

Role of 18F-FDG PET Scan in Parapharyngeal Space Tumors: Report of a Rare Case and Review of the Literature

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Abstract

Background: Tumors of the parapharyngeal space (PPS) are rare and account for only 0.5% of head and neck neoplasms. Approximately 80% of these tumors are benign lesions, yet they represent a formidable diagnostic and treatment challenge. They are difficult to diagnose because they have few symptoms, therefore, CT and MRI are essential to delineate the tumor extent, intracranial involvement and relationship to the adjacent vital structures.

Case presentation: We report the case of a 36-year-old male who presented with the sudden onset of a pharyngeal cavity mass. CT head and neck scan and MRI showed a left parapharyngeal mass occupying the prestyloid parapharyngeal space extending to poststyloid. Transorally biopsy revealed a well differentiated squamous cell carcinoma. A FDG PET/CT was performed and revealed outside the known tumor, vertebral metastasis of the cervical and thoracic spine, a right collarbone metastasis and pulmonary nodules. It was decided to manage this metastatic squamous cell carcinoma with chemotherapy.

Conclusion: Parapharyngeal squamous cell carcinomas are extremely rare. Imaging helps in planning the surgical procedure. Radionuclide imaging is complimentary to radiological imaging and provides specific information about the tumor's functional and molecular characteristics. This case of squamous cell carcinoma presents several unusual features: the scarcity of squamous cell carcinoma in the parapharyngeal space and faraway metastasis in this type of tumor. Moreover the role of FDG PET/CT have been exceptionally described in the literature.

Keywords: Parapharyngeal space tumors; Squamous cell carcinoma; Diagnostic imaging; Bone metastasis; FDG-PET

Background

Parapharyngeal space (PPS) tumors are rare, accounting for 0.5% of all neoplasms of head and neck. PPS tumors may be primary, metastatic or a direct extension of tumors from the adjacent spaces. The frequency of benign and malignant tumors is about 80% and 20%, respectively. Most of them originate from the salivary gland (40-50%), followed by a neurogenic etiology and the remainder are a broad spectrum of miscellaneous tumors [1-7].

The PPS is a lateral pharyngeal region. It is divided by muscular aponeurotic partition into an anterior (prestyloid) muscular compartment and a posterior (poststyloid) neurovascular compartment [1,3-7]. Imaging is crucial for the assessment of PPS tumors. Surgery is performed based on information provided by these diagnostic modalities.

This article will present a case of left parapharyngeal squamous cell carcinoma with unusual spinal metastases, and the potential role of FDG PET/CT will be illustrated.

Case Presentation

A 36-year-old male patient who showed up in April 2016 with 3 months' history of left side facial paralysis, left trismus, difficulty in swallowing and otological symptoms: otorrhea and otorrhagia. For the last month, he had developed a pharyngeal cavity mass. CT scan head and neck showed well defined heterogeneously enhancing left parapharyngeal solid mass (32×50×62 mm) with multiple area of necrosis, bulging into nasopharynx with extension to pharyngeal mucosal surface.

The mass overwhelms the tympanic cavity and spreads to the ipsilateral external auditory meatus and pterygoid muscle. It causes the

lysis of base of skull and the posterior walls of the left sphenoidal and cavernous sinuses, with endocranial extension. This aspect suggested either the diagnosis of schwannoma or glomus vegale, so we decided on MRI. Head and neck MRI confirmed the left parapharyngeal pear shaped mass occupying the prestyloid parapharyngeal space extending to poststyloid space bulging into the nasopharynx, likely representing schwannoma (Figure 1).

Transorally biopsy of the roof of mouth revealed a well differentiated squamous cell carcinoma: round and polygonal cells with large pleomorphic nuclei, aggregates of spindle shaped cells have been seen entrapped within a cellular, hyaline stroma, areas of necrosis and desmoplastic reaction present. Immunostaining was positive for cytokeratin.

Bone scintigraphy with radio bi-phosphonates was immediately requested to look for bone locations. Our patient received an intravenous injection of 680 MBq of ^{99m}Tc-MDP and whole body scanning was done after 2 h 30 min delay. It showed normal and symmetrical uptake of ^{99m}Tc-MDP on the whole skeleton without suspected secondary bone localization (Figure 2). Chest and abdominal computed tomography

