Original article

Pre-mental foramen mandibulotomy for resecting tumors of tongue base and parapharyngeal space

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Keywords: *tumor of the tongue base* · *parapharyngeal tumor* · *pre-mental foramen mandibulotomy* · *surgical approach*

Background Resection of tumors arising from the tongue base and the parapharyngeal space is difficult for exposure and manipulation because of their obscure location. The aim of this study was to evaluate the surgical approach of the pre-mental foramen mandibulotomy for resecting the tumors of tongue base and parapharyngeal space.

Methods Fifty-one patients with tumors of tongue base and parapharyngeal space were treated using the mandibulotomy approach on the pre-mental foramen. In the present study, this technique was described in detail. The patients were followed up for three months to six years with a mean of 26 months.

Results The tumors of tongue base and parapharyngeal space could be exposed clearly and be resected radically by surgical approach of pre-mental foramen mandibulotomy. The surgical complications were reduced.

Conclusions Compared to other surgical approaches, such as lateral mandibulotomy, midline mandibulotomy, the suprahyoid parapharyngeal approach, and paramedian mandibulotomy, we found that the pre-mental foramen mandibulotomy is the ideal choice for resecting the tumors of tongue base and parapharyngeal space.

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Resection of tumors arising from the tongue base and the parapharyngeal space is difficult for exposure and manipulation because of their obscure location. Surgical approach is the key point for successful operation. As an ideal surgical approach, wide exposure, less damage to the normal tissues, convenience for hemostasis and reconstruction of the defect, radical resection of the tumor and less postoperative deformity are necessary.

Several surgical approaches for resecting tumors of tongue base and parapharyngeal space, such as lateral mandibulotomy,[1,2] midline mandibulotomy,[3-7] the suprahyoid parapharyngeal approach[8-10] and paramedian mandibulotomy,[11,12] were reported in the literature. Each of these approaches has advantages and disadvantages. In the past 7 years, 51 patients with tumors of tongue base and parapharyngeal space were treated through the approach of pre-mental foramen mandibulotomy with satisfactory results and fewer complications.

METHODS

Between January 1997 and August 2004, 51 cases with tumor of tongue base and parapharyngeal space were treated by surgery with an approach of premental foramen mandibulotomy in the Department of Oral and Maxillofacial Surgery, Peking University School of Stomatology. Among these 51 cases, there were 27 men and 24 women. Their ages ranged from 5 to 73 years, with a median age of 45 years.

Twenty-six tumors located in the tongue base, and

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25 in the parapharyngeal space. Thirty-seven cases (72.5%) were malignant, 14 cases (27.5%) benign. All of the tongue base tumors were malignant. All of the benign tumors were localized to the parapharyngeal space.

Table 1 illustrates the histopathologic diagnosis of the tumors. Pleomorphic adenoma represented the most common benign tumor, and squamous cell carcinoma was the most common malignant tumor.

Table 1. Histopathologic diagnosis of the tumors

Histopathologic diagnosis	No. of cases
Benign tumor	14
Epidermoid cyst	1
Pleomorphic adenoma	9
Neurolemmoma	2
Carotid body tumor	1
Neurofibroma	1
Malignant tumor	37
Squamous cell Ca	25
Mucoepidermoid Ca	3
Oncocytic Ca	1
Epidermoid Ca	2
Ca in pleomorphic adenoma	1
Adenoid cystic Ca	1
Scarcoma	4
Total	51

Among the 33 patients with carcinoma, 23 cases were primary carcinoma. According to the UICC (2002),[13] the clinical stages of the 23 primary carcinoma patients were 2 in stage Ⅰ, 14 in stage Ⅱ, and 7 in stage Ⅲ, respectively.

The operation was performed under general anesthesia with nasotracheal intubation. Lower lip-splitting incision with lateral extension was designed. Submandibular incision was made firstly. The facial artery and facial vein were ligated. The mandibular marginal branch of facial nerve was protected. Then the skin incision was extended in the midline. The chin and lower lip were divided through their full thickness up to the mucosa reflection at the gingivalabial sulcus. Five mm of labial mucosa at the gingivalabial sulcus was left attached to the gum to facilitate closure. A short cheek flap was elevated to expose the mandibulotomy site. The mental nerve was protected from damage. Four-hole miniplates were placed on the outer cortex of mandible, and then the holes were drilled according to the plate holes. The miniplates were placed above and below the mental foramen, respectively (Fig. 1). Before the osteotomy, we performed fine sulcus at the lower border of mandible to fix the wire saw temporarily. The circle of wire saw was cut off. The wire saw was penetrated the interdental space between the canine and the first pre-molar tooth. This location varied between the first and second pre-molar tooth, depending on the position of mental foramen. The mandible was divided with the wire saw, and the proximate segment of mandible was pulled laterally. A mucosa incision was made in the floor of the mouth up to the anterior pillar of the soft palate, leaving a cuff of 1 cm of mucosa at the gingival to facilitate closure of the incision. The mylohyoid muscle was divided. The lingual nerve was preserved if possible. The tongue was retracted medially in the oral cavity to expose the tumor. Finally, the tumor was resected radically.

