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Parotid Adenocarcinoma Complicated by Peripheral Facial Paralysis: A Case Report

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***Abstract*-- Parotid gland adenocarcinoma is a rare malignant neoplasm of the major salivary glands, characterized by marked histological heterogeneity and variable biological behavior. Although its growth is often slow, the tumor demonstrates a strong tendency for local invasion, particularly perineural spread, which may result in peripheral facial paralysis (PFP). The presence of facial nerve dysfunction in a patient with a parotid mass is widely recognized as a major clinical warning sign of malignancy and is associated with advanced disease and poor prognosis.**

We report the case of a 58-year-old man presenting with a progressive right parotid mass complicated by peripheral facial paralysis. Radiological investigations revealed a parotid tumor suspicious for perineural invasion. Histopathological examination confirmed the diagnosis of parotid adenocarcinoma. The patient underwent right total parotidectomy with partial preservation of the facial nerve, followed by adjuvant radiotherapy.

After 12 months of follow-up, no local recurrence or distant metastasis was observed, and partial recovery of facial nerve function was noted.

Through this case report and an extensive review of the literature, we discuss the epidemiology, clinical presentation, diagnostic imaging, histopathological features, therapeutic strategies, prognostic factors, and functional outcomes of parotid adenocarcinoma complicated by peripheral facial paralysis. Emphasis is placed on the importance of early diagnosis, multidisciplinary management, and long-term follow-up.

***Keywords*-- Parotid adenocarcinoma; peripheral facial paralysis; facial nerve; perineural invasion; parotidectomy; radiotherapy; salivary gland malignancies.**

I. Introduction

Malignant tumors of the salivary glands are uncommon, accounting for less than 5% of all head and neck malignancies. Among these tumors, the parotid gland is the most frequently involved site, representing approximately 70–80% of salivary gland tumors. Despite this predominance, the majority of parotid tumors are benign, with pleomorphic adenoma being the most common histological subtype. Malignant parotid tumors are relatively rare and encompass a heterogeneous group of neoplasms with diverse histopathological patterns, biological behaviors, and clinical outcomes.

Parotid adenocarcinoma represents a rare subset of malignant salivary gland tumors, accounting for approximately 2–5% of parotid neoplasms. The term "adenocarcinoma" encompasses a group of epithelial malignancies characterized by glandular differentiation that do not fit into more specific histological categories. These tumors are often aggressive, with a propensity for local invasion, perineural spread, regional lymph node metastasis, and distant dissemination.

Clinically, parotid adenocarcinoma typically presents as a slowly enlarging parotid mass. Pain, skin fixation, ulceration, trismus, and cervical lymphadenopathy may be present in advanced stages. Among the various clinical signs, peripheral facial paralysis (PFP) is one of the most significant indicators of malignancy.

Facial nerve dysfunction is uncommon in benign parotid tumors and should immediately raise suspicion for malignant disease. The presence of PFP usually reflects direct tumor invasion or perineural spread along the facial nerve and is associated with a poor prognosis.

The management of parotid adenocarcinoma complicated by facial nerve involvement poses significant challenges. Surgical resection remains the cornerstone of treatment, often requiring total parotidectomy with or without facial nerve sacrifice.

Adjuvant radiotherapy is frequently indicated to improve local control, particularly in cases with perineural invasion, high-grade histology, or close surgical margins.

Facial nerve rehabilitation and long-term follow-up are essential components of patient care.

In this article, we report a case of parotid adenocarcinoma complicated by peripheral facial paralysis and provide a comprehensive review of the literature, highlighting diagnostic and therapeutic considerations, prognostic factors, and functional outcomes.

II. Clinical Observation

A 58-year-old man with no significant past medical or surgical history presented to the otorhinolaryngology department with a progressively enlarging mass in the right parotid region. The swelling had been evolving over a period of approximately eight months.

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Initially asymptomatic, the mass gradually became associated with mild intermittent pain and discomfort. Two months prior to presentation, the patient noticed progressive weakness of the right side of his face, characterized by facial asymmetry and difficulty closing the right eye.

On physical examination, a firm, poorly defined mass was palpated in the right parotid region. The mass measured approximately 4 cm in its greatest dimension, was slightly mobile superficially, and appeared adherent to deeper planes. The overlying skin was intact, without signs of inflammation or ulceration. No clinically palpable cervical lymph nodes were detected.

Neurological examination revealed peripheral facial paralysis on the right side, graded as House–Brackmann grade III.

