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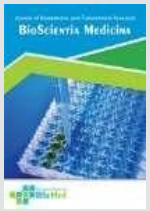

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Feasibility of Facial Nerve Preservation in Locally Advanced Parotid Squamous Cell Carcinoma Following Extended Neoadjuvant Chemotherapy: A Case Report

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A B S T R A C T

Background: Primary squamous cell carcinoma (SCC) of the parotid gland is a rare, aggressive malignancy often requiring radical parotidectomy with facial nerve sacrifice, particularly in T4b stage disease. The utility of neoadjuvant chemotherapy (NACT) in downstaging these tumors to facilitate functional nerve preservation remains controversial and under-reported in the literature. **Case presentation:** A 58-year-old male presented with a fixed, rapidly enlarging left preauricular mass classified as cT4bN2M0 (Stage IVA). The tumor involved the sternocleidomastoid muscle and encased the external carotid artery. Following a multidisciplinary tumor board decision, the patient underwent an extended course of six cycles of Paclitaxel and Carboplatin. The tumor exhibited a partial clinical response and significant central necrosis on imaging. Subsequently, a total parotidectomy was performed. Despite intraoperative fragility and adherence to deep vascular structures, the main trunk and primary divisions of the facial nerve were anatomically and functionally preserved. Histopathology confirmed high-grade SCC with perineural invasion limited to the distal excised branches, achieving clear margins. The patient received 66 Gy of adjuvant radiotherapy. At the 18-month follow-up, the patient remains disease-free with House-Brackmann Grade I facial function. **Conclusion:** Long-term facial nerve preservation is feasible in selected cases of locally advanced parotid SCC using a multimodal approach. Extended NACT may induce tumor necrosis and facilitate dissection along the neuro-vascular interface, provided that perineural invasion does not involve the main nerve trunk.

1. Introduction

Salivary gland neoplasms represent one of the most complex and heterogeneous groups of tumors in head and neck oncology. While they constitute a relatively small fraction of the overall oncologic burden—accounting for approximately 3 to 5 percent of all head and neck cancers—their pathological diversity is immense. The World Health Organization currently recognizes over 20 distinct malignant histological subtypes, each exhibiting unique biological behaviors, growth patterns, and prognostic implications.[1] Within this diverse spectrum, primary squamous cell carcinoma (SCC) of the parotid gland stands out as an exceptionally rare and aggressive clinical entity. It represents fewer than 1 percent of all salivary neoplasms, making it a diagnosis of significant rarity and clinical challenge. The distinction between primary parotid SCC and its metastatic counterpart is of paramount importance.[2] The parotid gland contains a rich network of intraglandular and paraglandular lymph nodes that serve as the primary drainage basin for the skin of the temporal region, scalp, and upper face. Consequently, the vast majority of squamous cell carcinomas

identified within the parotid parenchyma are metastatic deposits from cutaneous primaries, particularly in geographic regions with high ultraviolet radiation exposure. In contrast, primary parotid SCC is a diagnosis of exclusion. It is defined by the presence of invasive squamous cell carcinoma within the gland in the absence of a history of cutaneous SCC, mucosal lesions of the upper aerodigestive tract, or distant primary tumors. Unlike low-grade salivary malignancies such as acinic cell carcinoma or low-grade mucoepidermoid carcinoma, which may exhibit an indolent growth pattern over years, primary parotid SCC is characterized by rapid doubling times, aggressive local infiltration, and a high propensity for both regional lymph involvement and perineural invasion.[3]

The management of malignancies in this region is inextricably linked to the intricate anatomy of the facial nerve (Cranial Nerve VII).[4] The nerve exits the stylomastoid foramen and enters the substance of the parotid gland, dividing it into superficial and deep lobes before branching into the pes anserinus. This anatomical relationship creates the single most significant dilemma in parotid oncologic surgery: the balance between oncologic radicality and functional preservation. In early-stage disease, where the tumor is confined to the superficial lobe and is spatially distinct from the nerve trunk, nerve-sparing parotidectomy is the standard of care. However, the clinical landscape changes drastically in the presence of advanced-stage disease. The American Joint Committee on Cancer (AJCC) classifies tumors as T4a when there is invasion of the skin, mandible, ear canal, or facial nerve, and T4b when the tumor encases the carotid artery or involves the skull base. In these locally advanced scenarios, particularly Stage IVA (T4b) disease, the tumor often creates a dense, infiltrative mass that adheres to or encases the facial nerve branches.[5]