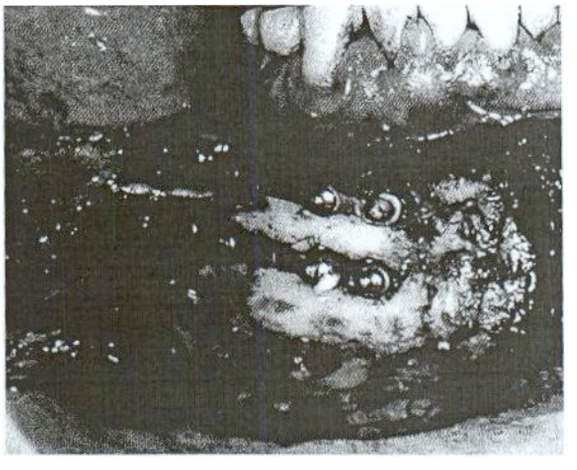

Fig. 1. The miniplates were placed above and below the foramen, respectively before osteomy.

Among the 51 cases, 27 received the reconstruction of defect with flaps, as shown in Table 2. The radial forearm flap was the most commonly used flap. The tongue defects were reconstructed using a platysma flap in two cases. Complete closure was performed in two layers including the muscle and mucosa.

Table 2. The flaps for reconstruction of defects

Flap	No. of cases
Radial forearm flap	23
Platysma flap	
Rectus adbominis myocutaneous flap	
Pectoralis major myocutaneous flap	1
Total	27

The cut ends of the mandible was reduced and fixed using previously shaped miniplates (Fig. 2). It is important to obtain a perfect alignment of the two

mandibular ends in order to restore the normal occlusion. A suction drain was placed in the wound. The midline lip-splitting and submandibular incisions were closed. Tracheostomy was performed in 28 patients. Nine cases received postoperative radiotherapy for a dose of 50 Gy.

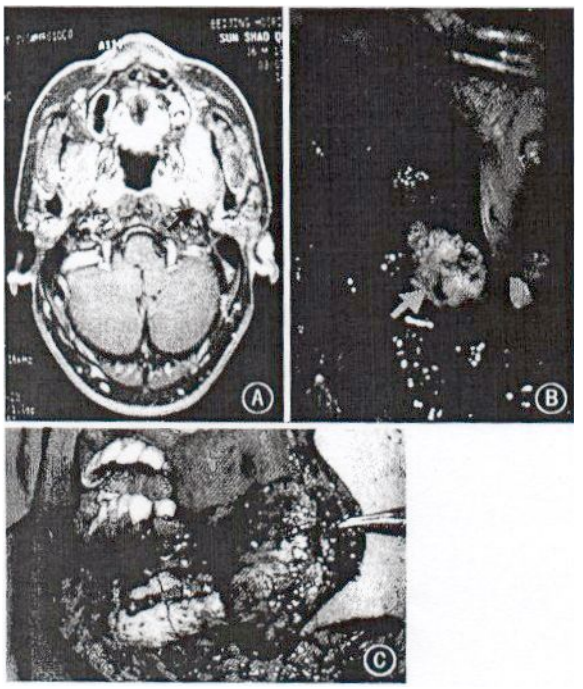

Fig. 2. Neurolemmoma of parapharyngeal space. **A**: MRI shows the mass with clear margin in the parapharyngeal space. **B**: the tumor was exposed clearly. **C**: the mandibulotomy was repaired with fixation using previously shaped miniplates.

Forty of 51 patients were followed up for a period ranging from 3 months to 6 years with a mean of 26 months. Their lower lip sensitivities were tested with a needle touch, and compared the reaction of the operated side to that on the contralateral side.

RESULTS

The tumors were exposed very clearly and resected radically in all the 51 patients (Fig. 2). The biopsy of frozen tissue section taken at the margins of resection showed free of tumor cells in the all 37 patients with malignant tumors.

An infection of the wound occurred in four cases, one of which was due to the wound dehiscence, and the other three were due to misocclusion. Reconstruction plates replaced the miniplates in 2 cases. Delayed healing of the wound was achieved with local wound care.

The X-ray films showed well-healed areas at the ends of segments about six months after the operation. We did not detect any mal-union or non-union, and the intra-oral views showed excellent tongue shape and mobility. The occlusion was good. No teeth were lost as a result of osteotomy. No limitation for opening mouth occurred. Five patients, however, did report slight numbness in the lower lip, which disappeared within six months. Among the nine patients who received postoperative radiotherapy, no mandibular radionecrosis occurred.

Among the 40 patients who were followed up from 3 months to 6 years, 29 showed the tumor recurrence free, and 10 experienced tumor recurrence. A distant metastasis occurred in 1 case. Five patients died of the recurrent carcinoma, while the other 6 patients were alive with carcinoma.

