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*Neuroradiology/Head and Neck Imaging* *Case Series*

# Cross-sectional imaging evaluation of atypical and uncommon extra-nodal head and neck Non-Hodgkin lymphoma: Case series

Esmat M. Mahmoud[1], Emily Howard[2], Humera Ahsan[2], Joseph P. Cousins[2], Ayman Nada[2]

[1]Department of Diagnostic and Interventional Radiology, National Cancer Institute, Cairo, Egypt, [2]Department of Radiology, University of Missouri, Columbia, Missouri, United States.

***Corresponding author:**
Ayman Nada,
Department of Radiology,
University of Missouri,
Columbia, Missouri,
United States.

anada@health.missouri.edu

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## ABSTRACT

Extra-nodal Non-Hodgkin lymphoma (ENHL) of the head and neck is not uncommon and has variable clinical and imaging presentations. It represents about 25% of extra-nodal lymphomas. In addition, lymphoma is the third most common malignancy of the head and neck just after squamous cell carcinoma (SCC) and salivary gland neoplasms. Unlike SCC, ENHL usually presents as a well-defined mass in the oral cavity, along the pharyngeal mucosa, sinonasal cavity, orbit, and other different neck spaces. One of the common presentations of ENHL is the glandular type which can arise within the salivary or thyroid glands as marginal zone non-Hodgkin lymphoma. ENHL can infiltrate the bone resembling high grade osseous malignancies. Rarely, ENHL can present as perineural spread without definitive mass and manifest clinically with several neuropathies. In this case series, we presented different imaging features and presentation of ENHL of the head and neck. The knowledge of various presentations of ENHL of the head and neck can help early diagnosis and prompt management of these patients' population.

**Keywords:** Computed tomography, Magnetic resonance imaging, Head and neck, Non-Hodgkin lymphoma, Extra-nodal

## INTRODUCTION

Lymphoma is a malignant neoplastic proliferation of the immune system with 10% classified as Hodgkin and 90% as non-Hodgkin lymphoma (NHL). Hodgkin's lymphoma occurs mainly in the lymph nodes, typically presenting with contiguous cervical, supraclavicular, and mediastinal lymphadenopathy. Only 4–5% of Hodgkin lymphoma is extra-nodal.[1-4] In contrast, NHLs are found in extra-nodal regions outside the lymphoid system in 40% of cases. The most frequently involved extra-nodal location of lymphoma in the head and neck is Waldeyer's ring, a mucosal pharyngeal space rich in lymphatic tissue, composed of the palatine tonsils, lingual tonsils, and nasopharyngeal tonsils.[1] Other common extra-nodal locations include the oral cavity, sinonasal cavities, orbit, salivary, and thyroid glands.[1,5] There are numerous subtypes of NHL, but in the head and neck, the most common subtypes are diffuse large B cell, follicular, mucosa-associated lymphoid tissue (MALT), extra-nodal NK/T cell, Burkitt's, mantle cell, small lymphocytic, and B cell lymphoblastic lymphomas. The most frequently encountered NHL is diffuse large B cell lymphoma (DLBL), which accounts for 30% of all lymphomas.[1,6] DLBL is often seen in the

paranasal sinuses, jaw, and Waldeyer's ring. Extra-nodal MALT lymphoma is an indolent lymphoma subtype and commonly develops within the thyroid and salivary glands, larynx, and ocular adnexa.[1,7] On the other hand, the aggressive NK/T-cell lymphoma is common in the sinonasal cavity.[1] The incidence of lymphomas is rising, increasing up to 35% in approximately the past 20 years. The increasing prevalence of lymphoma in developed countries may also be attributed to increased percentage of elder people.[8] Lymphoma represents the third most common malignancy in the head and neck region after squamous cell carcinoma and salivary gland neoplasms and accounts for 5% of all head and neck malignant neoplasms. In addition, the head and neck represent the second most common site for extra-nodal lymphomas following the gastrointestinal tract.[9-13] We will present various cases of extra nodal NHLs of the head and neck which occur in different head and neck subsites with diverse presentations.