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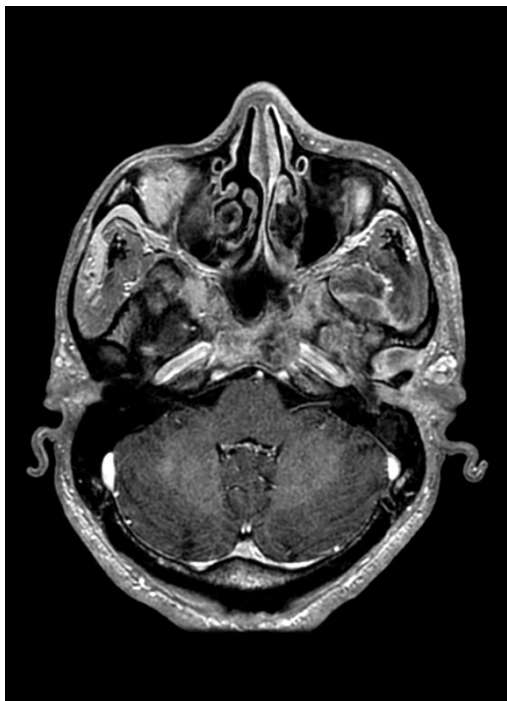


Figure 1: Head and neck MRI in axial slices showing a left parapharyngeal infiltrating process extended to the ipsilateral infra temporal fossa; isointense T1 and T2 enhanced heterogeneously after gadolinium injection.

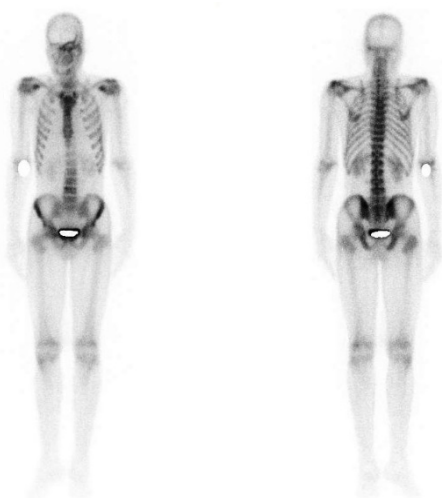


Figure 2: Whole body scintigraphy showing normal and symmetrical uptake of 99mTc-MDP on the whole skeleton without suspected secondary bone localization.

(CT) were carried out for the work up of the spread of the squamous cell carcinoma. It showed two suspected left pulmonary nodules: the first, measuring 11 mm, was localized in the upper lobe; the second, measuring 12 mm, in the lingula. A FDG PET/CT was performed to characterize the pulmonary nodules. It revealed outside the known tumor, an increased uptake of ¹⁸F-FDG at the vertebral column from C1 to T10 and the right collarbone. It also indicated an intense ¹⁸F-FDG activity in the left higher lobe (standard uptake value=10.0),

corresponding to pulmonary nodules (Figure 3). The degree of activity was highly suspicious of malignancy; suggesting pulmonary metastasis nodules from the primary squamous cell carcinoma of the parapharyngeal space. Following multidisciplinary consultation, it was decided to manage this squamous cell carcinoma with intracerebral extension, pulmonary and bone metastasis by chemotherapy with docetaxyl and cisplatin [8].

Discussion

The parapharyngeal space is in the shape of an inverted pyramid on pedestal [9]. The base is formed by the greater wing of the sphenoid at the skull base. The apex is at the level of the greater cornu of the hyoid bone. The medial wall is composed of the superior constrictor muscle. The prevertebral fascia forms the posterior wall. The lateral wall from an anteroposterior direction is formed by the medial pterygoid muscle, vertical ramus of the mandible, the deep lobe of the parotid, and the posterior belly of the digastric muscle, respectively. The parapharyngeal space is divided into prestyloid and poststyloid spaces. The prestyloid space contains the medial and the lateral pterygoid muscles, the ramus and condyle of the mandible, the deep lobe of the parotid gland, the maxillary artery, and branches of V3. The retrostyloid space contains the carotid sheath, the cervical sympathetic trunk, cranial nerves IX, X, XI, and XII, and multiple lymph nodes. Because the base, lateral and posterior walls of the parapharyngeal space are bony, tumors tend to grow medially. Hence, the most common physical sign is a medial and inferior displacement of the soft palate and tonsillar fossa.

Tumours of the parapharyngeal space PPS remain clinically silent for a long time till they attain a sufficiently large size to produce a palpable or visible lump in the oral cavity and neck. The symptoms of PPS tumors are multiple and relate to the prestyloid–poststyloid localization, they include frequent foreign body sensation, difficult deglutition, ontological symptoms, and hoarseness. Clinical manifestations of PPS tumors are a mass in the oropharynx, a neck mass, cranial nerve deficit and Eustachian tube obstruction [2,4,6-8].

In a multicentric meta-analysis of 1143 parapharyngeal space tumors presented in 17 studies, Riffat et al. showed that the most prestyloid tumors arise from the salivary glands, with a total of 15 different histological types reported in the cumulative series [10].

