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ROLE OF MRI IN CHARACTERIZATION OF NECK LESIONS: A CLINICAL AND HISTOPATHOLOGICAL CORRELATION STUDY

Radio-Diagnosis

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ABSTRACT

Neck lesions represent a wide spectrum of conditions, including congenital, inflammatory, benign, malignant, vascular, and postoperative pathologies. Due to the intricate anatomy of the neck and the close relationship of lesions with vital neurovascular and aerodigestive structures, precise imaging plays a crucial role in diagnosis and management. Magnetic resonance imaging (MRI), with excellent soft-tissue contrast and multiplanar capability, is particularly well suited for comprehensive evaluation. This prospective observational study evaluated the diagnostic role of 3 Tesla MRI in 59 patients with clinically suspected neck lesions at a tertiary care cancer institute. Imaging was performed using standardized MRI protocols, including T1-weighted, T2-weighted, STIR, diffusion-weighted, and contrast-enhanced sequences. Lesions were assessed for location, extent, signal characteristics, enhancement patterns, diffusion restriction, and associated aggressive features. Histopathological correlation was available in 41 cases. MRI demonstrated high diagnostic accuracy, with 90.24% concordance with histopathology. Restricted diffusion and heterogeneous enhancement were more commonly associated with malignant lesions. Overall, 3 Tesla MRI proved to be a reliable and comprehensive modality for accurate characterization and staging of neck lesions.

KEYWORDS

Magnetic resonance imaging; Neck lesions; Diffusion-weighted imaging; Head and neck tumors; Histopathological correlation

INTRODUCTION

The neck contains complex anatomical structures, including vital neurovascular bundles and glandular tissues, which require high-resolution, non-invasive imaging for accurate assessment. Magnetic resonance imaging (MRI) effectively addresses these challenges through excellent soft-tissue contrast and multiplanar imaging capabilities.

Neck masses are commonly encountered in clinical practice and demonstrate age-dependent etiologies. In pediatric patients, lesions frequently arise from embryological remnants such as branchial cleft cysts and thyroglossal duct cysts, whereas in adults, malignant entities including squamous cell carcinoma and lymphoma are more prevalent.

Imaging strategies for neck lesions have evolved substantially over recent decades. While computed tomography (CT) revolutionized cross-sectional imaging, its use is limited by exposure to ionizing radiation. MRI has emerged as a preferred modality due to its ability to comprehensively evaluate the neck without radiation exposure, making it particularly suitable for pediatric patients and repeat imaging during follow-up.

Advanced MRI techniques such as diffusion-weighted imaging and contrast-enhanced sequences provide insight into tissue cellularity and vascularity, improving differentiation between benign and malignant lesions. High-field MRI systems and dedicated head and neck coils have further enhanced spatial resolution and reduced scan times.

This study aims to evaluate the role of 3 Tesla MRI in the assessment of neck lesions and to correlate imaging findings with clinical and histopathological data.

METHODOLOGY

This prospective observational study was conducted at a tertiary care cancer institute in Gujarat, India. A total of 59 patients with clinically suspected neck lesions were included.

Inclusion criteria consisted of all clinically suspected neck lesions, postoperative and histopathologically confirmed cases, lesions extending into the neck from adjacent regions, and patients with residual or recurrent masses following treatment. Patients with contraindications to MRI, including non-compatible metallic implants, pacemakers, severe claustrophobia, or renal insufficiency precluding contrast-enhanced MRI, were excluded.

MRI examinations were performed using a 3.0 Tesla Siemens Magnetom Skyra scanner with standard head and neck coils. Imaging was acquired in axial, coronal, and sagittal planes. Intravenous gadodiamide was administered at a dose of 0.1 mmol/kg for contrast-enhanced sequences.

Lesions were evaluated for anatomical location, compartmental involvement, signal characteristics, enhancement patterns, diffusion restriction, margins, vascular encasement, perineural spread, cartilage invasion, and lymphadenopathy. Histopathological correlation was performed wherever available.

RESULTS

The age of patients ranged from less than 1 year to 80 years, with a slight male predominance. Neck swelling was the most common presenting symptom. MRI identified 18 distinct lesion subtypes with characteristic age-related distribution.

