

# Unexpected Carotid Body Paraganglioma Encountered During Modified Radical Neck Dissection for Buccal Mucosa Squamous Cell Carcinoma: A Diagnostic Pitfall in Oncologic Neck Surgery

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**Abstract:** Carotid body tumors (CBTs) are uncommon paragangliomas arising from specialized chemoreceptor tissue located at the carotid bifurcation. Because of their marked vascularity and characteristic anatomical location, they are usually identified on preoperative imaging. However, smaller lesions may occasionally remain undetected and may be encountered unexpectedly during surgical exploration of the neck. We present the case of a 68-year-old female who underwent composite resection with modified radical neck dissection for squamous cell carcinoma of the buccal mucosa. Preoperative contrast-enhanced computed tomography demonstrated cervical lymphadenopathy but did not reveal any vascular lesion. During neck dissection, a well-circumscribed pulsatile mass was identified at the carotid bifurcation. The lesion was meticulously dissected in the subadventitial plane and excised without vascular injury. Histopathological examination together with immunohistochemistry confirmed a carotid body paraganglioma (Shamblin grade I). This case highlights the potential for occult carotid body tumors to mimic nodal disease during oncologic neck surgery and the diagnostic limitations of imaging, the importance of intraoperative vigilance, and key surgical and pathological considerations.

**Keywords:** Carotid body tumor; Paraganglioma; Modified radical neck dissection; Buccal mucosa squamous cell carcinoma; Intraoperative finding

## 1. Introduction

Carotid body tumors are rare neuroendocrine neoplasms that arise from paraganglionic tissue located at the bifurcation of the common carotid artery. These tumors originate from neural crest-derived cells that function as peripheral chemoreceptors responsible for sensing changes in arterial oxygen tension and blood pH [1]. Although most carotid body tumors behave in a benign manner, their proximity to major cervical vessels makes surgical management challenging.

Patients usually present with a painless slowly enlarging mass in the upper neck. Modern imaging techniques such as contrast-enhanced computed tomography and magnetic resonance imaging allow accurate preoperative diagnosis in most cases [2]. Nevertheless, small tumors or lesions masked by surrounding pathology may remain radiologically occult.

In patients with oral cavity malignancies, cervical lymphadenopathy is frequently encountered and typically represents metastatic disease. However, other lesions may occasionally be present in the same anatomical region. Recognition of rare vascular tumors such as carotid body paragangliomas is important during neck dissection because inadvertent injury can result in significant bleeding or vascular complications.

## 2. Literature Survey

Paragangliomas of the head and neck are uncommon tumors arising from extra-adrenal paraganglionic tissue. Among these, carotid body tumors represent the most frequently reported subtype [3]. The Shamblin classification system categorizes these tumors according to their relationship with the carotid vessels and remains useful in predicting surgical complexity and operative risk [4].

Due to their hypervascular nature and characteristic location, most carotid body tumors are diagnosed pre operatively through imaging studies. However, several reports describe cases in which these tumors were detected during surgical exploration of neck [5]. Such situations highlight the importance of heightened awareness of unusual vascular lesions during neck dissection and meticulous dissection to ensure safe excision.

Surgical excision remains the primary treatment modality for carotid body tumors. Subadventitial dissection is generally considered the safest operative approach because it allows separation of the tumor from the carotid vessels while preserving vascular integrity [6].

## 3. Problem Definition

During oncologic neck dissection for oral cancers, enlarged cervical lymph nodes are commonly encountered and are

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usually interpreted as metastatic disease. However, rare vascular tumors located at the carotid bifurcation may mimic nodal masses intraoperatively. If these lesions are not recognized promptly, surgical manipulation may lead to significant hemorrhage or injury to major cervical vessels. Awareness of this possibility is therefore essential for surgeons performing neck dissections.

#### 4. Methodology / Approach

A 68-year-old female presented with a non-healing ulcer involving the right buccal mucosa that had progressively increased in size over several months. The lesion was associated with mild discomfort during mastication. There was no history of bleeding from the lesion, dysphagia, trismus, or referred otalgia. The patient did not report significant weight loss or systemic symptoms. She had a long history of chewing tobacco.

Clinical examination revealed an ulcerative infiltrative lesion involving the right gingivobuccal sulcus with surrounding induration. Examination of the remaining oral cavity did not reveal additional suspicious lesions. Palpation of the neck demonstrated enlarged ipsilateral cervical lymph nodes involving levels Ib, II, III, IV and V.

Incisional biopsy confirmed moderately differentiated squamous cell carcinoma of the buccal mucosa. Contrast-enhanced computed tomography showed an infiltrative gingivobuccal lesion with mandibular erosion and multiple enlarged cervical lymph nodes without evidence of vascular abnormality [Fig. 1].

Following multidisciplinary evaluation, the patient underwent composite resection of the primary tumor with ipsilateral modified radical neck dissection.