DISCUSSION

Tongue base and parapharyngeal space tumors present the maxillofacial or head and neck surgeons with a challenging task, primarily because of their obscure location. Because there is no alterative therapy for the affiliated patients, the surgeon must review the advantages and disadvantages of several available surgical approaches. The options include lateral mandibulotomy,[1,2] midline mandibulotomy,[3-7] the suprahoid parapharyngeal approach,[8-10] paramedian mandibulotomy[11,12] and pre-mental foramen mandibulotomy.[14]

The location of lateral mandibulotomy is at the angle of the mandible (Fig. 3). The inferior alveolar nerve must be transected by this approach. Transecting this nerve results in denervation of the teeth distal to the mandibulotomy site, and of the chin skin. Permanent numbness of the lower lip and the chin skin is unavoidable. The mandibulotomy site is directly within the lateral portal of the radiation field. Thus healing delays and complications occur at the mandibulotomy site. For these reasons, lateral mandibulotomy is seldom used currently because of its high complication rate, especially in patients undergoing radiation therapy.[15]

The location of midline mandibulotomy is at the anterior midline of the mandible (Fig. 4). This approach requires extracting a central incisor to prevent iatrogenic injury to both central incisors in some patients. The closure of the gingival tissue

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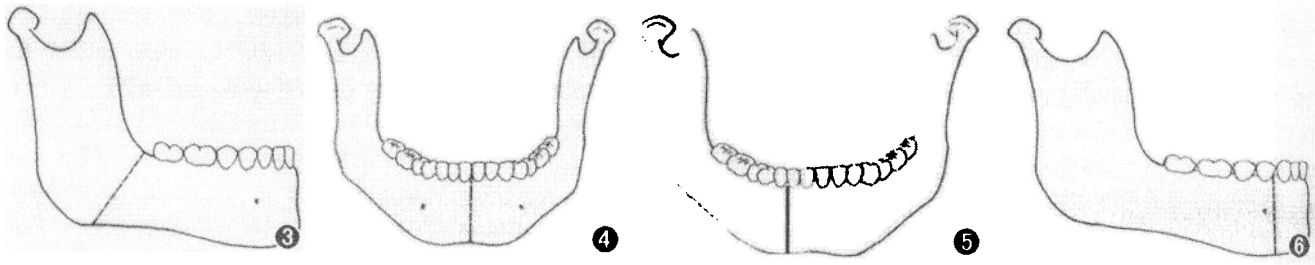

Fig. 3. The diagram of the location of lateral mandibulotomy.
Fig. 4. The diagram of the location of midline mandibulotomy.
Fig. 5. The diagram of the location of paramedian mandibulotomy.
Fig. 6. The diagram of the location of pre-mental foramen mandibulotomy.

over this extracted socket area is difficult and may result in exposed mandibular bone, which is immersed in bacteria-containing saliva that can cause wound infection. [15] This technique does not expose the tumor fully because the anterior segment remains obstructed. Transecting the muscles arising from the genial tubercle, such as the geniohyoid and the genioglossus muscles, is required. It results in delayed recovery of the swallowing function. [11] Therefore, midline mandibulotomy is also not recommended. However, for the benign, nonfiltrating tumors in the midline of the tongue base, midline mandibulotomy with midline glossotomy is the choice of surgical approach. [16]

The suprahyoid parapharyngeal approach occurs at the suprahyoid region, without mandibulotomy. Tumor exposure by this approach is limited, especially for tumors in the parapharygeal space. Muscles attaching the mandible and mouth floor tend to sustain damage, making this approach less than ideal.

The location of paramedian mandibulotomy is between the lateral incisor and the canine tooth (Fig. 5). It is a relatively reasonable approach. [15,17] However, tumor exposure is still partially obstructeded by the anterior segment.

The location of pre-mental foramen mandibulotomy is between the canine and the first pre-molar tooth (Fig. 6), and sometimes between the first and the second pre-molar teeth, depending on the position of mental foramen. This approach provides good exposure for tongue base and parapharyngeal space. It is very convenient for radical tumor resection. Because the mental nerve can be preserved, most patients in our series reported no lower lip or chin skin numbness, or the sensitivity recovered quickly. Good occlusion could be restored by fixation of the miniplates. No tooth lost as a result of osteotomy. The mandibulotomy site is outside of the radiation field center, which decreases the chances of radiotherapy-induced complications. In our series, nine cases of malignant tumors received postoperative radiotherapy. No radionecrosis of the mandible occurred. This approach facilitates the reconstruction by platysma flap, if necessary. For the above described reasons, we recommend using the pre-mental foramen mandibulotomy for resecting the tumors of tongue base and parapharyngeal space above all other alternatives.

There are some key points to performing this operation successfully. Gentle manipulation is required to avoid the damaging the mental nerve. The miniplates should be placed at the upper and lower parts of mental foramen to avoid mental nerve damage. Either a wire saw or ultra-thin high-speed power saw can avoid creating a wide space at the mandibulotomy site. A cuff of mucosa along the gingiva should be retained while the mucosa of mouth floor is incised to facilitate mucosa closure. Complete closure of the oral mucosa at the segement ends will help to prevent the wound dehiscence or the formation of fistulas.

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