The traditional surgical dogma, supported by current National Comprehensive Cancer Network (NCCN) guidelines, generally advocates for radical parotidectomy in these instances. This procedure involves the complete resection of the parotid gland along with the facial nerve to achieve clear oncologic margins (R0 resection). The rationale is grounded in the principle that leaving microscopic disease on the nerve sheath significantly increases the risk of local recurrence, which in high-grade SCC is often fatal.[5] However, the consequences of facial nerve sacrifice are immediate and devastating. The resulting dense hemifacial paralysis leads to significant functional morbidity, including lagophthalmos and exposure keratopathy due to the inability to close the eye, oral incompetence leading to drooling and difficulty with mastication, and profound speech articulation deficits. Beyond the physical sequelae, the psychological impact is severe. The loss of facial expression affects non-verbal communication and self-image, frequently leading to social isolation and severe depression. Consequently, the primary objective of modern parotid oncologic surgery has shifted toward the achievement of complete resection with negative margins while preserving facial nerve function whenever it is oncologically safe to do so.[6]

The current standard of care for high-grade parotid malignancies involves radical surgery followed by adjuvant radiotherapy or chemoradiation. While this approach provides locoregional control rates ranging from 50 to 70 percent, it often comes at the cost of the facial nerve in T4 disease. Furthermore, a subset of tumors presents as fixed, massive lesions that are deemed borderline resectable. In these cases, upfront surgery may necessitate extensive mutilation, including the sacrifice of the facial nerve, the sacrifice of the skin requiring flap reconstruction, and the potential sacrifice of the mandible, often with close or positive margins despite these aggressive measures. This clinical reality highlights a critical gap in the therapeutic armamentarium: the lack of effective strategies to downstage large, infiltrative tumors prior to surgical intervention. In other subsites of the head and neck, such as the larynx, hypopharynx, and oral cavity, the use of induction or neoadjuvant chemotherapy (NACT) is a well-recognized strategy for organ preservation.[7] Large randomized trials have

demonstrated that induction chemotherapy can reduce tumor volume, allowing for larynx-preserving strategies without compromising survival. However, the role of NACT in salivary gland malignancies remains ill-defined and is not currently considered standard practice.

Historically, salivary gland tumors have been regarded as chemo-resistant. This perception stems largely from the study of adenoid cystic carcinoma and other low-grade histologies, which grow slowly and exhibit poor sensitivity to cytotoxic agents that target rapidly dividing cells. Standard chemotherapy regimens have typically been reserved for the palliative setting in recurrent or metastatic disease, with modest response rates. However, it is biologically inaccurate to group high-grade primary parotid SCC with slow-growing salivary adenocarcinomas. Primary SCC shares a histomorphological and molecular profile more akin to mucosal squamous cell carcinoma, characterized by high mitotic indices and rapid cellular turnover.[8]

Emerging evidence in the recent decade suggests that high-grade salivary malignancies may indeed exhibit sensitivity to platinum-based chemotherapy regimens. Specifically, the combination of taxanes (such as Paclitaxel or Docetaxel) and platinum agents (Cisplatin or Carboplatin) has shown promise. Taxanes function by stabilizing cellular microtubules, preventing the disassembly of the mitotic spindle, which leads to cell cycle arrest at the G2/M phase and subsequent apoptosis. Platinum agents act as alkylating-like agents, forming DNA cross-links that inhibit replication. The theoretical benefit of applying this regimen in the neoadjuvant setting for T4b parotid SCC is two-fold. First, the primary goal is cytoreduction. By reducing the physical volume of the tumor, NACT may convert a fixed, technically unresectable tumor into a resectable one, or convert a tumor requiring radical sacrifice into one amenable to function-sparing surgery. Second, and perhaps more importantly regarding the facial nerve, is the concept of peripheral sterilization. T4b tumors often exhibit microscopic infiltrative fingers that track along the path of least resistance, which in the parotid gland is the facial nerve sheath.[9] Upfront surgery requires a wide margin to encompass these microscopic extensions, necessitating nerve sacrifice. A robust response to neoadjuvant chemotherapy may induce necrosis and fibrosis at the tumor periphery. This biological response could theoretically sterilize the microscopic interface between the tumor and the nerve epineurium, allowing the surgeon to dissect the tumor off the nerve (peeling) with a higher degree of safety and a lower probability of leaving viable tumor cells behind.

Despite the biological plausibility, the use of NACT in parotid carcinoma is typically limited to 2 or 3 cycles in the few reports that exist. There is a paucity of data regarding extended neoadjuvant protocols.[10] The rationale for extending the duration of chemotherapy is to maximize the cytoreductive effect in massive T4b tumors, pushing the tumor to maximum response prior to surgical intervention. This approach mimics the curative-intent chemotherapy courses used in nasopharyngeal or definitive non-surgical head and neck protocols, but uses them as a bridge to surgery rather than a replacement for it. The investigation of such aggressive multimodal protocols is essential because the alternative—universally sacrificing the facial nerve in T4 disease—is a morbidity that significantly degrades the quality of survivorship. If a pharmacological intervention can render the tumor separable from the nerve without compromising oncologic safety, it represents a paradigm shift in the management of this rare disease.