Table 01 MRI diagnosis with Clinical diagnosis

Radiological Diagnosis	no	yes	better	Difference from clinical diagnosis
epidermoid cyst	0	1	0	
floor of mouth mass	0	0	2	
larynx mass	0	5	0	
lymph node mass	1	7	1	metastatic deposit
metastatic deposit	0	2	0	
paraganglioma	1	0	4	neck mass
parathyroid mass	2	5	0	parathyroid adenoma
peripheral nerve sheath tumor	1	3	2	neck mass
post operative changes	1	1	0	schwannoma
pseudoaneurysm	0	0	1	
pseudomeningocele	0	0	1	
submandibular gland mass	0	0	1	
thyroglossal duct cyst	0	2	0	
thyroid mass	1	1	3	parathyroid adenoma
vascular malformation	1	5	1	neck mass
vascular tumor	0	0	2	
venous ectasia	0	0	1	

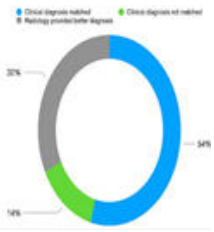
Table 01: This table shows Radiological diagnosis made by MRI on left side with number of cases within that diagnosis group matching (yes) , not matching (no) from Clinical diagnosis. In many of the cases MRI was able to provide more information apart from agreement with clinical diagnosis such as narrowing down the diagnosis, vascular invasion, cartilage involvement etc

Congenital and vascular lesions predominated in pediatric patients, while malignant lesions were more frequent in older age groups. Histopathological correlation was available in 41 cases, with MRI–histopathology concordance observed in 37 cases (90.24%).

Table 02 MRI diagnosis agreement summery

	Count	Percentage
Clinical diagnosis agreed	32.0	54.24
Clinical diagnosis not agreed	8.0	13.56
Radiology provided better	19.0	32.2

Graph 02



This table illustrates that MRI matched or improved clinical diagnosis in over 86% of cases, highlighting its strong diagnostic influence.

Table 03 Enhancement Distribution

Enhancement	Count	Percentage
heterogenous	35	59.32
no enhancement	11	18.64
homogenous	5	8.47
peripheral enhancement	4	6.78
mild	3	5.08
peripheral	1	1.69

Graph 03

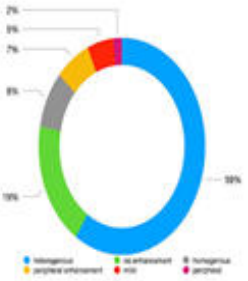


Table 03 and Graph 03: Heterogeneous enhancement was the most frequently observed post-contrast pattern (59.32%), consistent with vascular or necrotic lesion components. 18.64% of lesions did not show any enhancement, often pointing toward benign or avascular masses.

Restricted diffusion was seen in more than half of the lesions, commonly associated with malignancy. Heterogeneous enhancement was the most frequently observed post-contrast pattern.

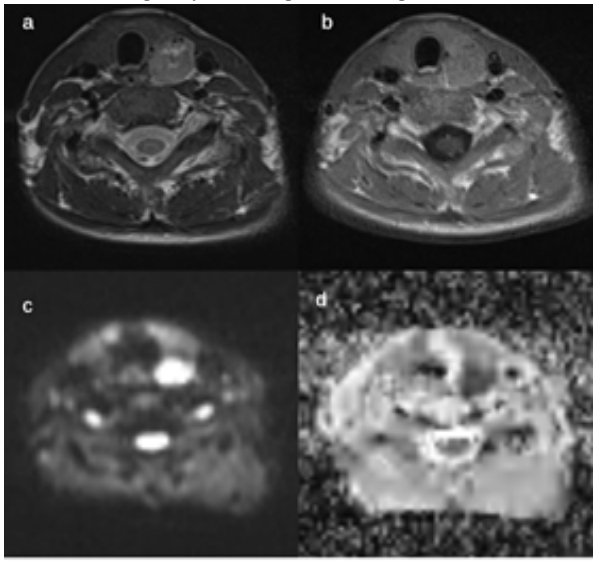


Image 03: This is the case of a 20-year-old female patient presented with complaints of body-ache and neck fullness. MRI revealed a lobulated marginated lesion at posterior border of left lobe of thyroid gland. The mass appeared hyperintense on T2W images (a) and no enhancement on post contrast T1W images (b).. DWI (c) showed restricted signal with corresponding ADC (d). Histopathology confirmed the diagnosis of parathyroid adenoma

