VIRTUAL PLANNING APPLIED TO DOUBLE MANDIBULOTOMY FOR ACCESSING THE PLEOMORPHIC ADENOMA IN PARAPHARINGE SPACE: CASE REPORT

DUPLA MANDIBULOTOMIA VIA PLANEJAMENTO VIRTUAL PARA ACESSO DE ADENOMA PLEOMÓRFICO EM ESPAÇO PARAFARÍNGEO: RELATO DE CASO

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ABSTRACT

Tumors in the parapharyngeal space are considered a complex challenge to the surgeon, since this space is delimited by several important structures, making the access to the tumor very difficult. The mandibular branch and the mastoid process are anatomical points that restrict the surgical approach. This study aims to demonstrate, through a clinical case, the technique of double mandibulotomy to access and remove a pleomorphic adenoma in the parapharyngeal space. through 3D planning that facilitates and makes the surgical procedure faster and safer, assisting in the planning and measurement of tumor extension. The technique consists of an osteotomy in the parasymphysis region and another in the mandibular branch region, allowing the lateral and upper rotation of the fragment containing the mandibular body, enabling the three-dimensional exposure of the parapharyngeal space with preservation of the inferior alveolar nerve bundle. The mandibulotomy technique proposed in this study is effective and safe, presenting an extensive exposure of the operative field, preserving the mandibular vasculo-nervous bundle. The described technique, which was virtually planned, presented itself as a tool that facilitates the approach of tumors in the parapharyngeal space. This method has a lower risk, due to the ability to broadly expose the tumor, lows patients to exercise the mandibular function on their post-operative period, dismiss the use of maxillomandibular fixation and do not cause paresthesia.

KEYWORDS: Tumor; mandibulotomy, pleomorphic adenoma.

1. INTRODUCTION

The parapharyngeal space has a deep bilateral cervical pyramidal aspect, with the base facing the skull and its apex facing the hyoid bone. Being filled with fat and presenting laterally to the suprahyoid pharynx. The parapharyngeal space has the following anatomical boundaries: Superior boundry: a portion of the temporal bone and has 3 bony anatomical marks (scaphoid fossa, spine of the sphenoid bone and styloid apophysis) and 3 fascias (pharyngobasilar fascia, palate tensor fascia and fascia medial pterygoid); Posterior wall: fascia covering the spine and paravertebral muscles; Lateral wall: it is defined by the fascia adjacent to the medial pterygoid muscle, branch of the mandible and deep lobe of the parotid gland; Lower delimitation: composed by the posterior branch of the digastric muscle and the large horn of the hyoid bone; Medial wall: fascia over the upper constrictor muscle and the tensor and elevator muscles of the palate.

Surgery to approach the parapharyngeal space becomes complex due to the difficulty of access and because it has several vital structures are present in this space. the fascia that extends from the styloid apophysis to the tensor muscle of the palate veil. Divided this space in two compartments, wich are Masseteric space and Carotid artery space. the structures found in the spaces are: Masseteric (pre-styloid, antero-lateral), where the internal maxillary and ascending pharyngeal arteries, nerve auriculo-temporal and deep lobe of the parotid gland are located; and Carotid artery space (retro-styloid, posterolateral), where the internal carotid artery, the internal jugular vein, the cranial nerves IX, X, XI, XII, cervical sympathetic chain, glomic tissue and lymph nodes are foun[1].

Approximately 0.5% of head and neck tumors occur in the parapharyngeal space[2]. This facial compartment is surrounded and associated with anatomical structures that hinder the surgical approach. A restricted visibility of this space can cause irreparable damage to certain structures (carotid artery, internal jugular vein, cranial nerves IX, X and XII and the sympathetic chain)[3]. Moreover, a deficient surgical approach can lead to an incomplete tumour resection in this space, which would cause recurrence of the lession[4].