## CASE SERIES

### Case 1: Sinonasal lymphoma

A 74-year-old woman presented for the evaluation of right facial pain. She had numbness and tingling feeling of the upper right palate, right cheek, and right lower jaw. Physical examination revealed impaired pinprick sensation on the right side of the face along the distribution of V2 nerve and diffuses hyperreflexia. It was thought to be trigeminal neuropathy due to a demyelinating disease, so magnetic resonance imaging (MRI) of the brain without and with IV contrast was performed. MRI showed asymmetric thickening and enhancement of the right V3 nerve with widening of the right foramen ovale and further extension into the lateral margin of the right cavernous sinus [Figure 1]. From the right cavernous sinus, there is notable thickening and enhancement through V2 nerve within foramen rotundum, and pterygopalatine fossa as well as thickening and enhancement of the right infra-orbital nerve [Figure 1]. This was interpreted as perineural invasion of an occult head and neck tumor, for which positron emission tomography with computed tomography (PET/CT) was performed. PET/CT revealed submucosal avid FDG activity within the medial wall of the right maxillary antrum, extending into the right pterygopalatine fossa [Figure 1]. Excisional biopsy was performed, and pathological evaluation demonstrated diffuse large B-cell lymphoma.

### Case 2: Prevertebral lymphoma

A 58-year-old man presented to the neurosurgery spine clinic with a non-radiating neck pain of more than 1-year duration.

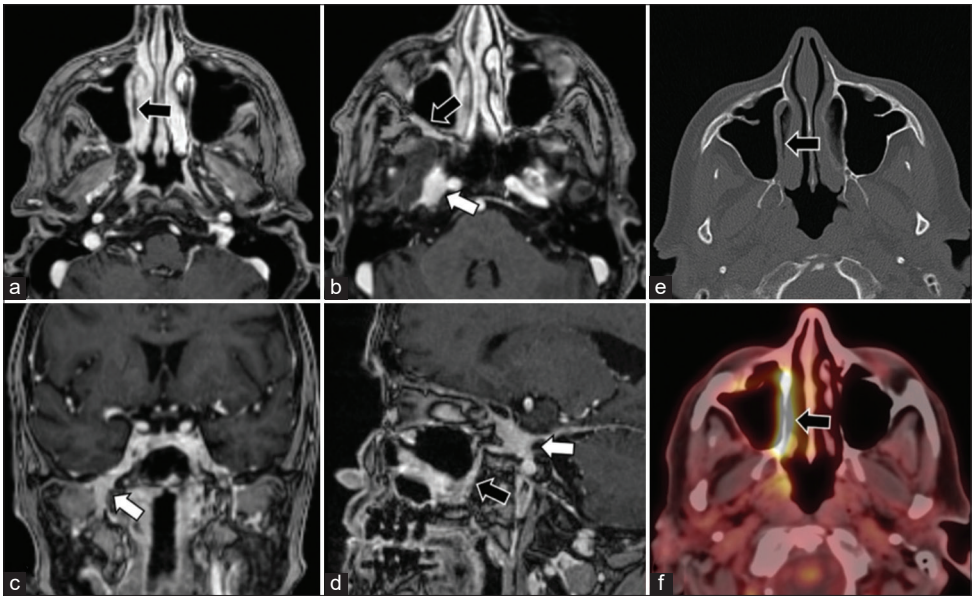


**Figure 1:** Sinonasal diffuse large B cell lymphoma in a 74-year-old female. Axial 3D T1 MPRAGE after IV gadolinium administration (a and b) showed asymmetric submucosal enhancement along the medial wall of the right maxillary antrum and within the right retromaxillary space (black arrows). Asymmetric thickening and mass like enhancement of the right V3 nerve at the level of right foramen ovale was noted (white arrow). Coronal (c), and sagittal (d) 3D T1 MPRAGE after IV gadolinium administration confirmed the abnormal thickening and mass enhancement at the right Meckle's cave, right foramen ovale, right masticator space and right retromaxillary spaces (arrows). Axial high-resolution non-contrast CT of the sinuses (e) revealed demineralization and lytic changes of the right maxillary medial wall, corresponding to abnormal enhancement on MRI. Axial fused PET/CT image at the level of maxillary antra (f) confirmed hypermetabolic mass along the right maxillary medial wall.

The neck pain was aggravated by coughing or moving his neck and gradually getting worse with frequent spasms. The patient felt that the spasm involved both sides but was worse on the right. He had been placed on antispasmodic medication and gabapentin with minimal improvement of his symptoms. He denied any difficulty using his hands, any difficulty ambulating, and reported no bowel or bladder dysfunction. MRI spine revealed a large prevertebral enhancing mass extending into upper cervical spine with circumferential cord compression [Figure 2]. CT guided biopsy was performed and showed diffuse large B-cell lymphoma.

**Case 3: Buccal space marginal zone lymphoma**

A 58-year-old man presented with right buccal swelling. The patient had been diagnosed with marginal zone lymphoma of the stomach 5 years earlier. The mass was superficial and easily biopsied. Pathological evaluation confirmed relapsed marginal zone lymphoma of the right buccal submucosa. CT neck with intravenous (IV) contrast demonstrated a well-circumscribed enhancing mass centered on the right buccal mucosa [Figure 3].

