Role of Diffusion Weighted Magnetic Resonance Imaging and Apparent Diffusion Coefficient Values in differentiating Benign from Malignant Cervical Lymph Nodes

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ABSTRACT

BACKGROUND

In this study, Apparent Diffusion Coefficient (ADC) cut-off values werederived by using diffusion weighted magnetic resonance imaging (DWMRI) to differentiate benign from malignant cervical lymph nodes with Histopathological correlation.

METHODS

This was a hospital basedcross sectional analytical study conducted among 72 patients who presented withenlarged cervical lymph nodesto the Department ofRadio-Diagnosis, R.L. Jalappa Hospital and Research Centre attached to Sri DevarajUrs Medical College, Tamaka, Kolar, over a period of 18 months from January 2021 to June 2022 after obtaining clearance from Institutional Ethics Committee and written informed consent from the study participants.

RESULTS

The difference in the proportion of pathological findings between ADC values of the lymph nodes was statistically significant (P-value <0.001). The ADC cut off value of 1.0 x $10^{-3}mm^2/s$ for cervical lymph nodes had a sensitivity of 100 %, specificity of 95.24 %, with total diagnostic accuracy of 97.22 % in predicting benign and malignant lymph nodes. Hence from our study results, the ADC value obtained had an excellent predictive value in predicting malignancy and correlated well with pathological diagnosis.

CONCLUSION

DWI is an MRI technique, which is non-invasive and helps in differentiating benign and malignant characteristics of the tissue. ADC is an objective parameter derived from DWI techniques, which helps to evaluate tissue-specific diffusion capacity and, in turn, determine its malignant potential.

KEYWORDS: Diffusion Weighted Magnetic Resonance Imaging, ApparentDiffusion Coefficient, Benign, Malignant Cervical Lymph Nodes

DOI Number: 10.48047/nq.2023.21.6.NQ23028 **NeuroQuantology2023;21(6):237-249**

INTRODUCTION

Lymph is a derivative of interstitial fluid that flows into the lymphatics. The system of lymphatic flow is a major route for absorption of nutrients, proteins and also the bacteria from the interstitial tissue. This systemic flow of lymph in the cervical region has 300 nodes out of the total of 800 nodes in the entire body.[1]"Lymphadenopathy" is defined as an abnormality in size and/or alteration in consistency of the lymph nodes. It is proven to result from various aetiologies, including infections, autoimmune disorders and malignancies (metastatic or lymphomas).[1]Cervical lymph nodes are prone to be involved in several pathological conditions. They are common sites for lymphoma, metastasis, and reactive enlargement in a number of conditions including tuberculosis (TB).[1] Differentiation between benign and malignant lymph nodes usually tends to affect the patient prognosis and plays a vital part in formulating a therapeutic approach in malignancy suspected patients.[2] However, the differentiation between benign and malignant lymph nodes remains challenging.[3]Conventional MRI diagnose malignancy based on morphological characteristics such as lymph node size, shape, vascularity, extra capsular dissemination, calcifications, and necrosis. These factors are insufficient to distinguish between benign and malignant lymph nodes.[4] Diffusion-weighted MR imaging (DW-MRI) is a non-invasive functional technique for the identification and characterization of lymph nodes; it highlights both normal and pathological lymph nodes and enables measuring diffusion in lymph nodes by means of apparent diffusion coefficient (ADC).[5,6]Normal lymph nodes have a relatively restricted diffusion (low ADC) because of their high cellular density. Metastatic lymph nodes may have increased cellular density or necrotic areas, which further restrict or increases diffusion, respectively.[7,8]The detection of nodal necrosis in patients with a primary head and neck tumour is the most reliable sign of a metastatic node.[9,10]DW-MRI is helpful in differentiating epidermoid carcinoma and malignant lymphoma, staging neck nodal disease, and distinguishing radiotherapy-induced tissue changes from persistent or recurrent cancer. The creation of an ADC map is an excellent method for differentiation between the viable and necrotic parts of head and neck tumours. Thus, the ADC map can be used to select the best biopsy site and to detect tumour viability in the post-treatment follow-up of patients after radiation therapy. Hence, this study mainly focuses on detecting and distinguishing benign from malignant cervical lymph nodes without invasive studies and risk of exposure to radiation.[11,12]

Aims and Objectives

1. To determine apparent diffusion coefficient (ADC) values by using diffusion weighted magnetic resonance imaging (DWMRI).
2. To derive ADC cut-off values to differentiate benign from malignant cervical lymph nodes.
3. To correlate DWMRI and ADC findings with pathological findings.