The access to the parapharyngeal space is limited

mainly because the mastoid process and the mandible branch delimit this space. Several techniques for accessing this space have already been proposed, such as: mandibular dislocation, division of the styloid process or the style-hyoid ligament, resection of the mastoid process and the mandibular condyle and mandibulotomies. Those techniques often did not promote a significant improvement in the visibility of the operative field and / led to the development of temporomandibular disorders[2]. However, techniques with single mandibular osteotomies, usually median, paramedian or lateral, have already been proposed and performed showing limited exposure of the parapharyngeal space and / or damage to the mandibular vasculo-nervous bundle[4].

The double mandibulotomy technique was introduced in 1984. The use of the two osteotomies allows a broader access and protection to the inferior alveolar vasculo-nervous bundle, which remains in the trans-surgical area completely contained in the osteotomized and mobilized mandibular segment. When compared to the previously mentioned techniques, it was presented as a low morbidity and high exposure of the operative field method, which allowed a proper visibility for surgical excision in tumors in the parapharyngeal space[5].

This work aims to demonstrate, through a clinical case, the double mandibulotomy technique through virtual planning, to access the parapharyngeal space, aiming at the surgical excision of a pleomorphic adenoma.

2. CASE REPORT

A 34-year-old white male patient sought care at a private clinic, reporting a lesion in the throat, with a two-month evolution. This patient had consulted with an otorhinolaryngologist before and had undergone a procedure that made an incision in his throat. After the procedure, the doctor requested an image exam, and the patient was referred to the Head and Neck Surgery specialist. He denied any allergies, habits, or personal and family history. The intraoral clinical examination showed a bulging in the right lateral wall of the oropharynx, associated with an oblique scar from previous surgical manipulation. In an extraoral evaluation, there were no changes. The X-ray computed tomography of the neck revealed a suprahyoid mass on the right, which was in the parapharyngeal space measuring 4.7 x 3.2 x 4.1 cm, coronal section of the tomography, the tumor causes a bulging in the larynx and extends to the base of the skull The radiologist mentioned some possible diagnoses, which were Schwnnoma, meningioma, paraganglione and adenopathy (Figure 1).

In 3D planning, it is possible to observe the superior extension of the tumor and optimizes the surgical planning (Figure 2)

Figure 1. Coronal section of the tomography, it can be seen that the tumor causes a bulging in the larynx and extends to the base of the skull.

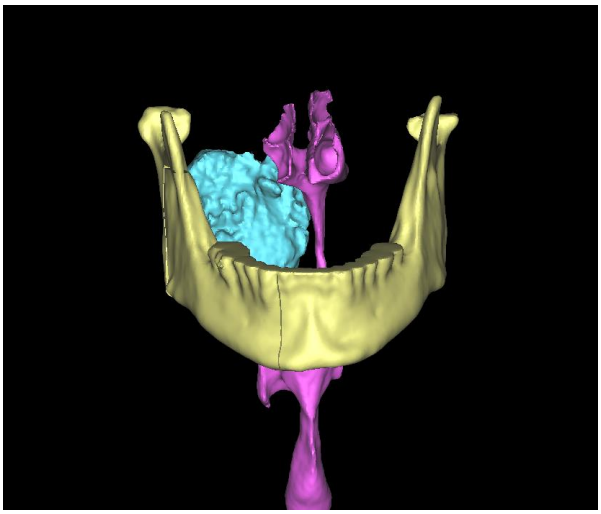

Figure 2. Can be observed in 3d measuremen suprahyoid mass on the right, located in the parapharyngeal space.

The proposed treatment was surgical resection using the transcervico-submandibular approach associated with mandibulotomy. A virtual planning was performed with tumor measurement and osteotomy planning for double mandibulotomy, where a vertical osteotomy was planned in the right mandibular posterior branch to the mandibular foramen and one in the parasymphysis region on the same side, anterior to the mental foramen. (Figure 3).