Table 04 DWI Signal Distribution

DWI	Count	Percentage
restricted	33	55.93
non restricted	26	44.07

Graph 04

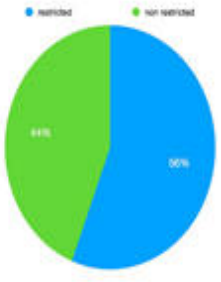


Table 04 and Graph 04: Over half of the lesions (55.93%) demonstrated restricted diffusion, indicating high cellularity, typically associated with malignant or densely packed tissues.

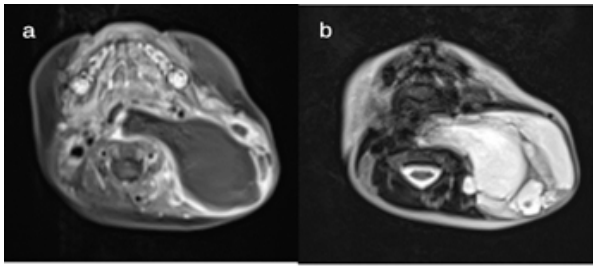


Image 02: Neonate female with swelling on neck was imaged due to neck mass. T1-weighted Post Contrast image (a) and T2-Weighted Image shows smooth marginated multiloculated cystic lesion on left side of neck involving carotid space, cervical space, parapharyngeal space, radiological diagnosis of cystic hygroma was made.

DISCUSSION

This study demonstrates the high diagnostic accuracy of 3 Tesla MRI in the evaluation of neck lesions. MRI effectively characterized lesions based on anatomical compartment, signal characteristics, enhancement patterns, and diffusion behavior.

The findings are consistent with previously published literature emphasizing the role of MRI in differentiating benign from malignant neck pathology. MRI was particularly useful in identifying aggressive features such as multispatial involvement, vascular encasement, perineural spread, and cartilage invasion.

The ability of MRI to provide comprehensive anatomical and functional assessment supports its role in treatment planning and follow-up.

CONCLUSION

Three Tesla MRI plays a pivotal role in the comprehensive evaluation of neck lesions. Its superior soft-tissue contrast, multiplanar capability, and functional sequences enable accurate diagnosis, staging, and assessment of disease extent. High concordance with histopathological findings underscores MRI's diagnostic reliability.

REFERENCES

1. Buch K, Reinshagen KL, Juliano AF. MR Imaging Evaluation of Pediatric Neck Masses: Magnetic Resonance Imaging Clinics of North America. 2019 May;27(2):173–99.
2. Wippold FJ. Head and neck imaging: The role of CT and MRI. Magnetic Resonance Imaging. 2007 Mar;25(3):453–65.
3. Ishikawa M, Anzai Y. MR imaging of lymph nodes in the head and neck. Neuroimaging Clinics of North America. 2004 Nov;14(4):679–94.
4. Walasangikar V, Musale A, Gaikwad S. Evaluation of neck masses by CT or MRI. ijhs. 2021 Nov 15;637–57.
5. Glazer HS, Niemeyer JH, Balfe DM, Devineni VR, Emami B, Hayden RE, et al. Neck neoplasms: MR imaging. Part I. Initial evaluation. Radiology. 1986 Aug;160(2):343–8.
6. Sato Y, Berbaum KS, Yuh WTC, Loes DJ, Ryals TJ, Kao SCS, et al. Magnetic Resonance Imaging and Computed Tomography in Pediatric Head and Neck Masses. Ann Otol Rhinol Laryngol. 1991 Jan;100(1):54–62.
7. Harnsberger HR, Osborn AG. Differential diagnosis of head and neck lesions based on their space of origin. 1. The suprahyoid part of the neck. American Journal of Roentgenology. 1991 July;157(1):147–54.
8. Smoker WR, Harnsberger HR. Differential diagnosis of head and neck lesions based on their space of origin. 2. The infrahyoid portion of the neck. American Journal of Roentgenology. 1991 July;157(1):155–9.