**Case 4: Glandular lymphoma**

***Case 4a: Thyroid lymphoma***

A 12-year-old man presented for the evaluation of a thyroid goiter, accompanied by her parents. Her mother reported a rapidly enlarging anterior neck mass starting 2 months before the presentation. The patient endorsed heat intolerance, dry skin of the arms bilaterally, fatigue, and increased forgetfulness in the past few months. She denied any fevers, night sweats, or weight loss. The patient's anti-TPO antibodies were 1011 IU/mL, and TSH was 1.04 mIU/L. Thyroid ultrasound revealed a highly heterogeneous appearance of the thyroid gland, without any discrete nodules [Figure 4]. The right lobe measured 6.53 cm in its greatest dimension, and left lobe measured 5.31 cm. Fine-needle aspiration cytology was performed from the left lobe which revealed atypical lymphocytes suspicious for lymphoma. However, there was no sufficient material for flow cytometry. The patient underwent left thyroid lobectomy. Histopathological analysis showed stage IE pediatric marginal zone lymphoma with background of Hashimoto's thyroiditis. Following diagnosis with lymphoma, the patient underwent $^{18}$FDG-PET/CT scan for lymphoma staging. $^{18}$FDG-PET/CT demonstrated multiple FDG avid enlarged lymphadenopathy involving right level 2B, level 3, and supraclavicular lymph nodes.

***Case 4b: Parotid lymphoma***

A 60-year-old woman presented with right parotid gland swelling. The mass was firm and slightly tender. She underwent a CT which showed a right parotid gland heterogeneously enhancing mass without obvious vascular

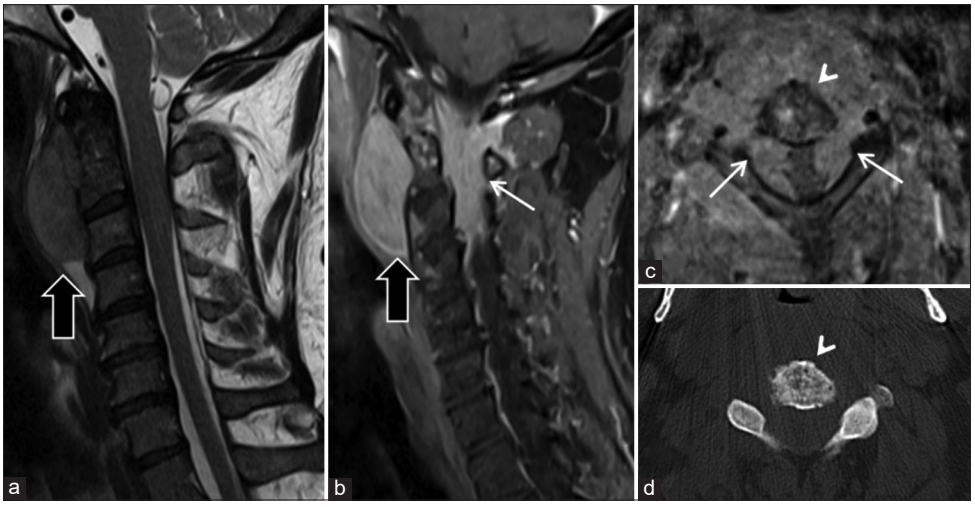


**Figure 2:** Prevertebral diffuse large B cell lymphoma in a 58-year-old male. Sagittal T2 (a) and T1 with fat saturation after IV gadolinium administration (b) showed large ovoid T2 hyperintense, enhancing mass within the prevertebral space (black arrows). Abnormal bone marrow enhancement of C2 vertebral body, suspicious for osseous origin or infiltration by the soft-tissue mass. Sagittal T1 with fat saturation after IV gadolinium administration also showed significant intraspinal extension with large enhancing mass compressing the spinal cord (white arrow). Axial T1 with fat saturation after IV gadolinium administration (c), and high-resolution non-contrast CT in bone window at the same level (d) confirmed the osseous erosive changes (arrow heads), and large enhancing intraspinal component (white arrows).

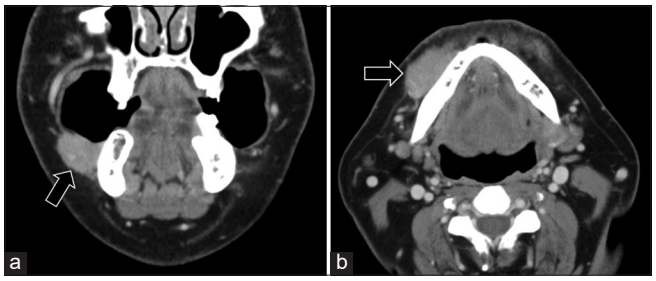

**Figure 3:** Right buccal marginal zone lymphoma in a 58-year-old male. Coronal (a) and axial (b) contrast enhanced images of the CT neck showed enhancing right buccal submucosal mass with involvement of the inferior gingivobuccal sulcus (arrows).