METHODS

This was a hospital based cross sectional analytical study conducted among 72 patients who presented with enlarged cervical lymph nodes to the Department of Radio-Diagnosis, R.L. Jalappa Hospital and Research Centre attached to Sri DevarajUrs Medical College, Tamaka, Kolar, over a period of 18 months from January 2021 to June 2022 after obtaining clearance from Institutional Ethics Committee and written informed consent from the study participants.

Inclusion Criteria

- Patients with enlarged cervical lymph nodes.

Exclusion Criteria

- Patients who have recently received radiotherapy/chemotherapy.

- Patients who underwent recent cervical lymph node FNAC/Biopsy in last 3 weeks.

Sample Size

Sample was calculated based on sensitivity of DWMRI as 97 % in a study by Parihar et al.[13] with 95 % confidence interval and absolute error of 5 %. The formula used to calculate the sample size is as follows:

$$\text{Sample size} = \frac{Z_{1-\alpha/2}{}^2 p(1-p)}{d^2}$$

Where$Z_{1-\alpha/2}$ = 1.96 at 5 % error alpha.
As in majority of studies *p* values are considered significant below 0.05 hence 1.96 is used in formula.
p = Expected proportion in population based on previous studies or pilot studies.
d = Absolute error or precision – Has to be decided by researcher.
p = 97 or 0.97
1 – p = 10 or 0.1
d = 5 %
Using the above values at 95 % confidence level a sample size calculated was 45 subjects with enlarged cervical lymph nodes.

Statistical Methods

The data were entered in Microsoft excel sheet. The measurable variables were analyzed and interpreted between them by the student's t test and the ordinal and categorical variables between them were interpreted by Chi-square (χ2) test. The predictive value of DWMRI for differentiating benign and malignant lymph nodes was estimated. The statistical procedures were performed with the help of Statistical Package for Social Sciences(SPSS) (ver 21) and OpenEpiver 3.01. P value less than 0.05 (P<0.05) was considered as statistically significant. Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy was calculated and compared with pathological findings, which is used as gold standard.

RESULTS

Age Group	**Number**	**Percentage (%)**
0 - 9	2	2.8 %
10 - 19	3	4.2 %
20 - 29	10	13.9 %
30 - 39	5	6.9 %
40 - 49	10	13.9 %
50 - 59	17	23.6 %
60 - 69	15	20.8 %
70 - 79	9	12.5 %
80 and above	1	1.4 %
Total	72	100.0 %
Age Distribution		
Gender	**Number**	**Percentage (%)**
Male	30	41.6 %
Female	42	58.4 %
Total	72	100.0 %
Sex Distribution		
Table 1: Demographic Distribution		

Out of 72 (100 %), majority of the patients were in the age group of 50 - 59 (17/23.6 %) years followed by 60 - 69 years (15/20.8 %).

Among 72 (100 %) patients, most of the patients were males (44/61.1 %) compared to females (628/38.9 %).

Side	**Number**	**Percentage (%)**
Right	22	30.6 %
Left	20	27.8 %
Bilateral	30	41.7 %
Total	72	100.0 %
Distribution of Patients Based on Side of Lymph Node		
Size	**Number**	**Percentage (%)**
1 - 2 cm	42	58.3 %
> 2 cm	30	41.7 %
Total	72	100.0 %
Distribution of Patients Based on Size of Lymph Node		
Number of Lymph Nodes	**Number**	**Percentage (%)**
One	22	30.6 %
Two	13	18.1 %
Conglomerate	37	51.4 %
Total	72	100.0 %
Distribution of Patients Based on Number of Lymph Node		
Table 2		

Out of 72 (100 %), 30 (41.7 %) patients had bilateral lymph node involvement, about 22 (30.6 %) of the patients had right side involvement and about 20 (27.8 %) of the patients had left side involvement.