The surgical approach was performed through a cervical access to reach the body, the mandibular branch, and deep cervical spaces, already prefixing the titanium plates in order to delimitate the mandibular osteotomies (Figure 4).

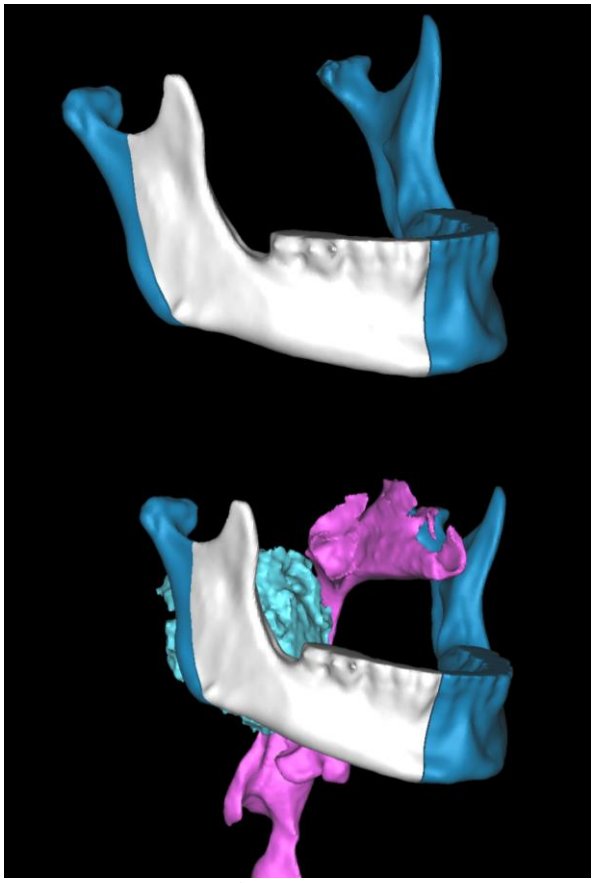

Figure 3. Virtual planning for double mandibulotomy.

The fixation plates were removed, the osteotomies were completed (Figure 5) and the osteotomized bone segment was mobilized in the latero-superior direction, exposing the entire tumor mass (Figure 6).

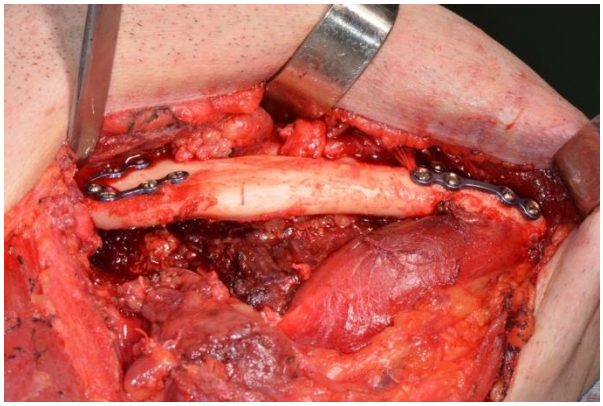

Figure 4. Cervical access to the body and mandibular branch and deep cervical spaces. Prefixation of 2.0mm system titanium plates to delimitate osteotomies without bone mobilization.

The osteotomized fragment was mobilized in lateral and upper directions, containing the mandibular vasculo-nervous bundle. After the tumor resection, a mandibular osteosynthesis was performed using the approach that was previously established (Figures 6 and 7). As a result, there was complete exposure of the tumor in the parapharyngeal space, allowing its entire excision. The tumor fragment was sent for anatomopathological exams which revealed a Pleomorphic Adenoma.