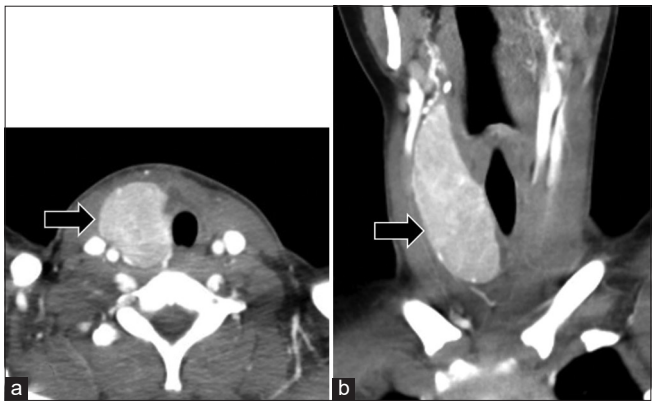

**Figure 4:** Thyroid marginal zone lymphoma in a 12-year-old female. Axial (a) and coronal (b) contrast enhanced images of the CT neck showed marked diffuse enlargement of the right thyroid lobe with diffuse heterogeneous enhancement and non-discrete masses (arrows). Note left thyroidectomy.

nor mandibular invasion [Figure 5]. Ultrasound guided fine needle aspiration was performed but non-diagnostic. Then, an incisional biopsy of the right parotid mass was performed. The final pathology from the right parotid mass was positive for diffuse large B-cell lymphoma. PET/CT scan was done and showed increased uptake in the right posterior parotid gland with an SUV of 30.8, also there was uptake in the left external iliac lymph nodes with max SUV of 7.9.

### Case 5: Carotid space lymphoma

A 65-year-old man presented to clinic for the evaluation of a left neck mass. The patient first noticed it 1.5 months earlier and thought he had a bug bite on his left neck, but the area of swelling did not go down. His left neck had been feeling stiff and sore. He denied any associated tenderness or discomfort, otalgia, dysphagia, odynophagia, voice changes, other neck lumps or bumps, or unintentional weight loss. Flexible laryngoscopy was performed and revealed normal pharyngeal spaces without masses or concerning findings. The left neck mass examined with ultrasound which showed

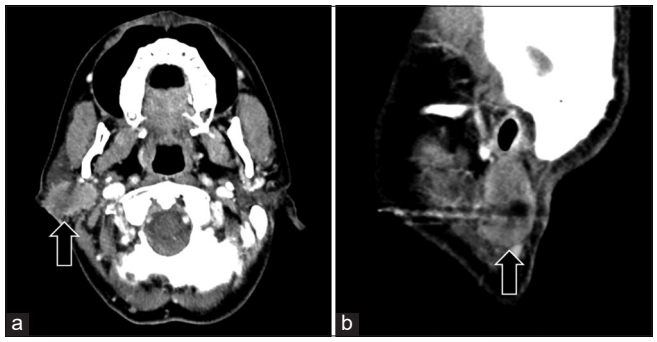

**Figure 5:** Right parotid diffuse large B cell lymphoma in a 60-year-old female. Axial (a) and sagittal (b) contrast-enhanced images of the CT neck at the level of right parotid gland showed an irregular enhancing mass within the deep lobe of the right parotid gland (arrows). The mass contacts the right retromandibular vein and abuts the inferior wall of right cartilaginous external auditory canal.

homogenous hypoechoic mass with increased vascular flow appreciated throughout the mass. No evidence of vascular invasion.

CT neck was obtained which revealed a well circumscribed oblong shaped enhancing mass within the left carotid space deep to the sternocleidomastoid muscle [Figure 6]. Contrast-enhanced MRI of the neck showed large lobulated mildly enhancing mass within the left carotid space, mildly compressing, and medially displacing the left carotid space vessels, that is, common, and internal carotid arteries as well as internal jugular vein [Figure 6]. The mass showed significant restricted diffusion on diffusion-weighted imaging (DWI) with decreased apparent diffusion coefficient (ADC) value [Figure 6]. Histopathological evaluation revealed high grade B cell lymphoma, NOS.

