection of primary tumors of the oral, oropharyngeal, and parapharyngeal areas. The histologic diagnosis was squamous cell carcinoma in six patients and rhabdomyosarcoma in one patient. The primary tumors of the six patients were from 2 to 4 cm in diameter in all cases. Adequate exposure and tumor removal in an en bloc fashion was possible without tumor spillage in all cases. A modified neck dissection was performed for two patients who had clinically palpable lymph nodes, and three of the patients with clinically negative neck nodes had selective neck dissection. Postoperative radiotherapy was given to two of the patients (Table 1). Five patients had no evidence of disease after surgery. Patient 1 had a regional recurrence in the periparotid lymph node 3 months after surgery, and salvage resection with parotidectomy was then performed. None of the patients experienced mandibulotomy-related complications such as tooth extraction, bony nonunion, malunion, or mini-

FIGURE 3. (A) Part of the surgical defect after removal of two thirds of the soft palate, entire left tonsillar area, and some of posterior pharyngeal area was seen through the neck. The hypoglossal nerve (arrow) was preserved. (B) A pectoralis major myocutaneous (PMMC) flap was elevated to reconstruct the surgical defect. (C) The mandible was reapproximated with the tailored titanium mini-plates after inset of the PMMC flap (arrowhead). The intact left mental nerve (arrow) was seen. (D) Patient appearance 2 weeks after surgery. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]
plate exposure. The lip movements of all the patients were symmetric on “E” and “O” phonation (Figure 4). The tactile sensitivity of both lateral areas to chin center were almost similar and intact. All the patients graded the postoperative appearance of chin and lip as “good” by their questionnaires and were satisfied with the cosmetic results of the lip and chin after the surgery. No changes in vermillion and lip skin appearance were observed.

**DISCUSSION**

A lower lip-splitting incision is traditionally performed in the midline extending in the vertical direction to a point beneath the chin. This technique has the advantage of creating minimal damage to the innervation and blood supply to the lip, and it avoids injury to branches of the mental nerve and facial nerve. However, these incisions are associated with an inevitable scar on the face and occasionally lip deformities, because this disrupts the muscle fibers of the orbicularis oris muscle. Complications may include notching of the lower lip, labial sulcus stenosis, fistula, loss of chin pad contour, decreased lip sensation, and decreased lip mobility. An increased potential risk for abnormal healing of the lower lip with secondary deformities exists when lip splitting is combined with resection of the anterior mandible or with resection of the floor of mouth. Oral sphincter incontinence may cause a delay in adjuvant therapy or in dental rehabilitation.

Over the years, several modifications of the original midline lip-splitting incision technique have been proposed in an attempt to improve postoperative function and appearance. McGregor and Robson proposed modifications by breaking the incision line to lessen muscle fiber disruption and scar contracture. However, although this can reduce some scar contracture, there is no ideal lower lip-splitting incision technique.

Various surgical approaches to the parapharyngeal space exist. When necessary, such as in the highly vascular or malignant tumors, a conventional midline mandibulotomy with lip splitting can be combined with each surgical approach to have a better surgical access or to preserve the carotid and jugular vessels and to preserve the function of facial nerve and mastication. Recently, a subcutaneous mandibulotomy approach was introduced for the removal of extensive parapharyngeal benign tumors without the lower lip-splitting, chin-splitting, and floor-of-mouth incisions.

In our parapharyngeal case, mandibulotomy was combined during the cervicoparotid approach to protect the great vessels and to secure the negative resection margins. Most tongue cancers can be resected through the various mandible-sparing surgical procedures. However, tongue cancers invading the tongue base often need wider exposure for oncologic safety. Two cases of tongue cancers in this study invaded posteriorly to the tongue base, and mandibulotomy was performed for better surgical access.

Our modification of the mandibulotomy without lip-splitting technique affords a less wide but still adequately wide exposure for the selected oropharyngeal malignant lesions. After mandibulotomy with an intact lower lip, each divided mandibular segment could be retracted laterally along with somewhat of an upward or downward direction for the operator to get the best surgical view by means of the combined transoral and transcervical routes.

**Table 1. Patient profile.**

<table>
<thead>
<tr>
<th>Patient no./sex/age, y</th>
<th>Primary site</th>
<th>Preoperative treatment</th>
<th>cTNM staging</th>
<th>Pathology</th>
<th>Reconstruction</th>
<th>Intraoperative resection margin</th>
<th>Postoperative complications*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/M/55</td>
<td>Tonsil</td>
<td>None</td>
<td>T2N2M0</td>
<td>SCC</td>
<td>ALTFF</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>2/M/61</td>
<td>Tonsil</td>
<td>None</td>
<td>T2N2M0</td>
<td>SCC</td>
<td>ALTFF</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>3/F/11</td>
<td>Parapharynx</td>
<td>CCRT</td>
<td>T1bN0M0</td>
<td>Rhabdomyosarcoma</td>
<td>Primary</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>4/M/57</td>
<td>Tonsil</td>
<td>None</td>
<td>T2N2M0</td>
<td>SCC</td>
<td>ALTFF</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>5/M/48</td>
<td>Tongue</td>
<td>Partial glossectomy</td>
<td>T2N2M0</td>
<td>SCC</td>
<td>ALTFF</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>6/M/69</td>
<td>Soft palate</td>
<td>RT</td>
<td>T2N2M0</td>
<td>SCC</td>
<td>PMMC</td>
<td>Negative</td>
<td>None</td>
</tr>
<tr>
<td>7/F/57</td>
<td>Tongue</td>
<td>None</td>
<td>T2N2M0</td>
<td>SCC</td>
<td>Skin graft</td>
<td>Negative</td>
<td>None</td>
</tr>
</tbody>
</table>

Abbreviations: SCC, squamous cell carcinoma; ALTFF, anterolateral thigh free flap; CCRT, concurrent chemoradiation therapy; RT, radiotherapy; PMMC, pectoralis major myocutaneous flap.

*Complications that needed surgical interventions.
In this series, our experience was limited to T2 oral and oropharyngeal cancers. We have obtained enough exposure to work and to achieve adequate resection margins in all cases. T2 lesions of these areas should be carefully chosen for this modified approach. In oropharyngeal cases, resection often includes part of tongue base, soft palate, and posterior pharyngeal wall. The surgical defects should be reconstructed with a major flap. Repair of the surgical defect with a major flap could be a difficult problem. However, repair with the alternative transoral and transcervical routes could be done without great difficulty with adequate retraction of the divided mandibular segments. Repair must proceed anteriorly from the tongue base and posterior pharyngeal wall. Although we have no experience in this series, there is potential of conversion to the lip-splitting procedure. It would be better to mark the lip-splitting incision line at the beginning of the procedure. All the mandibulotomy-related surgical complications could be expected in this approach. The potential risk of mental nerve damage because of direct damage with lower lip flap elevation or stretching of the divided mandible was not observed in this series.

We want to advocate this new technique for surgical access as an intermediate step that is short of a conventional mandibular swing approach with
lower lip splitting. We would also suggest reserving the conventional lip splitting mandibulotomy approach for more advanced and recurrent cases.

**CONCLUSION**

Our new modification of the non–lip-splitting mandibulotomy approach afforded wide surgical access enough to resect the malignant lesions (T2) of the oral cavity, oropharynx, and parapharyngeal areas and to reconstruct the surgical defects with major flaps. We avoided the lip-splitting–related morbidities and achieve excellent cosmetic results. Although the small number of cases limits this retrospective study, we advocate this technique for surgical access replacing the conventional mandibulotomy approach in selected malignant lesions of these areas.

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**REFERENCES**