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Case Report

A giant trigeminal schwannoma of the infratemporal fossa removed by transmandibular approach and coronoidectomy ☆

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ABSTRACT

The whole spectrum of infratemporal fossa (IF) tumors comprises both intra- and extracranial tumors. Schwannomas are benign nerve tumors arising from the Schwann cells. Approximately 25%-45% of schwannomas occur in the head and neck region. The lesions commonly arise from the roots of cranial and cervical nerves in the parapharyngeal space, with the majority originating from the vagus nerve. Trigeminal schwannomas account for about 0.2% of all intracranial tumors, and 0.8% and 8% of intracranial schwannomas. Trigeminal schwannomas are commonly located in the intracranium. Exclusive extracranial trigeminal schwannoma are exceptional lesions that may also involve the maxillary sinus, the orbit, and the parapharyngeal space. Schwannomas of the head and neck can originate from any section of the fifth cranial nerve, from the root to the distal extracranial branches, but the majority develops at the Gasserian ganglion, usually growing in the middle cranium. Schwannomas arising primarily within the IF, without intracranial extension, are extremely rare. Many approaches were described for extracranial trigeminal schwannomas originating from the skull base, such as transmaxillary approach, or Le Fort I type I osteotomy, or facial translocation approach, or infratemporal approach, or transmandibular transcervical approaches. We present a case of voluminous extracranial schwannoma, arising from the extradural divisions of the trigeminal nerve, extending in the IF and parapharyngeal space, treated via a transmandibular approach. The literature regarding extracranial schwannomas of the IF and parapharyngeal space, and their approaches are reviewed.

1. Introduction

The whole spectrum of infratemporal fossa (IF) tumors comprises both intra- and extracranial tumors.

Schwannomas are benign nerve tumors arising from the Schwann cells. Approximately 25%-45% of schwannomas occur in the head and neck region. The lesions commonly arise from the roots of cranial and cervical nerves in the parapharyngeal space, with the majority originating from the vagus nerve [1,2].

Schwannoma is a benign, slow growing encapsulated tumor that originates from the Schwann cells sheathing peripheral motor, sensory, and cranial nerves, except first and second cranial nerve.

First described as a separate entity by Verocay in 1910 [3], they have been reported in almost every part of the body.

Trigeminal schwannomas account for about 0.2% of all intracranial tumors, and 0.8% and 8% of intracranial schwannomas [4,5]. Trigeminal schwannomas are commonly located in the intracranium [6]. Exclusive extracranial trigeminal schwannoma are exceptional lesions that may also involve the maxillary sinus, the orbit, the parapharyngeal space [7].

Schwannomas of the head and neck can originate from any section of the fifth cranial nerve, from the root to the distal extracranial branches, but the majority develops at the Gasserian ganglion, usually growing in the middle cranium.

Schwannomas arising primarily within the IF without intracranial extension are extremely rare.

Many approaches were described for extracranial trigeminal schwannomas originating from the skull base, such as transmaxillary approach, or Le Fort I type I osteotomy, or facial translocation approach, or infratemporal approach, or transmandibular transcervical approaches.

We present a case of voluminous extracranial schwannoma, arising from the extradural divisions of the trigeminal nerve,

☆ All authors held their respective degrees at the date of first submission.

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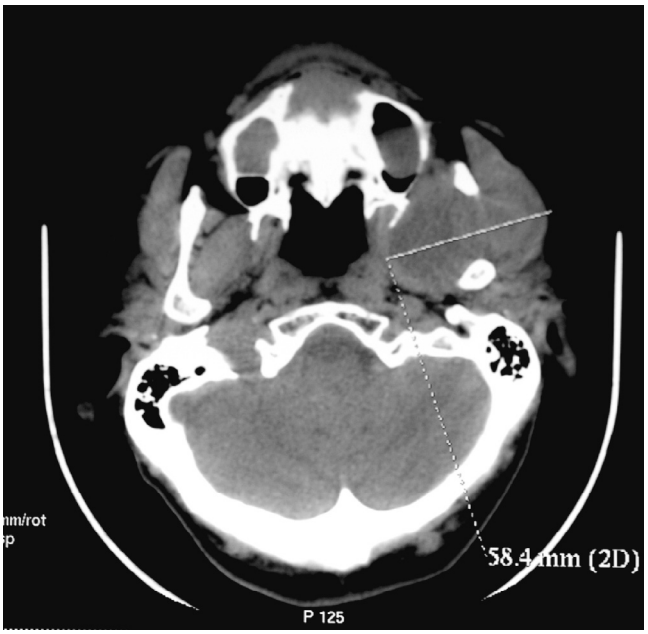

Figure 1. An axial postcontrast computed tomography scan shows that the tumor has grown in the left infratemporal fossa, extending laterally through the mandibular notch.

extending in the IF and parapharyngeal space, treated via a transmandibular approach and coronoidectomy.