This study aims to evaluate the efficacy and safety of an extended multimodal treatment protocol integrating six cycles of Paclitaxel and Carboplatin, radical surgery, and adjuvant radiotherapy in the management of Stage IVA High-Grade Parotid SCC. The novelty of this report lies in the successful long-term functional preservation of the facial nerve in a T4b tumor, challenging the traditional dogma of inevitable nerve sacrifice in cases of extensive deep lobe and extracapsular involvement.

2. Case Presentation

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images. A 58-year-old male presented to the Otorhinolaryngology-Head and Neck Surgery outpatient clinic with a rapidly enlarging, painful mass in the left preauricular region extending to the angle of the mandible. The mass had been present for four weeks. Prior to presentation at our tertiary center, the patient was treated at a regional hospital for a presumed parotid abscess. He underwent incision and drainage, which yielded no purulence, and was treated unsuccessfully with multiple courses of antibiotics and corticosteroids. The patient denied a history of prior skin cancer, radiation exposure, or immunosuppression. A thorough dermatological examination of the scalp, face, and external ear canal was performed to rule out a cutaneous primary, revealing no suspicious lesions.

Clinical assessment revealed a hard, fixed, non-fluctuant mass measuring approximately 4 by 5 cm involving the left parotid gland, fixed to the underlying masseter and sternocleidomastoid (SCM) muscle. The skin overlying the tumor was erythematous and indurated but not ulcerated. Critically, facial nerve function was intact bilaterally (House-Brackmann Grade I). The patient demonstrated full ocular closure and symmetrical oral competence. Palpation of the neck revealed multiple enlarged, hard lymph nodes in the ipsilateral Level IIa and IIb regions (Table 1).

A contrast-enhanced computed tomography (CECT) scan of the Head and Neck demonstrated an aggressively enhancing, infiltrative mass in the left parotid gland measuring 4.2 by 3.8 by 5.1 cm. The tumor exhibited the following T4b features: (i) Encasement of the left external carotid artery more than 180 degrees; (ii) Infiltration of the anterior border of the SCM muscle; (iii) Abutment of the mastoid tip and styloid process; (iv) Loss of fat planes with the posterior belly of the digastric muscle. To complete distant metastatic staging, a CECT of the Thorax and Abdomen was performed. This confirmed no evidence of pulmonary or hepatic metastases. Incidental bilateral thyroid nodules classified as TIRADS 3 were noted. An ultrasound-guided fine needle aspiration (FNA) was performed, confirming benign colloid nodules (Bethesda II), ruling out metastatic thyroid carcinoma.

Core needle biopsy revealed infiltrative nests of atypical epithelial cells with keratin pearls and intercellular bridges. The tumor cells exhibited hyperchromatic nuclei and high nuclear-to-cytoplasmic ratios. Based on these morphologic features and the absence of a cutaneous primary, a diagnosis of primary squamous cell carcinoma was made. Immunohistochemical staining was not performed due to resource limitations in our setting, but the classic histomorphological features were diagnostic. Final clinical stage was cT4b N2b M0 (Stage IVA - AJCC 8th edition).

The therapeutic management of this patient was dictated by the formidable anatomical constraints imposed by the Stage IVA (cT4b) status of the tumor. The defining feature of the disease—encasement of the external carotid artery system and gross infiltration of the sternocleidomastoid muscle—presented a significant oncologic barrier. In standard surgical algorithms, such extensive involvement typically mandates a radical parotidectomy with the *en bloc* sacrifice of the facial nerve to ensure clear margins. However, given the patient's intact facial function (House-Brackmann Grade I) and strong psychological motivation to avoid permanent hemifacial paralysis, the Multidisciplinary Tumor Board (MDT) convened to formulate a functional preservation strategy (Table 2). The consensus was to initiate a neoadjuvant chemotherapy (NACT) protocol, a strategy less commonly employed in salivary gland malignancies compared to mucosal head and neck cancers, but one with increasing evidence of efficacy in high-grade squamous cell carcinomas.

Table 1. Summary of Clinical Findings on Admission

PARAMETER	CLINICAL FINDING / DESCRIPTION
PATIENT DEMOGRAPHICS & HISTORY	
Age / Sex	58 Years / Male
Chief Complaint	Rapidly enlarging left preauricular mass (Duration: 4 weeks)
Associated Symptoms	Local pain; Rapid growth
Prior Management (External)	Misdiagnosed as abscess; Failed Incision & Drainage; Failed antibiotics (Clindamycin) and Corticosteroids
Relevant History	No history of cutaneous malignancy; No prior radiation exposure
PHYSICAL EXAMINATION	
Tumor Characteristics	4 x 5 cm, Hard consistency, Fixed, Non-fluctuant
Local Extension	Fixed to Masseter and Sternocleidomastoid (SCM) muscles; Skin erythema and induration
Facial Nerve Status (CN VII)	**House-Brackmann Grade I** (Bilaterally intact function)
Cervical Lymph Nodes	Palpable, enlarged, hard nodes in ipsilateral Level IIa and IIb
Oropharyngeal Exam	No tonsillar asymmetry; No mucosal lesions
RADIOLOGICAL STAGING (CECT HEAD & NECK)	
Tumor Dimensions	4.2 x 3.8 x 5.1 cm
Deep Structure Involvement (T4b)	Encasement of External Carotid Artery (>180°); Infiltration of SCM; Loss of fat planes with posterior belly of digastric
Metastatic Workup	Negative for distant metastasis (CT Thorax/Abdomen negative)
FINAL DIAGNOSIS & STAGING	
Histopathology (Core Biopsy)	Primary Squamous Cell Carcinoma (High Grade)
TNM Staging (AJCC 8th Ed.)	**cT4b N2b M0** (Stage IVA)

