M.R.I Diagnosis of Tumours and Tumour-Like Conditions Affecting the Pterygopalatine Fossa

Fahad Al Shehri
Assist. Prof. of Radiology, Qassim University,
Vice Dean Unaizah Medical College, KSA
Medical Director, Suleiman Al Habib Hospital,
Al Qassim, KSA

Abstract:

Objectives: To create awareness to the radiologist and clinicians for the magnetic resonance imaging (MRI) appearance of Pterygopalatine fossa (PTF) tumours and to evaluate the role of MRI in the diagnostic of PTF lesions.

Methodology: Retrospective evaluation of MRI features of 29 patients with pathologically proved pterygopalatine fossa (PTF) lesions was performed. The study included 18 males and 11 females with ages ranging between 15 and 68 years. All patients were examined on 1.5 Tesla magnets before and after injection of Gadolinium Meglumine. TI WI 5mm section sagittal scout views, followed by axial T1 5mm sections for the skull base and same sliced thickness during PD and T2 WI in axial and coronal planes.

Results: MRI features of various masses in pterygopalatine fossa were reviewed and correlated with those demonstrated in the literatures. Out of 29 PF masses, 7 masses were proved to be angiofibroma and 6 were nasopharyngeal carcinoma, entering the PTF.

Conclusion: MRI is a useful imaging test which helps in the differential diagnosis of pterygopalatine fossa lesions with precise evaluation of their extensions and nature of lesion and helping to reach the correct diagnosis. However, MRI has limitation for evaluation of associated bony erosion, for which adjuvant CT scan is needed.

Correspondence:

Dr. Fahad Al Shehri
Assist Prof of Radiology, Qassim University,
Vice Dean Unaizah Medical College, KSA
Medical Director, Suleiman Al Habib Hospital,
Al Qassim, KSA
fsalshehri95@gmail.com

Introduction:

Pterygopalatine fossa is a small slightly elongated triangular component that lies just behind the posterior wall of the maxillary sinus and in front of the pterygoid plates. It is bounded anteriorly by the corpus maxillae and superiorly by the body of the sphenoid bone. The medial margin of the pterygopalatine fossa is formed by the orbital process of the palatine bone. Its posterior border consists of the fused anterior mass of the medial and lateral pterygoid plates.

Although, CT has a considerable role in the diagnosis of pterygopalatine fossa lesions particularly those of osseous origin, yet the skull base region is often the site of partial volume average and beam hardening artefacts. (1)

MRI has been used for evaluation of the skull base lesions owing to its high capability for tissue characterization and multi-directional imaging. In particular, the pterygopalatine fossa can be properly evaluated by MRI allowing for precise assessment of mass lesions, extension and avoiding the common CT artefacts. (2)

The objective of this study is to describe the MRI appearance of various space-occupying lesions that affect the pterygopalatine fossa, not to determine the incidence of these lesions.

Materials and Methods:

Twenty nine patients with different lesions affecting the pterygopalatine fossa were selected in retrospect [18 males and 11 females] with ages ranging between 15 and 68 years.

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Table-1 demonstrates the number of patient's and corresponding ages and pathologic lesions in all our study population.

Table-1: Patient's data

No. of cases	Age	Pathological Diagnosis
7	15 – 18 years	Angiofibroma
2	19 and 26 years	Osteogenic sarcoma
3	14 – 60 years	Chordoma
2	45 and 58 years	Chondrosarcoma
1	22 years	Extra skeletal Ewing's sarcoma
6	30 – 68 years	Nasopharyngeal Carcinoma
3	33 – 40 years	Deep parotid neoplasms
1	15 years	Neuroectodermal tumour
1	50 years	Ca tongue
1	15 years	Fibrous dysplasia
2	40 – 45 years	Schwannoma

Results:

Two cases of angiofibroma, the lesions were mostly centered in the pterygopalatine fossa causing focal expansion with variable degrees of extensions in all orthogonal planes [nasal cavity, infratemporal fossa parapharyngeal space, orbital cavity via the inferior orbital fissure and middle cranial fossa via the superior orbital fissure. The involved foramina and pathways are usually smoothly expanded denoting benign behaviour of the lesion. On MRI, these lesions appear as a mass of heterogeneous low-intermediate signal intensity on T1 WI and PD, and of intermediate-high signal intensity on T2 WI. The flow voids of the medium calibre vessels which are clearly seen in the same places on both T1 and T2 WI are responsible for the heterogeneous appearance. After Gadolinium injection, the entire tumour intensely enhances. Of course, the young age of the patient [usually teenagers] with clinical presentation of

epsitaxis is usually helpful with the clinical setting to reach the correct diagnosis. (Fig.1).