### Case 6: Osseous (facial, skull base and calvarial) lymphoma

A 24-year-old man presented for the evaluation of a right submandibular swelling that had been present for a couple of weeks. The patient denied pain, drainage, fever, chills, sweats, nausea, vomiting, or other enlarged lymph nodes. He stated that he had a tightness of the right lower jaw. There were no overlying skin changes nor specific exacerbating or relieving factors. Physical examination revealed a non-tender subcutaneous swelling of his left forehead across to his temple and the parietal scalp without overlying skin wounds or changes. In his right upper neck, there was a diffuse subcutaneous enlargement which was contiguous with the parotid tail without overlying skin change. High-resolution contrast-enhanced CT neck showed diffuse osseous infiltration of the left frontal, and temporal calvarial bones, left sphenoid, and posterolateral orbital wall as well as the left zygomatic arch [Figure 7]. The right submandibular gland was hypertrophied with bilateral cervical lymphadenopathy.

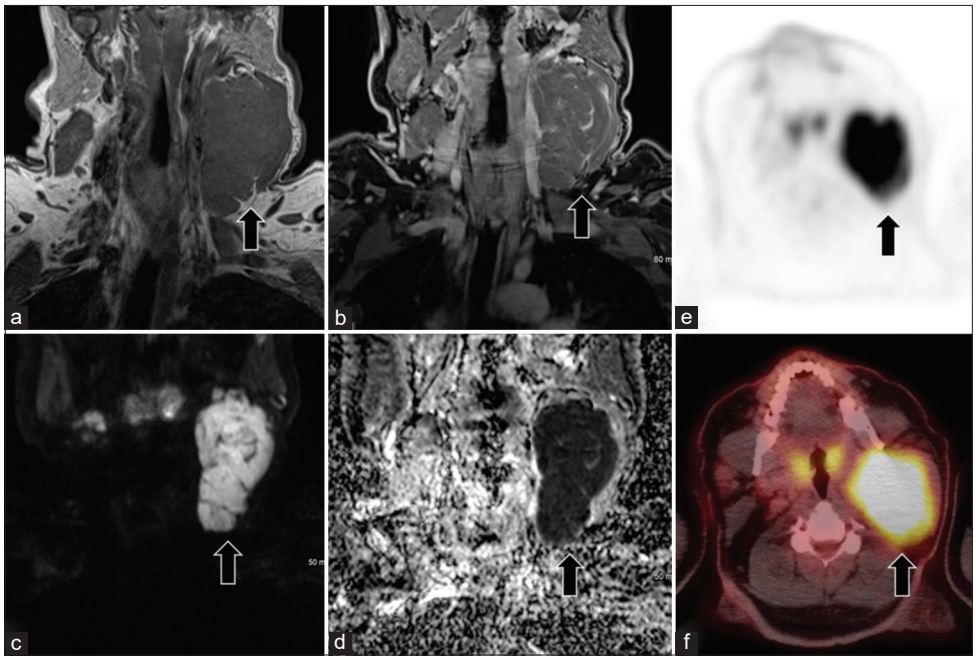


**Figure 6:** Left carotid space diffuse large B cell lymphoma in a 65-year-old male. Coronal T1 (a) and T1 with fat saturation after IV gadolinium administration (b) showed large lobulated mildly enhancing mass within the left carotid space medially displacing and compressing the left internal jugular vein (arrows). The mass has significant predominantly homogeneous restricted diffusion on diffusion weighted image (c), and ADC (d). Axial PET (e), and fused PET/CT (f) images demonstrated significant hypermetabolism of the mass with increased FDG uptake (arrows).

The findings were concerning for osteomyelitis and reactive lymphadenopathy. The patient underwent contrast-enhanced MRI of the neck for further confirmation and characterization of CT findings. MRI demonstrated diffuse infiltration of the osseous structures with significant reduced diffusion and extra-osseous extra/intra-cranial enhancing masses without abscess formation. MR findings raise suspicion of underlying neoplastic process rather than inflammatory/infectious process. Core-needle biopsy was performed. Histopathological evaluation demonstrated high-grade B-cell lymphoma.

## DISCUSSION

Extra-nodal non-Hodgkin lymphoma (ENHL) of the head and neck represents a diagnostic challenge for clinicians, radiologists, and even pathologists because it has a wide spectrum of presentations clinically and radiologically.[10-12,14] This diagnostic dilemma is even more relevant as the prevalence of lymphoma is rising. We described atypical and uncommon presentations of various types of ENHL within the head and neck. In our cohort, ENHL of the head and neck manifested as a subtle submucosal mass in the nasal cavity with extensive perineural spread. Other cases presented as a well-defined mass within the prevertebral, buccal, or carotid spaces. We also described osseous lymphoma that appeared as aggressive and infiltrative mass within the mandible and calvarium. Given the wide variety in clinical and radiologic presentations of head and neck lymphomas, it should be virtually excluded in any patients presented with nodal or extranodal mass in the head and neck region.[2,11,15,16] Knowledge of predisposing factors and various radiological signs helps to suggest ENHL of the head and neck and thus leads to biopsy confirmation, initiation of treatment at an early stage, and thus improved patients' outcome.