The objective was twofold: cytoreduction to pull the tumor away from the critical neurovascular structures, and the induction of tumor necrosis to facilitate a safer dissection plane. The selected regimen comprised Paclitaxel (175 mg per square meter) and Carboplatin (AUC 6), administered intravenously every three weeks. This platinum-taxane combination was chosen for its synergistic ability to disrupt microtubule dynamics and induce DNA cross-linking in rapidly dividing squamous cells. The clinical course during the neoadjuvant phase was monitored meticulously. The patient demonstrated robust physiological tolerance to the cytotoxic agents during the initial three cycles, with manageable hematological toxicity. An interim contrast-enhanced computed tomography (CECT) scan performed after Cycle 3 provided the first evidence of biological sensitivity, revealing a Partial Response characterized by a 25 percent reduction in volumetric tumor burden. This favorable interim response emboldened the MDT to extend the induction phase. Rather than proceeding immediately to surgery, the protocol was expanded to a total of six cycles. The rationale for this extension was to maximize the cytocidal effect, pushing the tumor toward a maximal pathological response before attempting the high-risk resection.

Upon completion of the sixth cycle, a definitive pre-operative CECT evaluation was conducted to map the surgical approach. Interestingly, the radiological findings presented a complex picture. According to RECIST 1.1 criteria (Response Evaluation Criteria in Solid Tumors), the tumor was classified as stable disease relative to the interim scan, as the external dimensions had not shrunk significantly further. However, the qualitative internal architecture of the mass had undergone a profound transformation. The previously solid, enhancing tumor core now appeared hypodense, a radiological surrogate for extensive central necrosis. Furthermore, while the tumor remained adherent to the deep vascular structures, the peripheral enhancement involving the sternocleidomastoid muscle had attenuated. This suggested that while the tumor volume had not collapsed, the biological activity at the infiltrative leading edge had likely been blunted, potentially creating a fibrotic or necrotic interface between the malignancy and the vital structures.

The patient was taken to the operating room for a total parotidectomy and selective neck dissection (Levels I through IV) under general anesthesia. The surgical approach utilized a modified Blair incision, extending into a cervical crease to allow for adequate exposure of both the parotid bed and the cervical lymphatics. The dissection began with the elevation of the skin flaps in the sub-SMAS (superficial musculoaponeurotic system) plane to preserve the blood supply to the skin. The critical first step was the identification of the facial nerve main trunk. Using the tragal pointer and the tympanomastoid suture as reliable osseous landmarks, the main trunk was located at its exit from the stylomastoid foramen.

Intraoperative findings confirmed the radiological suspicion: the tumor was centrally necrotic, rendering it exceptionally fragile and prone to rupture. The mass was firmly adhered to the superficial layer of the deep cervical fascia and was noted to be encasing the external carotid artery. The dissection proceeded with extreme caution, utilizing continuous nerve integrity monitoring (NIM) to assess the functional status of the nerve branches in real-time. The surgical team employed a peeling technique, utilizing sharp microsurgical dissection to separate the tumor capsule from the epineurium of the facial nerve. The extensive chemotherapy appeared to have created a distinct, albeit tenacious, plane of dissection. The tumor involved the deep lobe, necessitating a meticulous dissection between the nerve branches (tunnel technique) to mobilize the deep portion of the gland. The main trunk and the primary divisions—the temporofacial and cervicofacial branches—were structurally preserved. However, during the dissection of the lower division, the tumor was found to be densely adherent to the distal marginal mandibular branch. To ensure oncologic safety and prevent leaving gross residual disease, the decision was made to sacrifice this specific distal branch. Vascular

management was equally challenging. The external carotid artery, which was encased by the tumor mass, was ligated and divided to facilitate *en bloc* removal. The internal jugular vein, although adherent to the medial aspect of the tumor, was successfully dissected free without injury. The specimen was removed, and a selective neck dissection was completed to address the clinically positive nodal basins.

The patient's immediate post-operative recovery was uneventful, with no hematoma or wound complications. The final histopathological examination of the resected specimen provided the definitive verdict on the efficacy of the neoadjuvant strategy. The diagnosis was confirmed as invasive squamous cell carcinoma. Crucially, the specimen exhibited approximately 40 percent tumor necrosis accompanied by extensive stromal fibrosis, a finding consistent with a significant treatment effect (ypT4b). This pathological response validated the hypothesis that the extended chemotherapy course had induced central cell death, even if the total volume had not dramatically decreased on CT.

