Abstract: Invasive carcinoma of temporal bone is an uncommon, aggressive tumor with poor prognosis. We report such case of invasive carcinoma of temporal bone with temporal abscess. Imaging modalities and management issues are discussed along with a brief review of literature.

**Keyword:** invasive carcinoma of temporal bone, temporal lobe abscess, imaging, Pittsburgh Classification, management.

**INTRODUCTION:**
Invasive carcinoma of temporal bone is a rare but aggressive tumor with an incidence of around 0.2% of all head and neck cancers. The commonest primary site is the external auditory canal (EAC). The most common type of primary cancer in the EAC is squamous cell carcinoma, and invasive carcinoma of the temporal bone may originate from the EAC. In contrast to adults, rhabdomyosarcoma is the commonest malignancy in the tympano-mastoid region in the pediatric age group. Though large proportion of cases are associated with chronic otitis media, there are no well documented risk factors.

**CASE REPORT:**
A 24 year old male presented in our department with history of altered sensorium and recent onset of left sided lower motor neuron facial palsy. He also had a history of mucopurulent and foul smelling discharge from left ear since childhood and loss of weight and appetite for past 6 months. He was unconscious on presentation. His pupils were equally reacting to light. On motor examination, he was moving all four limbs and localizing to pain. Otoscopic examination revealed pulsatile discharge from left ear and a pinkish fleshy mass in the left external auditory canal. Computed tomography (CT) scan of brain revealed a left temporal abscess with destruction of upper part of pterygoid, mastoid, squamous and petrous part of temporal bone along with soft tissue mass on the left side involving the left parotid gland, infratemporal fossa, left temporal and parietal region (image 1 and 2). Magnetic resonance imaging (MRI) of brain showed a destructive lesion of skull base, left temporal bone with extension into left masticator space and direct infiltration of left temporal lobe (image 3 and 4). Patient underwent subtotal excision of the left temporal bone and drainage of the abscess.

Pus, temporal muscle bits and excised temporal bone was sent for histo-pathological examination. Following surgery patient regained consciousness. Audiogram revealed hearing loss in left ear. Pus for culture revealed no growth. Temporal muscle biopsy showed solid nests of well differentiated squamous cell carcinoma (image 5). Bone biopsy revealed intertrabecular fibrous marrow containing neoplastic squamous cells with pearl formation, indicative of secondary deposits of squamous cell carcinoma (image 6). Revised Pittsburgh staging was T4 - N2c. Due to poor general condition of the patient and unresectability, further surgical procedure was not done. Patient was referred for radiotherapy and is on periodic follow up.

**Image 1, image 2:** Plain CT scan of brain showing a left temporal abscess with destruction of upper part of pterygoid, mastoid, squamous and petrous part of temporal bone along with soft tissue mass on the left side involving the left parotid gland, infratemporal fossa, left temporal and parietal region. Image 1, image 2
Suppurative otitis media (CSOM). The other possible causes are chronic middle ear infection - Chronic otitis media, human papillomavirus, following RT for other malignancies of the temporal bone are adenocarcinoma, rhabdomyosarcoma, lymphoma, melanoma, osteosarcoma, adenoid cystic carcinoma, acinic cell carcinoma. The usual foci of the disease is from external auditory canal. The most common type of primary cancer in the EAC is squamous cell carcinoma. They tend to invade posteriorly into the retroauricular sulcus. Medially placed tumors in the external auditory canal extend through the tympanic membrane and invade into the middle ear. Subsequently they spread via the eustachian tube, round and oval window, into the air spaces of the mastoid cavity. They have propensity to spread into the infratemporal fossa, neck and nasopharynx. Involvement of sigmoid sinus and dural invasion heralds poor prognosis.

Invasive carcinoma of temporal bone is a rare, aggressive and destructive tumor. In spite of the advances in surgery and radiotherapeutic techniques, it carries poor prognosis. They account for 0.2 to 0.3% of all head and neck tumors with equal incidence in both sexes. Etiological factors implicated are chronic exposure to sunlight and genetic predisposition. Studies show that more than 40% of the patients have long standing middle ear infection - Chronic suppurative otitis media (CSOM). The other possible causes are cholesteatoma, human papillomavirus, following RT for nasopharyngeal carcinoma. Other malignancies of the temporal bone are adenocarcinoma, rhabdomyosarcoma, lymphoma, melanoma, osteosarcoma, adenoid cystic carcinoma, acinic cell carcinoma. The usual foci of the disease is from external auditory canal. The most common type of primary cancer in the EAC is squamous cell carcinoma. They tend to invade posteriorly into the retroauricular sulcus. Medially placed tumors in the external auditory canal extend through the tympanic membrane and invade into the middle ear. Subsequently they spread via the eustachian tube, round and oval window, into the air spaces of the mastoid cavity. They have propensity to spread into the infratemporal fossa, neck and nasopharynx. Involvement of sigmoid sinus and dural invasion heralds poor prognosis.