### Clinical presentation of ENHL of the head and neck

The clinical presentation of ENHL is non-specific and depends on the site of involvement.[3,16-18] ENHL of the head and neck typically develops in the sixth and seventh decades of life with a slight male predominance.[1,19] Exceptions are salivary, orbital, and thyroid lymphomas, which have a female predominance.[20,21] Constitutional symptoms such as fatigue, weight loss, fever >38°C, and night sweats with increased risk of infections are common.[1] Sinonasal lymphomas usually present with obstructive symptoms, rhinorrhea, epistaxis, non-healing ulcer, or pain.[1,22] Aggressive and high grade sinonasal lymphomas are typically associated with bone destruction, nasal septal perforation, and extension into orbit with development of proptosis.[1,2,23] Due to the

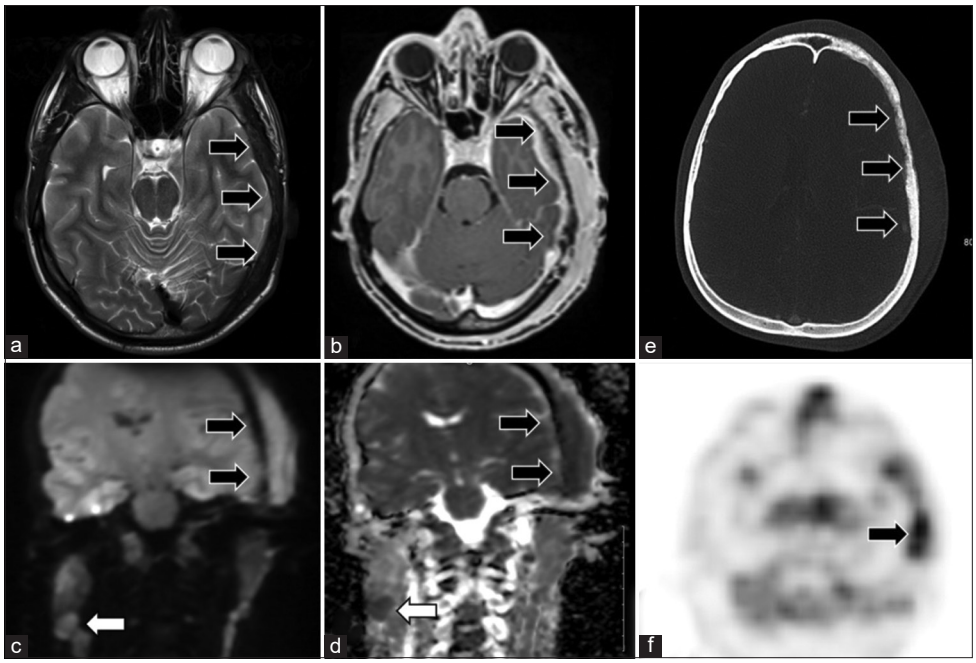


**Figure 7:** Multifocal calvarial, skull base, and facial osseous high-f diffuse large B cell lymphoma in a 24-year-old male. Axial T2 (a) and axial 3D T1 MPRAGE after IV gadolinium administration (b) showed diffuse expansion, thickening and infiltration of the left fronto-temporal calvarial bones, associated with extra-cranial and intracranial enhancing masses (arrows). Coronal diffusion weighted image (c), and ADC (d), showed characteristic restricted diffusion of associated soft-tissue components. Axial high-resolution non-contrast CT head in bone window (e) demonstrated permeative pattern of osseous infiltration of the left fronto-temporal calvarial bones (arrows). Axial PET image (f) confirmed hypermetabolic activity of the mass (arrow).

aggressive behavior, it is very difficult to differentiate from sinonasal squamous cell carcinoma.[23] Orbital lymphomas usually involve the superotemporal quadrant and manifest as a painless enlarging mass with proptosis, eyelid swelling, and diplopia.[1,2,23] Thyroid lymphomas present as a rapidly enlarging neck mass. In general, indolent types of ENHL of the head and neck manifest clinically as slowly growing masses that could overlap with other benign head and neck masses such as parotid, oral/buccal, or orbital masses while more aggressive forms can present with bony erosion among other aggressive features.