The patient demonstrated asymmetry at rest, incomplete eye closure, diminished forehead wrinkling, and reduced movement of the oral commissure. There were no signs of involvement of other cranial nerves.

Otolaryngological examination of the external auditory canal, tympanic membrane, oral cavity, oropharynx, and larynx was unremarkable. No trismus or mucosal lesions were observed.

III. Diagnostic Imaging

Initial ultrasound examination of the parotid gland revealed a heterogeneous, hypoechoic mass within the right parotid gland, with irregular margins and increased internal vascularity. Several small, non-specific cervical lymph nodes were noted.

Figure(1) : "Heterogeneous hypoechoic parotid mass suggestive of adenocarcinoma "

Contrast-enhanced computed tomography (CT) of the head and neck demonstrated a 3.5 cm solid mass involving both the superficial and deep lobes of the right parotid gland. The lesion exhibited heterogeneous enhancement and ill-defined borders, raising suspicion for malignancy.

There was evidence of infiltration of adjacent soft tissues, and the relationship between the tumor and the facial nerve was concerning for perineural involvement.

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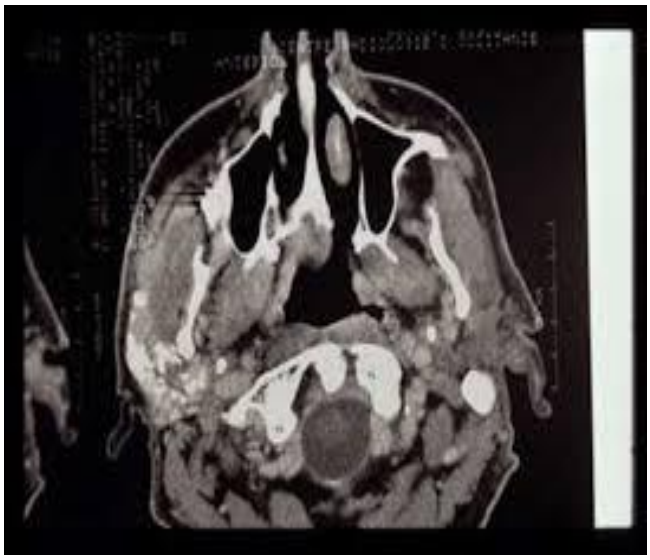

Figure (2) : CT scan showing the right parotid mass with suspected perineural invasion

Magnetic resonance imaging (MRI) was subsequently performed to better assess soft tissue extension and neural involvement. MRI revealed a parotid mass with low signal intensity on T1-weighted images and heterogeneous high signal intensity on T2-weighted images.

After gadolinium administration, intense and irregular enhancement was observed. Abnormal enhancement and thickening along the expected course of the facial nerve were noted, highly suggestive of perineural invasion.

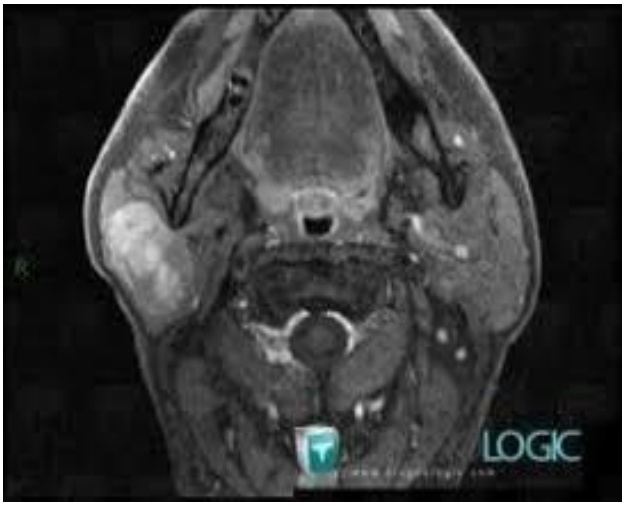

Figure 3. MRI showing tumor extension and right facial nerve infiltration.

IV. Histopathological Findings

A preoperative core needle biopsy was performed and revealed features consistent with adenocarcinoma. Following surgical excision, histopathological examination of the resected specimen confirmed the diagnosis of parotid adenocarcinoma.

Microscopically, the tumor was composed of malignant epithelial cells arranged in glandular and cribriform patterns, with moderate nuclear atypia and increased mitotic activity.

Evidence of perineural invasion was identified. Surgical margins were free of tumor infiltration.