2. Presentation of case

A 63-year-old woman presented with a 6 months' history of swelling in the left lateral face.

On examination, a mass was localized in the left preauricular region. There was no evidence of uvular deviation or palpable mass in the retromandibular area. There was hypoesthesia in the distribution of the mandibular division of the trigeminal nerve. Full-mouth opening was 3.5 cm and moderate tenderness developed on palpation of the left temporomandibular joint area.

A complete physical examination did not reveal any cutaneous manifestations of neurofibromatosis.

A cranial computed tomography scan demonstrated a discrete, well-circumscribed, homogeneously enhancing mass of the IF extending inferiorly in the parapharyngeal space and, laterally, through the mandibular notch (Figure 1).

An open biopsy preoperatively diagnosed the lesion as a benign schwannoma.

The lesion was planned to be removed via a transmandibular approach in consideration of its location and the patient's symptoms. This approach can be considered a modified Yumoto's [8] approach.

The surgical approach started with a labiotomy. The skin incision continued down to the chin and curved downward across the neck and up in front of the ear. A modified Blair's incision combined with horizontal incision in the skin crease was made two fingers breadth below the mandible (Figure 2). A subplatysmal flap was elevated. The submandibular gland was retracted, and the angle and parts of the mandible were exposed. A mucosal incision was made proceeding posteriorly along the lower gingivolabial sulcus. The incision crossed the ascending ramus of the mandible and ended close to the pterygoid hamulus. Soft tissues including skin, the parotid gland, and the masseter muscle were elevated from the mandible

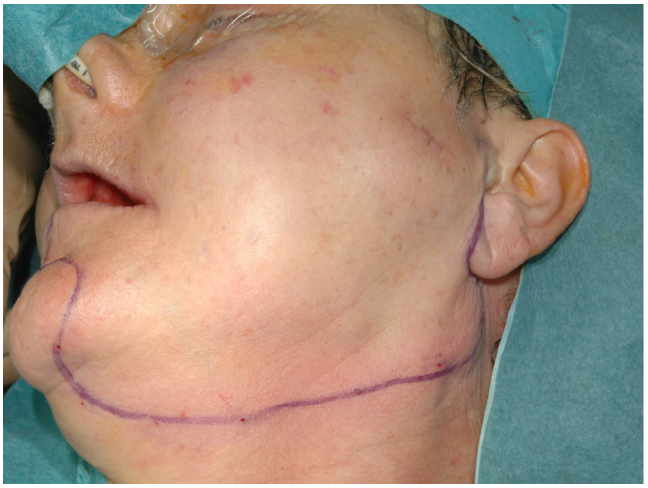

Figure 2. Intraoperative photograph showing the surgical approach.

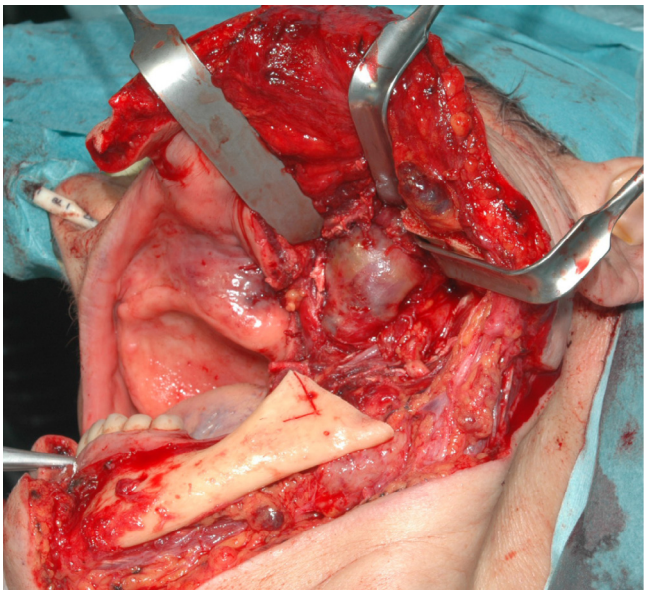

Figure 3. Intraopertative photograph of the tumor mass after the cut of the mandible at the level of the angle. The ascending ramus is retracted upward.