The margin status was reported as R0 (microscopically negative), although the deep margin was close, measuring less than 3 mm. This narrow clearance is often unavoidable in T4b tumors abutting the skull base or carotid sheath. A critical pathological finding involved the perineural status. Perineural invasion (PNI) was identified histologically within the sacrificed distal marginal mandibular branch. However, the perineurium of the preserved main trunk and primary divisions was free of tumor invasion. This distinction is paramount; it suggests that the tumor was tracking retrograde along the distal nerve fibers but had not yet compromised the main trunk, vindicating the decision to preserve the proximal nerve while sacrificing the involved distal segment. Nodal pathology revealed metastasis in 2 of the 19 dissected lymph nodes (pN2b), with the presence of extranodal extension (ENE), a high-risk feature for regional recurrence.

Given the convergence of high-risk adverse features—specifically the pT4b stage, high-grade histology, and the presence of extranodal extension—the MDT recommended a comprehensive adjuvant treatment course. The patient underwent post-operative chemoradiation therapy, receiving a total dose of 66 Gy delivered in 33 fractions using intensity-modulated radiation therapy (IMRT). This was administered concurrently with weekly Cisplatin (30 mg per square meter) acting as a radiosensitizer to maximize locoregional control. The patient tolerated the adjuvant therapy with expected but manageable Grade 2 mucositis and dermatologic toxicity. The follow-up protocol was rigorous, involving serial clinical examinations and radiological surveillance. At the 3-month post-treatment interval, the surgical incision was well-healed, and the patient maintained a House-Brackmann Grade I facial nerve function, indicating full preservation of movement in the forehead, eye, and midface, with only minor, clinically insignificant weakness in the lower lip depressors due to the marginal mandibular sacrifice. Long-term surveillance continued to yield promising results. At 12 months, a CECT of the neck and chest demonstrated no evidence of local recurrence in the parotid bed or neck, and no distant metastasis in the lungs. At the most recent 18-month follow-up, the patient remains clinically disease-free. The facial nerve function remains fully intact (Grade I) without evidence of synkinesis or late deterioration. This outcome represents a significant victory in quality of life, demonstrating that with a tailored, multimodal approach utilizing extended neoadjuvant chemotherapy, functional preservation is achievable even in the context of locally advanced, high-grade parotid malignancy.

3. Discussion

Primary squamous cell carcinoma (SCC) of the parotid gland represents a rare and biologically distinct entity within the spectrum of salivary neoplasms, accounting for fewer than 1% of all salivary gland tumors. Its pathogenesis is hypothesized to involve squamous metaplasia of the ductal epithelium, potentially driven by chronic

inflammatory stimuli, prior irradiation, or de novo carcinogenesis, distinct from the more common metastatic cutaneous SCC, which arises from sun-damaged skin and spreads lymphatically to the intra-parotid nodes.[11] This differentiation is clinically paramount; while metastatic disease follows predictable lymphatic drainage patterns, primary SCC originates centrally within the parenchyma, leading to a more diffuse and infiltrative growth pattern that challenges surgical clearance.

TABLE 2. DIAGNOSIS, TREATMENT, FOLLOW-UP, AND OUTCOME

Phase / Parameter	Detailed Description
1. INITIAL DIAGNOSIS	
Histopathology	Primary Squamous Cell Carcinoma (High Grade)
Clinical Staging (TNM)	**cT4b N2b M0 (Stage IVA)**
Critical Features	Encasement of External Carotid Artery; Infiltration of Sternocleidomastoid Muscle; Adherence to Deep Cervical Fascia.
2. NEOADJUVANT CHEMOTHERAPY (NACT)	
Regimen	**Paclitaxel** (175 mg/m²) + **Carboplatin** (AUC 6)
Duration	6 Cycles (Extended Protocol due to interim partial response)
Radiological Response	RECIST: Stable Disease (SD) by dimensions. Qualitative: Significant central hypodensity indicating tumor necrosis.
3. SURGICAL INTERVENTION	
Procedure	Total Parotidectomy + Selective Neck Dissection (Levels I–IV)
Facial Nerve Management	**Functionally Preserved** Main trunk, Temporofacial, and Cervicofacial divisions preserved intact. *Note: Distal marginal mandibular branch sacrificed due to tumor adherence.*
Post-Op Pathology (ypTNM)	**ypT4b pN2b** (2/19 nodes positive with Extranodal Extension). Histology showed **40% Tumor Necrosis** (Chemotherapy Effect). Margins: Negative (R0), deep margin < 3mm.
4. ADJUVANT THERAPY	
Modality	Concurrent Chemoradiation (CCRT)
Dosage	**Radiotherapy:** 66 Gy in 33 Fractions (IMRT) **Chemotherapy:** Weekly Cisplatin (30 mg/m²)
5. FOLLOW-UP AND OUTCOME	
3-Month Assessment	Wound healed; House-Brackmann Grade I facial function.
12-Month Surveillance	CT Neck/Chest: No evidence of locoregional recurrence or distant metastasis.
18-Month Final Status	**Disease Free** Facial Function: **House-Brackmann Grade I** (Fully Intact). Patient reports satisfactory Quality of Life.