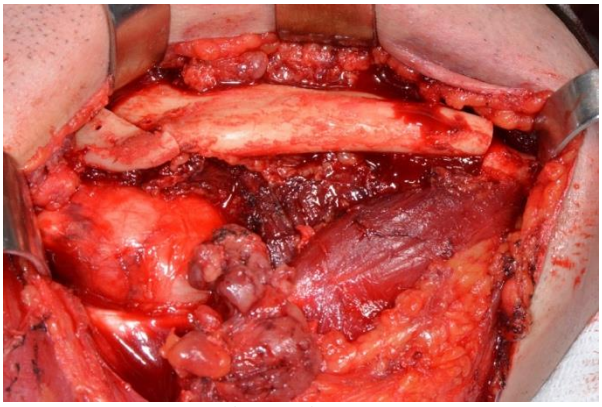

Figure 5. Osteotomies performed after romoving the plaque.

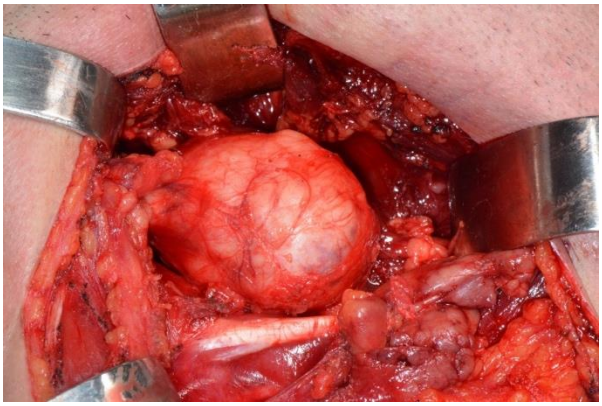

Figure 6. Complete tumor exposure.

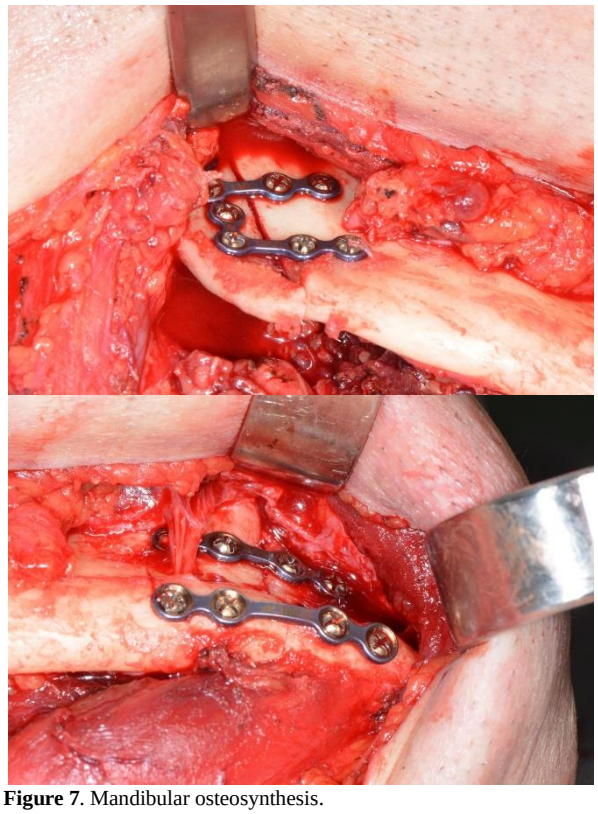

Figure 7. Mandibular osteosynthesis.

3. DISCUSSION

The parapharyngeal space is a complex area and a

wide range of tumors in this space can be formed, the most common are salivary glands (50%), followed by neurogenic tumors (20%)[6]. Pleomorphic adenoma is the most frequent tumor in the parapharyngeal space, and the most frequent neurogenic tumor is Schwannoma, usually from the vagus nerve or the sympathetic chain[7].

There are other less common tumors in this space, such as hemangiomas, lymphangiomas, lipomas, branchial cysts, teratomas, lymphomas or chondrosarcomas. Most of the tumors in the parapharyngeal space are benign. The most common tumors found in the parapharyngeal space are pleomorphic adenomas (58.1% of benign tumors and 47.4% of total tumors)[8]. According to Olsen and his collaborators[6], this figure is higher than the 25% and 40% claimed by Hughes and collaborators[7].