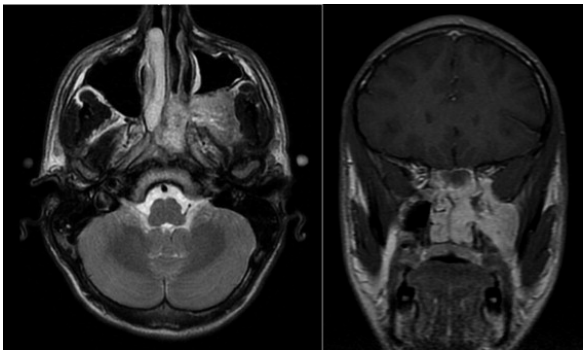

Fig 1. MRI Angiofibroma. T2W axial image with hyper intense signal and signal void foci. T1W coronal image after gadolinium showing large diffusely enhancing mass arising from left nasopharynx with extension to left pterygopalatine fossa.

In cases of nasopharyngeal carcinoma involving the pterygopalatine fossa the MRI images demonstrated abnormal soft tissue masses implicating the nasopharyngeal wall, extending forward to the pterygopalatine fossa with often effacement of the fossa of Rosen Muller and eustachian tube orifice. These masses are of nonuniform texture, being mostly iso-intense during T1 WI and of mildly hyper intense signal during T2 WI with moderate enhancement after contrast administration. (Fig.2). The nasopharyngeal carcinoma may infiltrate the skull base bones best demonstrated in the fat suppression images, where the marrow is replaced by tumoral enhancing tissues. Associated cervical lymphadenopathy due to metastatic spread may be encountered most clinically and radiologically. Similar changes were

In cases of Chordoma, the tumours arise in the basisphenoidale with extension to the pterygopalatine fossa, intracranial epidural space, back of orbits and sella turcica, usually in symmetric fashions. MRI has great advantage of permitting sagittal section, which often show the lesion best and together with coronal and axial sections permit full demonstration of the extent and relations of the tumour. Tumours appeared as lobulated, inhomogeneous masses generally iso-intense with brain in T1 and of higher signal intensity on T2 weighted images, with intense contrast uptake. (Fig 3). Multiple tiny signal void spots may be demonstrated representing matrix calcifications.

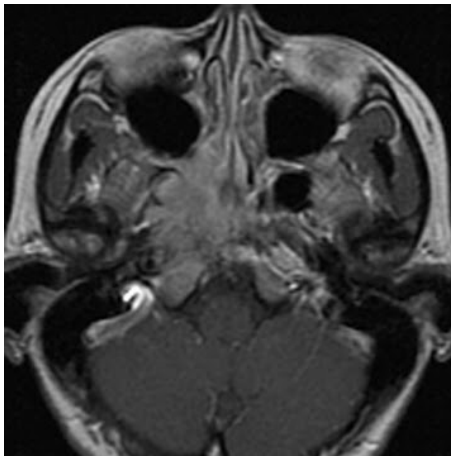

Fig 2. MRI T1W axial image after gadolinium contrast enhancement showing right nasopharyngeal carcinoma with extension into the sphenoid sinus, cavernous sinus, petro us apex and pterygopalatine fossa.

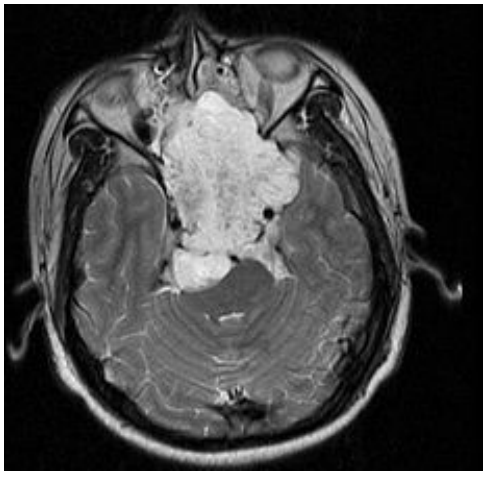

Fig.3. MRI of Clival Chordoma., T2W axial view showing large hyper intense mass with extension to in the nasopharynx , and left pterygopalatine fossa.

In cases of Osteogenic sarcoma and Ewing's sarcoma involving the skull base and encroaching on the pterygopalatine fossa, the tumours were primarily implicating maxillary antrum and floor of the middle cranial fossa respectively. These tumours appear as osseous expanding lesions replacing the marrow by heterogeneous, soft tissue lesions

having low-intermediate signal during T1 WI and of a mixture of high and low signal intensities during T2 WI. After contrast administration, nonuniform considerable enhancement was demonstrated. The extra-osseous soft tissue extensions were also demonstrated with perfect delineation of the pterygopalatine fossa involvement.

The MRI appearance of the encountered Chondrosarcoma showed high signal on T2 WI, with differential enhancement on the post-Gadolinium scans, which is seen at the peripheries of the mass while the central chodromatous course displayed very low enhancement. These changes are presumably dependent upon vascularity of the tissues concerned.