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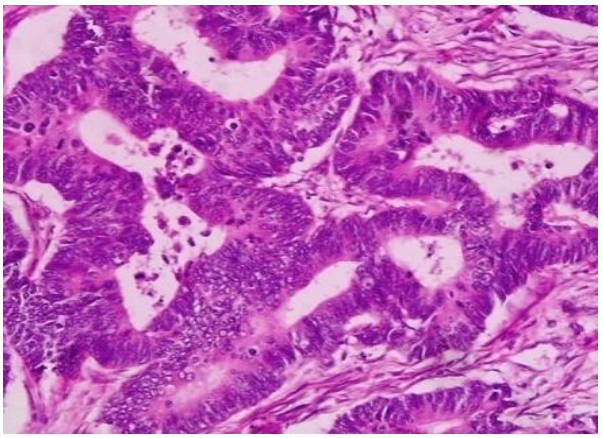

Figure 4. Histopathological image showing cribriform structures compatible with adenocarcinoma.

V. Therapeutic Management

The patient underwent a right total parotidectomy with functional cervical lymph node dissection. Intraoperatively, the tumor was found to be closely adherent to branches of the facial nerve. Partial preservation of the facial nerve was achieved, as complete sacrifice was not deemed necessary based on intraoperative findings.

Given the presence of perineural invasion and the malignant nature of the tumor, adjuvant radiotherapy was administered postoperatively. The patient also received facial nerve rehabilitation therapy aimed at improving functional recovery and preventing long-term sequelae.

Follow-Up and Outcome

At 12 months of follow-up, the patient showed no evidence of local recurrence or distant metastasis on clinical examination and imaging studies. Partial recovery of facial nerve function was observed, with improvement to House–Brackmann grade II following rehabilitation.

VI. Discussion

1. Epidemiology and Biological Behavior

Malignant tumors of the salivary glands are rare entities, and among them, parotid gland adenocarcinomas represent a particularly uncommon subgroup. Epidemiological studies indicate that these tumors predominantly affect adults in the fifth to seventh decades of life, with a slight male predominance. Unlike benign parotid tumors, which often present as slow-growing and asymptomatic masses, adenocarcinomas tend to exhibit more aggressive biological behavior.

The heterogeneity of parotid adenocarcinomas reflects their diverse cellular origins and differentiation patterns. These tumors are characterized by infiltrative growth, a high propensity for perineural invasion, and a significant risk of regional and distant metastases. The biological aggressiveness of these tumors explains their tendency to present at an advanced stage, often with neurological symptoms such as peripheral facial paralysis.

Perineural spread is a hallmark of salivary gland malignancies, particularly adenocarcinomas and adenoid cystic carcinomas. Tumor cells invade the perineural space and migrate along nerve sheaths, facilitating local extension beyond the primary tumor site and contributing to treatment resistance and late recurrences.

2. Peripheral Facial Paralysis: Pathophysiology and Clinical Significance

Peripheral facial paralysis (PFP) is one of the most critical clinical indicators of malignancy in parotid tumors. In benign parotid lesions, facial nerve dysfunction is exceedingly rare, occurring in less than 1% of cases. Conversely, facial paralysis is reported in 15–30% of malignant parotid tumors and is strongly associated with advanced disease.

The mechanisms underlying PFP in parotid adenocarcinoma include:

- **Direct tumor infiltration** of the facial nerve branches
- **Perineural invasion**, allowing tumor spread along the nerve sheath
- **Compression or ischemia** of the nerve due to tumor mass effect

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Perineural invasion represents not only a pathway for tumor dissemination but also an independent adverse prognostic factor. Several studies have demonstrated that patients with facial nerve involvement have significantly lower disease-free survival and overall survival rates compared to those without nerve involvement.

Clinically, PFP may be partial or complete and can progress insidiously. Early signs such as facial asymmetry, reduced blink reflex, or mild weakness should prompt immediate investigation, particularly in the presence of a parotid mass.

3. Diagnostic Imaging: Role and Limitations

Imaging plays a pivotal role in the diagnostic workup of parotid adenocarcinoma, particularly when facial nerve involvement is suspected.

Ultrasound is often the first-line imaging modality due to its accessibility and ability to differentiate solid from cystic lesions. However, its limited field of view and operator dependency restrict its utility in assessing deep lobe involvement and perineural spread.

Computed tomography (CT) provides valuable information regarding tumor size, location, bone erosion, and cervical lymph node status.

CT is particularly useful for surgical planning in advanced tumors and for detecting osseous involvement.

Magnetic resonance imaging (MRI) is considered the gold standard for evaluating soft tissue extension and perineural invasion.