Since these lesions grow slow, they can develope for a long time before the symptoms appear. When the symptoms appear, in most cases, the tumor in the parapharyngeal space has already reached at least 3cm[9], being able to promote an intraoral submucosa tumecfation that displaces the lateral pharyngeal wall, amygdala and soft palate anteromedially, which could be mistaken for tonsillites infecction or amygdalar tumor[6].

In general, a contrast enhanced computed tomography is used to evaluate these lesions and analyze the vessels involved in the lesion. Angiography, or, ideally, magnetic resonance angiography (MRI) or CT angiography can be performed when there is a suspicion of involvement of the carotid artery or of highly vascularized tumors, such as paragangliomas. A fine needle aspiration (FNA) is more appropriate for confirming pleomorphic adenomas since neurogenic tumors are too acellular to provide ideal tissue for study[1]. The incisional biopsy should always be avoided due to the risk of spreading the tumor[10].

Once the difficulty of accessing the parapharyngeal space is known, treatment with a reverse planning begins, beforehand the surgical procedure. The mandibular osteotomies are planned before the operation (during the patient's pre-op exams) by some clinical radiographic examinations and/ or virtual planning program. Some mandibulotomies have already been proposed on the studies, usually a single osteotomy was used, which did not allow a good tumor exposure and consequently an incomplete removal of the lesion, which would lead to a higher rate of recurrences. The double mandibulotomy was first described by Attia et al in 1984. This approach enabled a greater exposure of the tumor mass, allowing its complete removal and preserving the inferior alveolar vasculo-nervous bundle.

The use of two osteotomies instead of only one allows the displacement of the superior and lateral mandibular segment without damaging the temporomandibular joint and permits a better access to the superior and medial directions tumors with extensions, as well as in depth in the parapharyngeal space[3]. As well as we advocate in the proposed treatment, after the osteotomies, we mobilized the mandibular segment without having a vascular and nerve damage.

The mandibulotomy associated with the cervical or cervical-parotid route increases the tumor exposure and it is appropriate for extremely bulky tumors, tumors that extend to the base of the skull, (as shown on this reported case), malignant tumors, previously operated or irradiated patients, or for highly vascular lesions8. This pathway may have complications such as malocclusion, teeth loss or temporomandibular joint dysfunction, which was not evidenced in the presented case. The use of mandibulotomy, however, is only necessary in less than 10% of cases[1,11].

On the research developed by Correia *et al* (2016)[8], the mandibulotomy was used in 5.7% of primary tumors, 2 malignant cases (a post-styloid sarcoma that extended to the infratemporal region and a pre-styloid ex-pleomorphic adenoma carcinoma). It was also the necessary way for the excision of 2 recurrent tumors, both benign (pleomorphic adenomas). Biedlingmaier and Ord (1994)[12] described three cases using a modified double mandibulotomy, characterized by a vertical osteotomy in the parasymphysis, anterior to the mental foramen, and a horizontal osteotomy in the branch, above the mandibular foramen. A. The most significant technique modification they used was the introduction of the use of rigid internal fixation for osteosynthesis. The case reported in this article shows that the osteosynthesis with titanium plates and screws is indispensable, once the mandibular function returns immediatly after the surgery, when the patient is still on the post-operative period, dismissing the need of a maxillomandibular fixation.

4. CONCLUSION

The dual mandibulotomy proved to be an efficient method for accessing the parapharyngeal space. Virtual planning, 3D printing of the jaw and prior planning of the surgery with surgical guidebooks allow us to optimize the surgical time. It is possible to observe a wide and complete tumor exposure, which permitted its complete surgical excision and reduced the risk of recurrence. The mandibular vascular nervous bundle was preserved, and contained in the mobilized fragment, making the procedure even safer.

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