DISCUSSION:

Invasive carcinoma of temporal bone is a rare, aggressive and destructive tumor. In spite of the advances in surgery and radiotherapeutic techniques, it carries poor prognosis. They account for 0.2 to 0.3% of all head and neck tumors with equal incidence in both sexes. Etiological factors implicated are chronic exposure to sunlight and genetic predisposition. Studies show that more than half of the patients have long standing middle ear infection - Chronic suppurative otitis media (CSOM). The other possible causes are cholesteatoma, human papillomavirus, following RT for nasopharyngeal carcinoma. Other malignancies of the temporal bone are adenocarcinoma, rhabdomyosarcoma, lymphoma, melanoma, osteosarcoma, adenoid cystic carcinoma, acinic cell carcinoma. The usual foci of the disease is from external auditory canal. The most common type of primary cancer in the EAC is squamous cell carcinoma. They tend to invade posteriorly into the retroauricular sulcus. Medially placed tumors in the external auditory canal extend through the tympanic membrane and invade into the middle ear. Subsequently they spread via the eustachian tube, round and oval window, into the air spaces of the mastoid cavity. They have propensity to spread into the infratemporal fossa, neck and nasopharynx. Involvement of sigmoid sinus and dural invasion heralds poor prognosis.

The route for spread into the neck and parotid gland is via the stylohyoid foramen and facial nerve. The retropharyngeal or deep jugular nodes can get involved at a later stage. Distal metastasis is rare. Route of spread is by direct erosion of the osteitic bone by inflammation, thrombophlebitis of emissary vein traversing the bone and dura. Common presenting symptoms are chronic otalgia, bleeding, otorrhea, hearing loss (conductive deafness), tinnitus, facial nerve palsy, external canal mass and parotid mass. Other cranial nerve palsies uncommonly can develop later, which indicate a poor prognosis. In addition to routine investigations, specific investigations include HRCT scan (high resolution CT) of temporal bone and neck (1mm cuts) to look for erosions of EAC (external auditory canal), jugular fossa, otic capsule, temporal bone, mastoid and for posterior fossa involvement. It is also important for accurate preoperative staging and treatment. MRI with Gadolinium enhancement to delineate soft tissue involvement, to distinguish tumor from fluid and inflamed mucosa. Audiometry to check hearing threshold prior to definitive surgery. Chest radiography to rule out metastasis. Carotid angiography if carotid artery involvement is suspected. Biopsy to determine if the lesion is benign or malignant.

Staging:

Two major staging systems are quoted in literature. The Clarke’s modification of Stell’s proposal and the revised Pittsburgh Classification System. The second staging has shown to be more useful.

T1 – tumor limited to EAC without bony erosion or evidence of soft tissue involvement
T2 – Tumor with limited EAC bone erosion with limited soft tissue involvement (< 0.5cm)
T3 – tumor eroding the osseous EAC (full thickness) with limited soft tissue involvement (< 0.5cm)
T4 – tumor eroding cochlea, petrous apex, medial wall of middle ear, carotid canal, jugular foramen, dura, facial nerve involvement or with extensive soft tissue involvement
N1 – single ipsilateral lymph node (< 3cm)
N2 – single ipsilateral lymph node (3- 6cm)
N2b – multiple ipsilateral nodes (< 6cm)
N2c – bilateral or contralateral nodes, all less than 6cm
N3 – nodes involved > 6cm

Treatment:

Surgery is the primary modality of treatment. Removal of the cancer en bloc is optimal as positive margins are associated with poor survival. Procedures could be a modified lateral temporal bone resection, lateral temporal bone resection, subtotal temporal bone resection, total temporal bone resection.

Adjuvant surgical procedures include craniotomy, neck dissection and parotidectomy. Literature evidence show a survival benefit with post operative radiotherapy. Primary radiation therapy as such is ineffective for curative treatment. For advanced tumors with intracranial invasion, treatment should be limited to palliative chemotherapy and radiotherapy in view of the grave prognosis of the tumor. (5 fluorouracil, fluoropyrimidine complex and external beam radiotherapy (EBRT) with a dose of 40Gy).

Conclusion:

Early identification and treatment of carcinoma of EAC is important to avoid secondary spread to skull bones and brain. Advanced lesions can produce neurovascular involvement and life threatening complications which carry poor prognosis in spite of aggressive management. So early identification is key for better outcome.
References:
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