#### 5. Results and Discussion

During nodal clearance in the upper jugular region, a small well-defined pulsatile mass measuring approximately 2 × 2.5 cm was encountered at the carotid bifurcation [Fig. 2]. The pulsatile nature and anatomical location raised suspicion of a vascular lesion rather than nodal disease. Careful subadventitial dissection was performed and the mass was excised en bloc while preserving the vascular integrity. Haemostasis was achieved, and the modified radical neck dissection was completed as planned. Postoperatively, the patient showed no signs of cerebrovascular insufficiency or haemorrhagic complications.

Gross examination of the excised lesion revealed a well-circumscribed encapsulated mass with a reddish-brown cut surface [Fig. 3]. Microscopic examination demonstrated nests and cords of tumor cells arranged in the classical **zellballen pattern**, separated by fibrovascular septa. Tumor cells showed granular cytoplasm and round nuclei with minimal mitotic activity [Fig. 4].

Immunohistochemical analysis demonstrated strong positivity for **chromogranin A** and **synaptophysin** [Fig 5.], confirming neuroendocrine differentiation. Tumor cells also showed positivity for **CD56**. Staining for epithelial markers

such as pan-cytokeratin and epithelial membrane antigen was negative. Sustentacular cells surrounding tumor nests showed characteristic **S-100 protein positivity**. The **Ki-67 proliferation index** was approximately 3–4%, consistent with a low-grade lesion.

These findings confirmed the diagnosis of **carotid body paraganglioma (Shamblin grade I)**. Similar incidental findings during neck surgery have been reported but remain uncommon [5]. Recognition of such lesions during surgery is important because appropriate surgical technique, particularly subadventitial dissection, can minimize vascular injury and improve outcomes [6].

#### 6. Conclusion

Incidental identification of a carotid body paraganglioma during modified radical neck dissection for buccal mucosa squamous cell carcinoma is uncommon. Such tumors may resemble metastatic lymph nodes and therefore present a potential surgical hazard. This case highlights the diagnostic limitations of preoperative imaging in the presence of complex cervical pathology, heightened intraoperative vigilance, early recognition, awareness of cervical vascular anatomy, careful intraoperative assessment and meticulous surgical technique which are essential to ensure safe management. Reporting such rare intraoperative encounters contributes to surgical awareness and promotes safer oncologic neck surgery.

#### 7. Future Scope

Improved imaging techniques and increased awareness among surgeons may facilitate earlier recognition of occult carotid body tumors in patients undergoing oncologic neck surgery. However, further clinical studies involving larger patient populations may help in clarifying the true incidence of such incidental findings.

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#### Conflict of Interest

The authors declare no conflict of interest.

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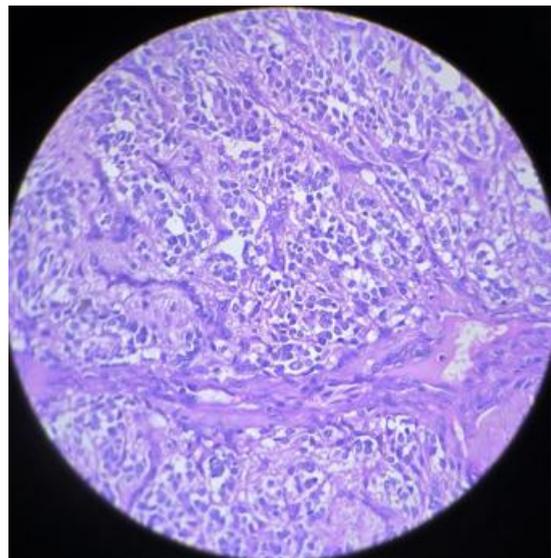
**Figure 1:** Contrast-enhanced CT scan showing right gingivobuccal lesion with mandibular erosion and associated cervical lymphadenopathy.



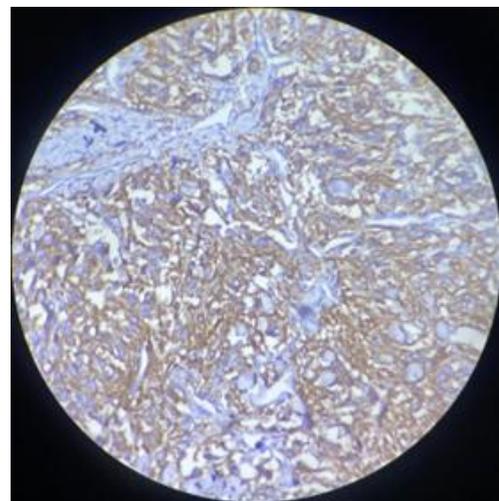
**Figure 2:** Intraoperative photograph showing a well-encapsulated pulsatile mass located at the carotid bifurcation encountered during neck dissection



**Figure 3:** Gross specimen of the excised carotid body tumor measuring approximately 2 × 2.5 cm



**Figure 4:** Histopathology (H&E stain) showing classical zellballen architecture characteristic of paraganglioma



**Figure 5:** Immunohistochemistry demonstrating synaptophysin positivity in tumor cells.