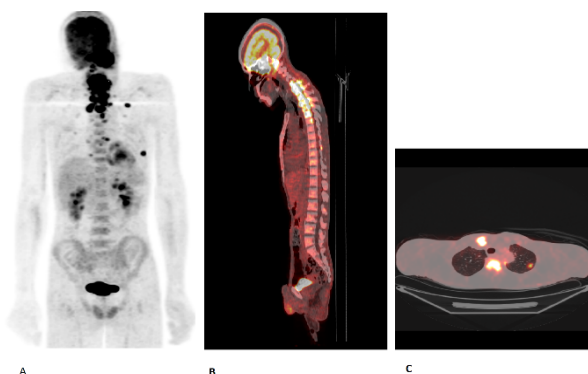


Figure 3: 18F-FDG PET/CT. A: PET/CT (MIP slice) performed at staging, showed pathological foci on the left parapharyngeal space, associated to pathological foci of vertebral column extended from C1 to T10 and a right collarbone increased uptake of FDG. It also showed increased pathological uptake of 18F-FDG in the pulmonary nodules. B: sagittal slice showing increased uptake of 18F-FDG on the vertebral column. C: PET/CT in axial slice at pulmonary parenchymal window showing an increased uptake in the pulmonary nodule.

Parapharyngeal squamous cell carcinomas are extremely rare, and only a few cases have been described in the literature. It is usually seen as a metastatic nodal disease or less commonly as an extension of deep lobe parotid tumor into the parapharyngeal space. Som et al. [11] and Maran et al. [12] have reported an incidence of 14% and 17% respectively. Rarely, primary PPS tumours can arise from lateral pharyngeal wall or minor salivary gland tissue of PPS (SCC comprises 1.2% of minor salivary gland epithelial neoplasms) [13,14]. The tumor in our case probably originated anew from minor salivary glands of the parapharyngeal space or from lateral pharyngeal wall.

CT scan and MRI are important diagnostic tools in tumors of parapharyngeal space. These helps in determining the extent of disease, local spread and help to some extent in determining the type of tumor. Contrast enhancement is seen in vascular and neurogenic tumors. Presence of intact fat plane helps in distinguishing benign tumors from malignant ones. Extension of tumors from the deep lobe of a parotid gland is distinguishable from tumor arising anew in parapharyngeal space by a fine translucent line representing the compressed layer of fibroadipose tissue between the tumor and deep lobe of parotid [15]. MRI has been shown to be superior to computed tomography in the investigation of parapharyngeal space tumors [16,17]. Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) are the cornerstone in the initial evaluation. Radionuclide imaging is complimentary to radiological imaging and provides specific information about the tumor's functional and molecular characteristics. Positron emission tomography (PET) has a higher sensitivity than single-photon emission computed tomography (SPECT) and provides images of better resolution [18].

In addition, FDG-PET has been known as a useful method in detecting bone metastasis in pre-operative patients or in post-operative follow-up patients [19-21]. On the other hand, conventional bone scintigraphy (BS) is an established imaging modality as a first choice for detecting bone metastasis, but also known for its drawback in detecting pure osteolytic bone metastases [19,20,22].

MRI and ¹⁸F-FDG PET can detect malignant marrow involvement early during the disease before identifiable bone destruction or reactive osteoblastic changes occur and, thus, may precede CT and BS in identifying the presence of malignant bone involvement. Although ¹⁸F-fluoride uptake depends on regional blood flow and osteoblastic activity, like ^{99m}Tc-MDP, the better spatial resolution of PET and the favorable pharmacokinetic characteristics of ¹⁸F-fluoride make ¹⁸F-fluoride PET a more sensitive modality for detecting both lytic and blastic lesions [23]. In our case BS and CT misdiagnosed the column metastases; only FDG-PET was positive.

Fine needle aspiration cytology is the modality of choice for obtaining biopsy sample for diagnosis [24].

Surgery is the mainstay of treatment in parapharyngeal tumors. The surgical approach chosen should facilitate complete tumor extirpation with minimal morbidity. The conventional surgical approaches described for the parapharyngeal tumors are transoral, trans-parotid, trans-cervical with or without mandibulectomy and midline transmandibular-oro-pharyngeal approaches. The correct choice between them depends upon the accurate information on mass size and location, its relationship with the surrounding vessels and nerves and its nature [25].

Conclusion

Parapharyngeal squamous cell carcinomas are extremely rare.

Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) are the cornerstone in the initial evaluation. Radionuclide imaging is complimentary to radiological imaging and provides specific information and higher sensitivity. Surgery is the mainstay of treatment in parapharyngeal tumors.

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