It is also important to keep in mind various risk factors that are attributed to the development of lymphoma including infections, autoimmune disorders, congenital or acquired immunodeficiency syndromes, impairment of the cell cycle, host susceptibility, and immunosuppression due to organ transplantation.[1,8] The infectious factors are many and include human immune-deficiency virus (HIV), Epstein-Barr virus (EBV), Hepatitis C, Helicobacter pylori, and human T-cell leukemia virus-1.[8,19] Burkitt's lymphoma is common in children and has strong association with the EBV.[1] Chronic HIV infection poses a 100 times increased risk of lymphoma. Autoimmune disorders such as Hashimoto's thyroiditis and Sjogren syndrome increase the risk of thyroid and salivary gland lymphoma respectively.[1] In one study of patients with primary thyroid lymphoma, about 80% were associated with a history of Hashimoto thyroiditis. Environmental or occupational exposures to substances such as dioxin, agricultural pesticides, organophosphates, and organochlorines are also risk factors for development of NHL.[3,18,24-27]

Diagnostic workup for suspected lymphoma should include basic laboratory tests such as erythrocyte sedimentation rate, complete blood count, and liver function tests for better clinical staging.[1]

### Common imaging features ENHL of the head and neck

On imaging, ENHL of the head and neck can have non-specific and overlapping features with other infectious, inflammatory, and neoplastic processes. Initial imaging evaluation of ENHL of the head and neck depends on the primary site of involvement. Ultrasound is the initial imaging modality for the evaluation of superficial masses within the orbit, cervical lymph nodes, thyroid, and salivary glands.[1,2,19,23,28-30] Deeper lesions, however, require evaluation with CT and MRI.[1,22,31,32]

The imaging criteria depend on site of involvement of ENHL of the head and neck as well as the histologic subtype [Table 1]. In general, the indolent types such as extra-nodal MALT appear as well circumscribed masses with homogenous density and enhancement on CT.[33,34] MR imaging criteria typically demonstrate well-defined masses of isointense signal on T1-weighted images and slightly hyperintense signal on T2-weighted images relative to surrounding muscles.[10-12] After IV gadolinium administration, the masses show moderate homogenous enhancement.[10] Higher grade and aggressive lymphomas can appear as infiltrative mass with overlapping criteria with head and neck squamous cell carcinoma.[26,32,35-38]

DWI is a very useful non-invasive technique in the evaluation of the head and neck masses, differentiating benign from malignant masses, necrotic malignancy from infection with abscess formation, and tumor recurrence from post-treatment changes.[9,39-44] DWI contrasts different tissues based on Brownian motion of water molecules within different tissue compartments.[39,42,43] ENHL of the head and neck typically has a restricted diffusion pattern with high signal intensity on DWI and dark signal on ADC.[39,42] ADC value can provide a quantitative measure to distinguish different malignancies. For example, Maeda *et al*. found that ADC value of $0.76 \times 10^{-3}$mm$^2$/s has 98% accuracy to distinguish lymphoma from squamous cell carcinoma.[39,45] While Wang *et al*. found a 92% accuracy when they used the same ADC value of $0.76 \times 10^{-3}$ mm$^2$/s.[39,46] Nodal disease, when present, appears as multiple homogenous lymph nodes that may show variable enhancement. Nodal necrosis or calcification may be seen before or after treatment.[10,11] Nodal necrosis that is present before the initiation of the treatment is more suggestive of high-grade disease. Definitive diagnosis relies on biopsy with examination of the tissue for architectural analysis and immunophenotyping.

Once the lesion has been proved to be ENHL, PET/CT is imperative for accurate staging and evaluation of sites of involvement.[14,24] PET/CT has been shown to be insufficiently sensitive in detecting presence of bone marrow involvement. Therefore, bone marrow biopsy is important to exclude bone marrow disease, as 18% of ENHL have bone marrow involvement.[1] PET/CT is also essential for assessing treatment response and monitoring for recurrence by measuring metabolic activity through standardized uptake of FDG.[24,25]

## Differential diagnosis of ENHL of the head and neck and how to distinguish based on imaging

The differential diagnosis of head and neck lymphoma is dependent on the site of involvement [Table 2].