and retracted upward. This step preserved the facial nerve. After the coronoidectomy, the mandible was cut at the level of the angle. The ascending ramus was then retracted upward. Resection of the coronoid process facilitated mobility of the ascending ramus and increased the surgical exposure (Figure 3). A well-defined bilobate mass was identified. The origin site of the lesion was identified to be the mandibular branch of the trigeminal nerve. The mass was well encapsulated end measured 6.5×3 cm after removal (Figure 4).

The retracted ascending ramus assumed its original position and was fixed by two miniplates and screws (prepared with pre-plating techniques before mandibular osteotomy). Occlusion was managed with temporary intermaxillary fixation with four intermaxillary fixation screws and wire, and with the pre-plating of the two plates before the osteotomy.

The histopathology was consistent with a benign schwannoma. The histologic examination revealed a spindle-celled proliferation with nuclear palisading and Verocay-body formation.

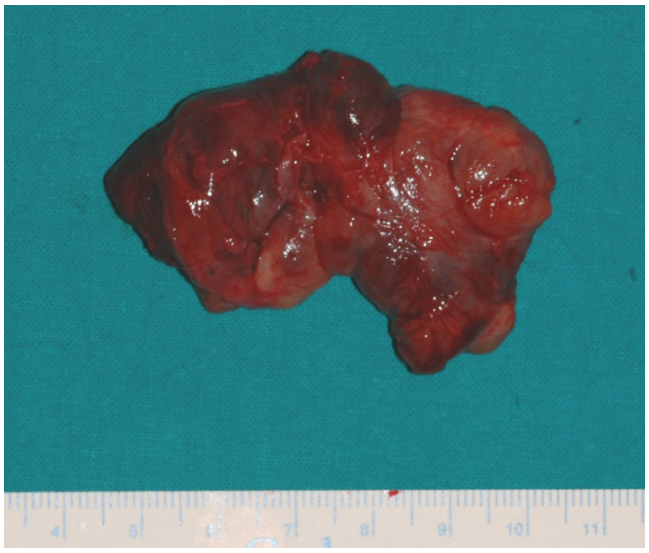

Figure 4. Surgical specimen.

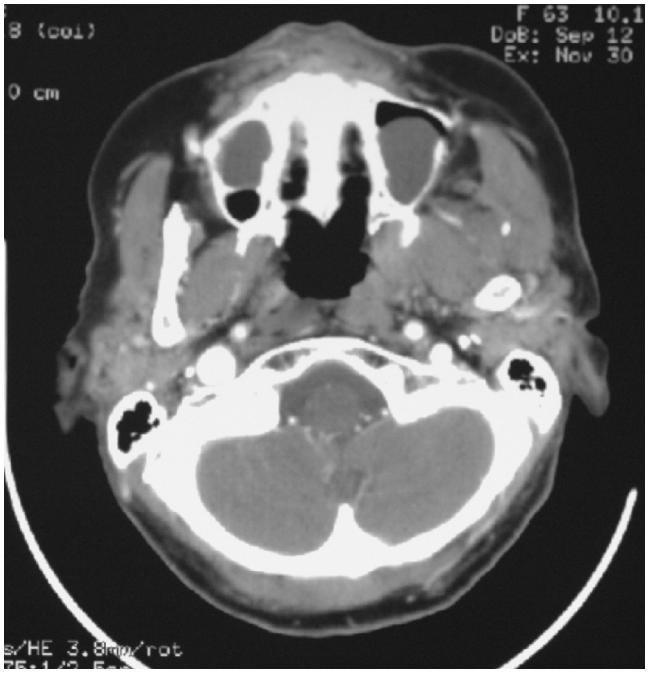

Figure 5. Computed tomography scan of the patient 2 years after surgery.

Postoperatively, the patient was free of symptoms, except for the paresthesia due to the mandibular division and discharged on day 4 after the operation with no complications. Mandibular function was restored after 1 month, with an asymptomatic full-mouth opening of 4 cm.

The patient has been followed up 2 years after the surgery with no evidence of tumor recurrence (Figure 5).