In the presented case, the diagnosis of primary SCC was rigorously established by excluding cutaneous primaries through a comprehensive dermatologic survey and the absence of solar elastosis in the overlying skin, a hallmark of UV-induced carcinogenesis.[12] The tumor's high-grade features and rapid doubling time (estimated at less than 30 days) underscore its aggressive biological behavior, necessitating a departure from single-modality treatment toward an aggressive, multimodal approach.[13]

The utility of neoadjuvant chemotherapy (NACT) in salivary gland malignancies remains a subject of ongoing debate, lacking Category 1 endorsement in current National Comprehensive Cancer Network (NCCN) guidelines.[14] However, the biological behavior of primary parotid SCC, which mirrors mucosal Head and Neck SCC more closely than indolent salivary adenocarcinomas, provides a compelling rationale for its use. The decision to employ an extended six-cycle regimen of Paclitaxel and Carboplatin in this case was a calculated deviation from standard protocols, driven by the interim partial response observed after three cycles.[15]

Taxanes, such as Paclitaxel, exert their cytotoxic effects by stabilizing cellular microtubules, thereby preventing the disassembly of the mitotic spindle. This leads to cell cycle arrest at the G2/M phase and subsequent apoptosis, a mechanism particularly effective in rapidly dividing high-grade tumors. The addition of Carboplatin, an alkylating agent, enhances this effect by inducing DNA cross-links. The clinical impact of this regimen was profound, not merely in terms of volumetric reduction but in the qualitative transformation of the tumor bed.[16] Intraoperatively, the tumor exhibited significant fragility and central necrosis, confirmed pathologically as 40% tumor necrosis. This finding is critical; while chemotherapy can induce fibrosis that obliterates surgical planes, significant necrosis can paradoxically create a pseudocapsule or cleavage plane between the vital tumor tissue and the epineurium of the facial nerve. We hypothesize that the extended duration of chemotherapy maximized this necrotic effect, effectively sterilizing the tumor-nerve interface and facilitating a dissection that might otherwise have been impossible given the dense cellularity and infiltrative nature of a viable T4 tumor.[17]

The management of the facial nerve in T4 parotid malignancies represents the apex of surgical decision-making, balancing the imperative of oncologic radicality against the devastating sequelae of facial paralysis (Figure 1). The presence of Perineural Invasion (PNI) is traditionally viewed as a mandate for nerve sacrifice to prevent local recurrence. However, this case illuminates the critical distinction between intraneural invasion, where tumor cells penetrate the axon or fascicles, and perineural tracking, where cells travel along the nerve sheath. The pathological analysis revealed PNI restricted to the distal, sacrificed branches, while the main trunk remained free of invasion. This finding validates the concept of retrograde dissection, a technique where the nerve is identified proximally at the stylomastoid foramen and traced distally. Had the main trunk been sacrificed blindly based solely on the T4b clinical stage, the patient would have incurred unnecessary and permanent functional morbidity.[18] However, preserving the nerve in the presence of close margins carries the inherent risk of microscopic residual disease (R1 resection). To mitigate this, the administration of high-dose adjuvant intensity-modulated radiation therapy (IMRT) to 66 Gy serves as a critical safety net, targeting potential microscopic foci on the nerve sheath and ensuring locoregional control. This multimodal synergy allows for function-sparing surgery without compromising oncologic safety.[19] While the 18-month disease-free survival observed in this case is encouraging, the study is limited by its nature as a single case report. High-grade SCC is notorious for late recurrences, and long-term surveillance is essential to validate the durability of this approach.