Orbital lymphoma should be differentiated from other disorders that present with diffusion restriction in particular idiopathic orbital inflammatory pseudotumor, IgG4 disease, granulomatosis with polyangiitis, and metastatic disease.[7,30,47-49]

Sinonasal NHL can be difficult to distinguish from granulomatosis with polyangiitis, squamous cell carcinoma, and esthesioneuroblastoma.[15,50-53] Lymphoma is more likely to present in nasal cavity rather than paranasal sinuses as seen in squamous cell carcinoma.[54-56]

Primary thyroid lymphoma can be confused with anaplastic thyroid carcinoma. Imaging can help distinguish these two entities.[57] Thyroid lymphoma tends to be homogeneous without calcification or necrosis.[57]

Nasopharyngeal NHL can have significant overlap with nasopharyngeal carcinoma on imaging.[58] However, nasopharyngeal carcinoma is more likely to infiltrate surrounding tissues and cause skull base bony erosion.[58,59]

**Table 1:** Imaging criteria of indolent and aggressive types of head and neck Non-Hodgkin lymphoma.

| Imaging modality | Indolent types, for example, extra-nodal mucosa-associated lymphoid tissue | Aggressive types, for example, nasal T-cell/NK cell lymphoma |
|---|---|---|
| CT | | |
| Morphology | Well circumscribed mass | Ranges from infiltrative pattern to a mass-forming pattern |
| Density and enhancement | Homogenous density and enhancement | Slightly heterogeneous |
| MRI | | |
| Morphology | Well-defined mass | Infiltrative mass<br>Osseous invasion<br>Perineural extension |
| Signal intensity | | |
| T1 | Isointense | Isointense |
| T2 | Slightly hyperintense | Isointense |
| DWI | Hyperintense | Hyperintense |
| ADC | Hypointense | Hypointense |
| Enhancement | Moderate homogenous enhancement | Heterogeneous enhancement |
| Calcification | No calcification | No calcification |

**Table 2:** Common imaging features of HN-NHL and differential diagnoses according to site of involvement.

| Site | Imaging features | Common differential diagnosis |
|---|---|---|
| Orbital | • Well circumscribed mass<br>• Hyperdensity on CT<br>• T2 Hypointense signal<br>• Hyperintense DWI signal<br>• Hypointense "dark" signal on ADC map | • Idiopathic orbital inflammatory syndrome<br>• Sarcoidosis<br>• Granulomatosis with polyangiitis<br>• Erdheim-Chester disease<br>• Metastasis<br>• Lacrimal tumors |
| Sino-nasal | • Polypoid mass<br>• Submucosal infiltrative mass<br>• Less likely to cause bony erosion compared to SCC | • Sinonasal SCC<br>• Sinonasal Adenocarcinoma<br>• Olfactory neuroblastoma<br>• Granulomatosis with polyangiitis<br>• Sarcoidosis<br>• Chronic or invasive fungal rhinosinusitis |
| Oral and maxillofacial | • Well circumscribed mass in the superficial spaces e.g., buccal space<br>• Tonsillar mass<br>• Submucosal pharyngeal mass<br>• ±lymphadenopathy | • Oropharyngeal and oral cavity SCC<br>• Neurogenic tumor, for example, Schwannoma<br>• Minor salivary gland tumors |
| Glandular NHL | • Homogenous mass within parotid, submandibular, lacrimal, or thyroid gland<br>• Diffuse glandular involvement<br>• ±lymphadenopathy<br>• No calcification or necrosis | • Warthin tumor<br>• Mucoepidermoid carcinoma<br>• Adenoid cystic carcinoma<br>• SCC<br>• Anaplastic thyroid carcinoma<br>• Differentiated thyroid carcinoma |
| Osseous NHL | • Focal destructive mass with periosteal reaction<br>• Diffuse infiltrative mass with permeative pattern | • Osteosarcoma<br>• Ewing sarcoma<br>• Osseous metastasis |

NHL: Non-Hodgkin lymphoma, SCC: Squamous cell carcinoma

Osseous NHL can be misinterpreted as primary or secondary malignant bone tumors.[60,61] The infiltrative pattern, decrease in ADC values and almost homogenous pattern of mass enhancement might differentiate osseous NHL from other primary or secondary osseous malignancies.

### Impact of early diagnosis of ENHL of the head and neck on treatment and patients' prognosis

Treatment for ENHL of the head and neck depends on the stage and pathological type of lymphoma. Standard treatment for early-stage lymphoma is chemotherapy followed by involved field radiotherapy. Patients with stage I and stage II disease usually respond well to therapy and prognosis is much better than those with advanced disease.[3,17,18,23,51] In advanced stage (bulky stage II, stage III, and stage IV) combined chemotherapy with cyclophosphamide, hydroxy-doxorubicin, oncovin, prednisone, and Rituxan is needed.[3,18] If ENHL of the head and neck is suspected, timely diagnosis, and treatment improves clinical outcomes.

## CONCLUSION

ENHL of the head and neck has a wide spectrum of clinical presentations and imaging criteria. High index of suspicion with knowledge of characteristic imaging features would help early diagnosis and prompt management.

### Declaration of patient consent

The authors' certify that they have obtained all appropriate patients' contest.

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Nil.

### Conflicts of interest

There are no conflict of interest.

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