3. Discussion

The IF is a quadrangular space that has its base anteriorly, behind the maxilla, and it has its apex posteriorly at the styloid process. The parapharyngeal space arises from the skull base, at the origin of the styloid process and has its apex toward the greater cornu of the hyoid bone.

The IF contains different structures embedded in fat: the mandibular nerve and its branches, the pterygoid muscles and venous plexus, the sphenomandibular ligament, the maxillary artery, and the chorda tympani nerve. It is an open space behind the maxilla that communicates with the temporal fossa through a wide opening under the zygomatic arch. The anterior wall of the fossa is the posterior part of the maxilla. Superior, to the anterior wall, between it and the great wing of the sphenoid, is the inferior orbital fissure, through which the IF communicates with the orbit. The roof of the fossa is the surface of the greater wing of the sphenoid. The medial wall is the lateral pterygoid plate and the pterygo-maxillary fissure, through which the IF communicates with the pterygo-palatine fossa (a medial extension of the IF). The superior constrictor muscle separates the medial wall of the fossa from the nasopharynx. The posterior border is formed by the styloid process ant its muscles. The styloid apparatus separates the IF from the parapharyngeal space. The lateral wall is the vertical ramus of the mandible with its coronoid process [9].

The upper gingivobuccal sulcus forms the floor of the anterior side of the IF. Tumors of the IF can be palpated in this region, as in the case reported in this paper.

Only few cases of extracranial schwannomas of the IF have been reported up until now [6,7,10–14].

Trigeminal schwannomas have been reported in association with neurofibromatosis [15,16]. These include bilateral trigeminal schwannomas, plexiform schwannomas of the trigeminal nerve, and as a component of forme fruste presentation of neurofibromatosis [7].

The retromaxillary or pterygomandibular region appeared to be the most likely site for malignant variant of schwannoma [17].

Several surgical approaches are considered in relation to the size and site of the neoplasm [18].

For decades, the prognosis of these tumors has been poor due to the difficulty of total tumor removal.

Surgical approaches to this region vary depending on the anatomic location, on the extent of the tumor, and on the surgeon.

Schwannomas of the IF can be successfully treated by complete surgical excision. These lesions are located in an area that is difficult to reach, and several different approaches have been described, as transcranial, anterior, and lateral routes. The transcranial approach is a frontotemporal or subtemporal route through a craniotomy and a zygomatic osteotomy. This procedure is extradural and indicated for treatment of tumors with an extension to the middle cranial fossa [7].

The anterior route is a combination of a transmaxillary approach and a transmandibular approach with a median or paramedian osteotomy of the mandible. The surgical exposure of the anterior approaches can be increased by a Weber-Fergusson incision with maxillotomy [14]. The lateral approach is a transparotid approach with the dissection of the gland and the facial nerve. This route has several limitations of difficulty in exposure of the upper part of the IF and of the risk of facial nerve injury.

A transmandibular approach was described in 1984 [19] for the removal of an angiofibroma of the pterygomaxillary fossa and lateral parapharyngeal space, but it implicated a double osteotomy of the mandible, involving the teeth-bearing area.

Other approaches are inferior, extradural zygomatic middle fossa approach, subtemporal infratemporal approach, and orbitozygomatic extradural approach [20].

Le Fort type I osteotomy, transpterygoid plate approach, and facial translocation approach can expose adequately the middle and anterior margins of the tumor, but these approaches are more invasive.

4. Conclusion

The schwannoma of present case was completely removed by a transmandibular approach.

The use of the cervical approach with a single mandibulotomy provides good access to the upper and lower part of parapharyngeal schwannomas, when alveolar nerve preservation is not required because the third trigeminal nerve branch will be resected with the tumor.

Using the reported technique, it is possible to avoid osteotomies in the teeth-bearing area, with no risk to the dental elements. Distraction of the proximal ramus after a mandibular osteotomy and resection of the coronoid process resulted in wide field exposure.

A transmandibular approach with coronoidectomy offers a wide operative field, making it possible to easily manage large blood vessels and cranial nerves. With this approach, the operative field is directly close to the surgeon's hand compared with anterior or other approaches.

Resection of the coronoid process facilitated mobility of the ascending ramus and increased the tumor exposure, and prevented postoperative trismus.

The transmandibular approach is indicated for extracranial schwannomas of the IF extending to the parapharyngeal space.

Consent

Written informed consent was obtained from the patient(s) for publication of this case report and case series and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Conflict of interest

The authors declare there are no conflicts of interest.

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