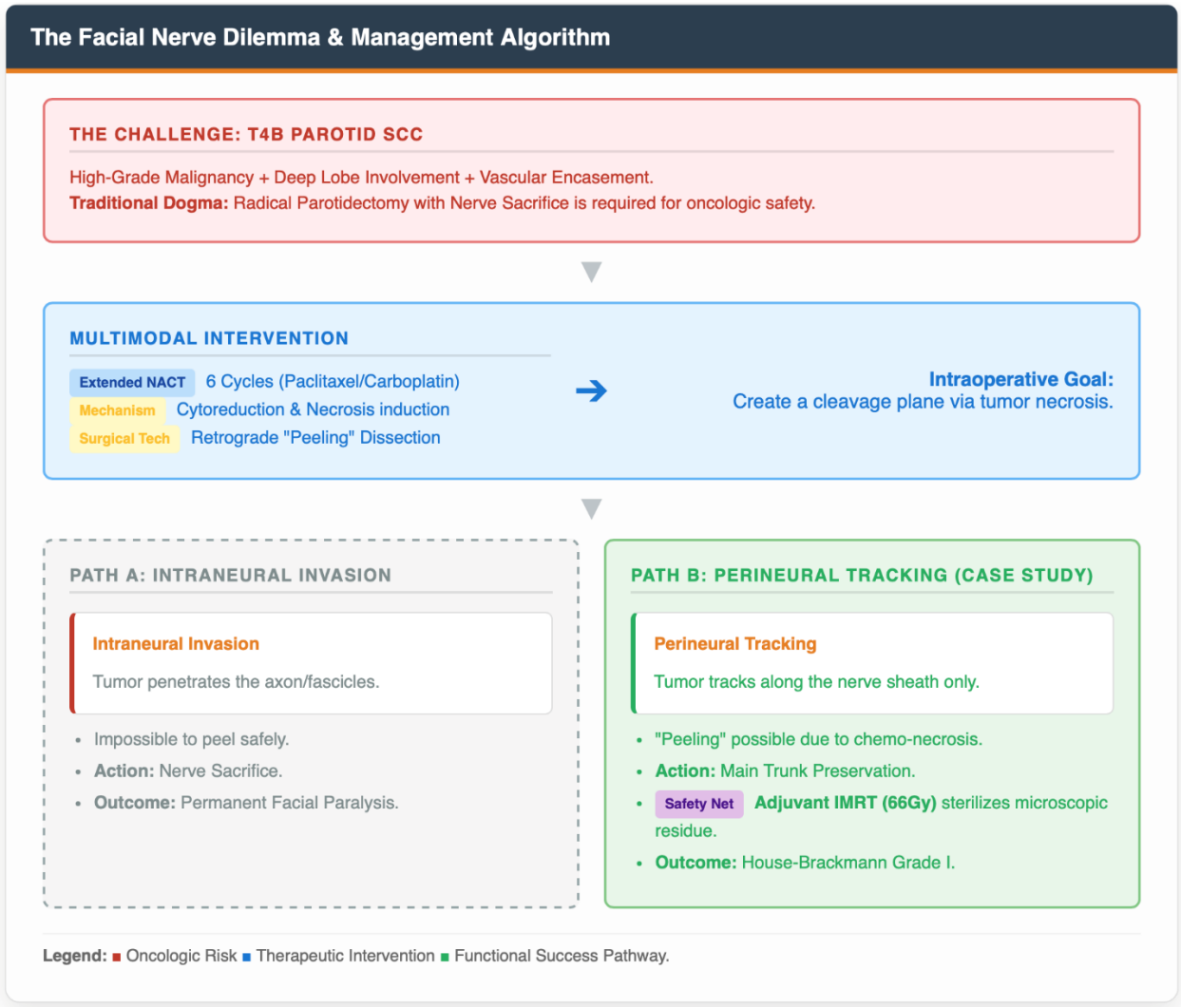

Figure 1. The facial nerve dilemma.

Furthermore, the extended NACT regimen imposes a significant burden in terms of toxicity and time, delaying definitive surgery by approximately 18 weeks. This delay theoretically risks disease progression or the selection of chemo-resistant clones if the tumor fails to respond.[20] Consequently, this approach cannot yet be generalized to all patients. Future research must focus on multi-centric randomized controlled trials comparing Upfront Surgery versus Induction Chemotherapy specifically for T4 salivary malignancies, incorporating molecular profiling to identify patients most likely to respond to neoadjuvant strategies.

4. Conclusion

The management of Stage IVA (T4b) primary parotid squamous cell carcinoma presents a complex clinical challenge that demands a nuanced balance between oncologic radicality and functional quality of life. This case demonstrates that facial nerve preservation is feasible even in the setting of locally advanced disease with extensive vascular and soft tissue involvement, provided a meticulous, multidisciplinary strategy is employed. The integration of an extended neoadjuvant chemotherapy regimen (Paclitaxel and Carboplatin) played a pivotal role in inducing tumor necrosis, thereby facilitating a plane

of dissection along the facial nerve that allowed for preservation of the main trunk. We advocate for a personalized approach where nerve sacrifice is not a predetermined outcome of T4 disease. Instead, surgical decisions should be based on a dynamic assessment of the intraoperative tumor-nerve interface and the biological response to systemic therapy. This function-sparing paradigm, underpinned by aggressive adjuvant chemoradiation, offers a promising alternative to radical sacrifice, potentially preserving the patient's identity and quality of life without compromising survival.