Deep parotid neoplasms encountered in this study were pleomorphic adenoma (two cases) and adenoid cystic carcinoma (one case). These lesions were inseparable from the parotid gland and demonstrated epicentres at the deep portions with well-defined borders whenever benign. While infiltrative margins were detected in malignancy. Benign lesions, tend to be heterogeneous with iso – hypo-intense signal shown during T1 WI, also, hemorrhagic spots of bright signal intensity were seen during the same pulse sequence. During T2 WI**,** those tumours were of mixed high, intermediate and dark signals (probably of calcifications]). Contrast enhancement was mild to moderate with areas of necrosis within. The malignant forms of parotid tumours were more heterogeneous (Fig 4).

In case of recurrent tongue carcinoma, the mass lesion was fixed to the tongue base, with extension to the pterygopalatine fossa. It showed poorly-defined margins, irregular configuration and heterogeneous texture low and relatively high signal intensities during T1 and T2 WI respectively. Mild non-uniform enhancement was noticed after contrast administration (Fig.5).

The case of fibrous dysplasia was a 15 years old, with heterogeneous soft tissue skull base mass implicating the corpus maxillae and body of sphenoid bone with significant encroachment on the pterygopalatine fossa. The mass was well-defined representing heterogeneous low signal intensity during T1 and T2 WI with cystic bright components during T2 WI.

In case of Neuroectodermal tumour, the mass was rather well-defined. Extending in various directions, rather sizeable, mainly involving the great wing of sphenoid, with involvement of the pterygopalatine fossa. It demonstrated heterogeneous texture during T1 and T2 WI with non-uniform intense contrast uptake. The final diagnosis was reached only after biopsy.

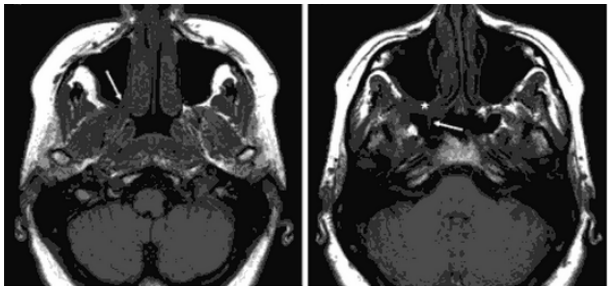

Fig 4 MRI of adenoid cystic carcinoma with extension to right pterygopalatine fossa.

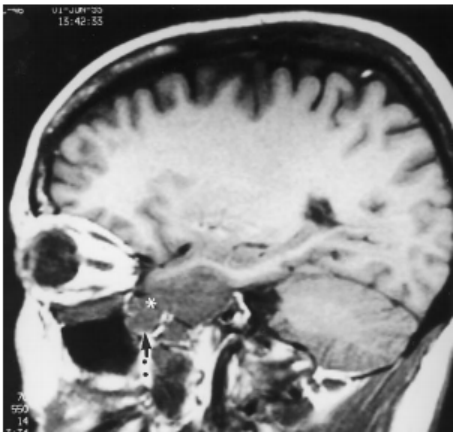

FIG 5 MRI sagittal T1W image showing neoplastic infiltration into the pterygopalatine fossa.

Discussion:

The described MRI features in this study are consistent with criteria stated by Som and Curtin in 1992. [3]

The finding in nasopharyngeal carcinoma described in this study is almost similar to described by Hudings and Gussak in 1992. [4]

The cases of Chordoma in this study showed signal void areas for calcifications.

Those dark foci of matrix calcifications were also described by Mafee in 1993. [5]
MRI Criteria of Osteogenic Sarcomas were similarly demonstrated by Vanel et al in 1997 [6] and Som et al in 1937. [3]

Chondrosarcoma exhibited low signal intensity on T1 weighted sequences, nodular or plaques of calcifications might often show as signal void areas within the tumour matrix. These MRI features were corresponding to criteria described by Lioyd et al in 1992. [7]

The described features were similar to those detailed by Sigal et al, who correlated signal intensity on T2 WI with the degree of cellularity and water content of a particular lesion, and has been proposed as potential predictive factor of biological aggressiveness. [8]

The findings described in fibrous dysplasia in this study are similar to what was described by Som and Curtin in 1992. [9]

Two cases of neurofibromas were included in our study and they appeared as well-defined ovoid masses of nonuniform low and high signal intensities during T1 and T2 WI respectively with moderate heterogeneous enhancement after contrast injection. Such criteria are almost identical to those described by Chow at al 199. [10]

Conclusions:

MRI is a useful imaging modality which aids in the differential diagnosis of pterygopalatine fossa lesions with precise evaluation of their extensions and nature of lesion, helping to reach the correct diagnosis. However, bone erosion is a limitation of the MRI examination and should be combined with adjuvant CT scan in the complicated cases.

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