MRI offers superior contrast resolution and allows detailed visualization of the facial nerve pathway. Typical MRI findings suggestive of perineural invasion include nerve enlargement, abnormal enhancement, and obliteration of fat planes along the nerve course.

Despite advances in imaging, microscopic perineural invasion may still be underestimated, highlighting the importance of careful intraoperative assessment and histopathological analysis.

4. Histopathology and Molecular Characteristics

Histopathological examination remains the definitive diagnostic tool for parotid adenocarcinoma.

These tumors demonstrate glandular differentiation and may exhibit various architectural patterns, including cribriform, tubular, solid, or mixed configurations.

- *Cribriform pattern:* Associated with slow growth but a high tendency for perineural invasion and local recurrence.
- *Tubular pattern:* Generally intermediate behavior.
- *Solid pattern:* Associated with high-grade malignancy, increased mitotic activity, and a higher risk of nodal and distant metastases.

Immunohistochemical studies aid in diagnosis and differential diagnosis, particularly in distinguishing adenocarcinoma from other salivary gland malignancies. Molecular profiling is an emerging field that may provide prognostic and therapeutic insights in the future.

5. Therapeutic Strategies

5.1 Surgical Management

Surgery is the cornerstone of treatment for parotid adenocarcinoma. The primary objective is complete tumor excision with histologically negative margins while preserving facial nerve function whenever oncologically feasible.

In cases without facial nerve involvement, nerve preservation is strongly recommended. However, when the nerve is infiltrated, partial or complete nerve sacrifice may be necessary to achieve adequate oncological control. Intraoperative nerve monitoring has become an essential tool to assist in nerve identification and preservation.

Neck dissection is indicated in cases with clinically or radiologically evident lymph node metastases and is often considered prophylactically in high-grade tumors.

5.2 Adjuvant Radiotherapy

Adjuvant radiotherapy plays a crucial role in improving local and regional control, particularly in patients with high-risk features such as:

- Perineural invasion
- High-grade histology
- Close or positive surgical margins
- Advanced T stage

Several studies have demonstrated improved local control rates with combined surgery and radiotherapy compared to surgery alone.

5.3 Chemotherapy and Targeted Therapy

The role of chemotherapy in parotid adenocarcinoma remains limited. It is generally reserved for recurrent, unresectable, or metastatic disease.

Emerging targeted therapies and immunotherapy are under investigation but have not yet become standard of care.

6. Prognosis and Survival Outcomes

The prognosis of parotid adenocarcinoma is variable and depends on multiple factors, including tumor stage, histological grade, perineural invasion, lymph node involvement, and adequacy of surgical margins.

Facial nerve involvement is consistently identified as one of the most powerful negative prognostic indicators.

Five-year survival rates range from 30% to 70%, depending on disease stage and treatment modality.

Late recurrences are well documented, particularly in tumors with perineural spread, underscoring the need for long-term follow-up.

7. Facial Nerve Rehabilitation and Quality of Life

Facial nerve dysfunction significantly impacts patients' quality of life, affecting facial expression, speech, mastication, and ocular protection. Early initiation of facial rehabilitation is essential to optimize functional recovery.

Rehabilitation strategies include physiotherapy, neuromuscular retraining, and, in selected cases, surgical reanimation procedures. Multidisciplinary management involving surgeons, physiotherapists, and rehabilitation specialists is critical.

8. Comparison with the Literature

Large retrospective series, including those by Spiro and Bradley, have demonstrated that combined surgical resection and adjuvant radiotherapy provide the best oncological outcomes for malignant parotid tumors. Patients with clear margins and no perineural invasion exhibit significantly better survival and lower recurrence rates.

Our case aligns with these findings, highlighting the importance of early diagnosis, adequate surgical management, and adjuvant therapy in achieving favorable outcomes despite the presence of facial nerve involvement.

VII. Conclusion

Parotid adenocarcinoma is a rare but aggressive malignancy of the salivary glands. The presence of peripheral facial paralysis should always raise suspicion of malignancy and indicates advanced disease with potential perineural invasion.

Early recognition, comprehensive imaging, and meticulous histopathological evaluation are essential for accurate diagnosis and optimal treatment planning.

Surgical excision with clear margins remains the mainstay of treatment, while adjuvant radiotherapy improves local control in high-risk cases.

Preservation of facial nerve function, when oncologically feasible, and structured postoperative rehabilitation are crucial for maintaining quality of life.

Long-term follow-up is mandatory due to the risk of late recurrence and metastasis. Reporting such cases contributes to the growing body of evidence guiding the management of complex parotid gland malignancies and reinforces the importance of a multidisciplinary approach.

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