5. References

1. Togo G, Gazzini L, Ionna F, Orabona GD, Calabrese L. Prognostic stratification for parotid metastases from head and neck cutaneous squamous cell carcinoma. Int J Oral Maxillofac Surg. 2025; 54: 141–2.
2. Hsiao Y, Cheng C. Impact of parotid lymph node metastasis on prognosis in oral squamous cell carcinoma: a retrospective analysis. Int J Oral Maxillofac Surg. 2025; 54: 156.
3. Noguchi A, Yamagata K, Kawamatsu N, Takaoka S, Fukuzawa S, Uchida F, et al. Synchronous mandibular squamous cell carcinoma and parotid gland salivary duct carcinoma ex-pleomorphic adenoma: a case report. J Oral Maxillofac Surg Med Pathol. 2025; 37(4): 703–10.
4. Vias P, Saklani A, Thakur A, Sankhyan E. Parotid gland metastasis of conjunctival squamous cell carcinoma: a case report of a rare phenomenon. Arch Med Health Sci. 2025; 13(3): 452–5.
5. Karkoutli A, Bellamkonda N, Kerrigan KC, McCrary HC. Primary squamous cell carcinoma of the lung with metastasis to the parotid gland in a never-smoking patient: a rare case report. Otolaryngol Case Rep. 2025; 36(100673): 100673.
6. Das D, Navaudhayam D, Agrawal D, Dr, Kaur P, Yadav P. Basal cell adenocarcinoma of parotid gland: a case report of a rare salivary gland neoplasm. J Cancer Res Rev. 2024; 1.
7. Razack R, Bishop JA, Alwan J, Coetzee L, De Wet DR, Mahomed W, et al. Cytopathology of a newly described salivary gland neoplasm: a case report of microsecretory adenocarcinoma presenting in the parotid gland. Acta Cytol. 2024; 68(6): 516–24.
8. Ramanan R, Yeola M, P N, S A, Uma Maheswaran K. A case of primary tuberculous parotitis mimicking parotid neoplasm: a rare clinical entity. Cureus. 2024; 16(4): e58217.
9. Mithun V, Karuppusamy UR, Balasubramanian NB, Rajan M. A rare case of benign synchronous neoplasm of parotid salivary gland. Ann Pathol Lab Med. 2024; 11(4): C53-58.
10. Bunch PM, Patwa HS. Differentiating benign and malignant parotid neoplasms with dual-energy computed tomography. Acad Radiol. 2024; 31(5): 2039–40.
11. Dandachi A, Seuthe IMC, Eichhorn S, Park J. Rare neoplasm of the parotid gland. Laryngorhinootologie. 2024; 103(S 02): S172.
12. Gaikwad MD, Zainab B, Choudhary A. Cervicofacial actinomycosis with chronic parotid sialadenitis-mimicking malignant neoplasm of parotid gland: a rare case. Int J Res Med Sci. 2024; 12(7): 2609–12.
13. Montella M, Ruggiero R, Savarese G, Colella G, Ronchi A, Franco R, et al. Parotid squamous cell carcinoma metastases: Application of human papillomavirus-DNA test on liquid-based cytology to recognize oropharyngeal origin of the neoplasm. Diagn Cytopathol. 2024; 52(9): E187–93.
14. Abarca L, Green LK, Wang RY, Sandulache VC, Hernandez DJ. Tobacco exposure linked to Warthin's tumor being the most common benign parotid neoplasm in Veterans: a

retrospective cohort study. Sci Prog. 2025; 108(4): 368504251399563.

15. Lo Giudice G, Nastro Siniscalchi E, Arena P, Bottari A, Silipigni S, Calvo A, et al. Diagnostic accuracy of ultrasound guided core needle biopsy in parotid gland neoplasms: a retrospective comparative study. J Craniomaxillofac Surg. 2025; 53(12): 2279–87.
16. Knoedler L, Knoedler S, Hoch CC, Safi A-F, Wollenberg B, Alfertshofer M, et al. Risk factors and outcomes after surgery for malignant neoplasm of the parotid gland: an ACS-NSQIP study. J Plast Reconstr Aesthet Surg. 2025; 101: 264–74.
17. Eker Ç, Sürmelioğlu Ö, Dağkıran M, Tarkan Ö, Özdemir S, Kızıl Y, et al. Minimally invasive approach for the parotid gland neoplasm: a multicenter retrospective analysis. J Cukurova Anesth Surg. 2025; 8(1): 81–4.
18. De Ponte FS, Giudice GL, Fauci AL. Diagnostic accuracy of ultrasound guided core needle biopsy in parotid gland neoplasms: a retrospective comparative study. Int J Oral Maxillofac Surg. 2025; 54: 157–8.
19. Vishneva NV, Demenchuk PA, Petropavlovskaya OY, Selifanova EI, Lanina AN, Kalakutsky NV, et al. Controversial issues in core needle biopsy for diagnosing parotid neoplasms. Parodontologiâ. 2026.
20. Prince ADP, Schaaff C, Forner D, Oslin K, Smith J, Alevato MM, et al. Perioperative outcomes in antegrade, retrograde, and extracapsular approaches to parotidectomy in benign and malignant neoplasms. Otolaryngol Head Neck Surg. 2026; (ohn.70112).