Majority of the patients had lymph node size measuring 1 – 2 cm (42/58.3 %) and about 30 (41.7 %) patients had lymph node measuring > 2 cm

Most of the patients i.e., 37 (51.4 %) of patients had conglomerate lymph nodes followed by 1 lymph node in 22 (30.6 %) of the patients and about 13 (18.1 %) of the patients had 2 lymph nodes.

Level	**Number**	**Percentage (%)**
Level 1	17	23.6 %
Level 2,3,4	21	29.2 %
Level 5	13	18.1 %
Level 6	1	1.4 %
Multilevel	20	27.8 %
Total	72	100.0 %
Distribution of Patients Based on Level of Lymph Nodes		
Margin	**Number**	**Percentage (%)**
Irregular	51	70.9 %
Smooth	21	29.1 %
Total	72	100.0 %
Distribution of Patients Based on Margin of Lymph Nodes		
Shape	**Number**	**Percentage (%)**
Round	22	30.6 %
Oval	50	69.4 %
Total	72	100.0 %

Distribution of Patients Based on Shape of Lymph Nodes

Table 3

Majority, 21 (29.2 %) of patients had level 2, 3, 4 lymph nodes, followed by 20 (27.8 %) had multilevel involvement, about 17 (23.6 %) had level 1, about 13 (18.1 %) had level 5 and only 1 patient (1.4 %) had level 4 lymph node.

Out of 72 (100 %) patients, most of the patients, 49 (68.1 %) had smooth margin in lymph nodes followed by irregular margin in 23 (31.9 %) of the patients.

Majority, 50 (69.4 %) of the patients had lymph modes in oval shape and remaining 22 (30.6 %) of the patients had lymph node round in shape.

Pathological Diagnosis	**Number**	**Percentage (%)**
Metastatic SCC	20	27.7 %
Metastatic adeno carcinoma	5	6.9 %
Hodgkin's lymphoma	3	4.2 %
Non-Hodgkin's lymphoma	2	2.8 %
Reactive lymphadenitis	22	30.5 %
Acute suppurative lymphadenitis	7	9.7 %
Acute or chronic lymphadenitis	1	1.4 %
Tuberculous lymphadenitis	10	13.9 %
Granulomatous lymphadenitis	2	2.8 %
Total	**72**	**100.0 %**

Distribution of Patients Based on Pathological Diagnosis

Restricted Diffusion	**Number**	**Percentage (%)**
Present	32	44.4 %
Absent	40	55.6 %
Total	72	100.0 %

Distribution of Patients Based on Restricted Diffusion

Table 4

The reactive lymphadenitis 23 (31.9 %) was the commonest pathological diagnosis followed by 19 (26.4 %) metastatic SCC, tuberculous lymphadenitis in 10 (13.9 %) of the patients, 7 (9.7 %) acute suppurative lymphadenitis, 5 (6.9 %), metastatic adeno carcinoma, 3 (4.2 %) Hodgkin's lymphoma, 2 (2.8 %) non-Hodgkin's lymphoma, 2 (2.8 %) granulomatous lymphadenitis and 1 (1.4 %) acute chronic lymphadenitis respectively.

Among 72 (100 %) patients, about 32 (44.4 %) of the patients had restricted diffusion.

ADC	**Pathology**		**Total**	**X^2**	**p**
	Malignant	**Benign**			
< 1.0 x 10^{-3}	30 (100.0 %)	2 (4.8 %)	32 (44.4 %)	60.22	0.0001
>1.0 x 10^{-3}	0 (0.0)	40 (95.2 %)	40 (55.6 %)		
Total	30	42	72		

Table 5: Comparison of ADC and Pathological Findings

Out of 72 (100 %), about 30 pathologically proven malignant cases had ADC value of <1.0x 10^{-3} mm^2/s, among 42 pathologically proven benign cases, 40 cases have ADC value of >1.0x 10^{-3} mm^2/s, 2 discrepancies cases showed ADC value of <1.0 x 10^{-3} mm^2/s and given as malignant, but pathologically proven as benign case of tuberculous abscess. There was a statistically significant association between ADC and pathological findings. Hence, findings with ADC cut-off value as 1.0 x 10^{-3} mm^2/s for differentiating benign from malignant cervical lymph nodes were corresponding with histopathological findings.

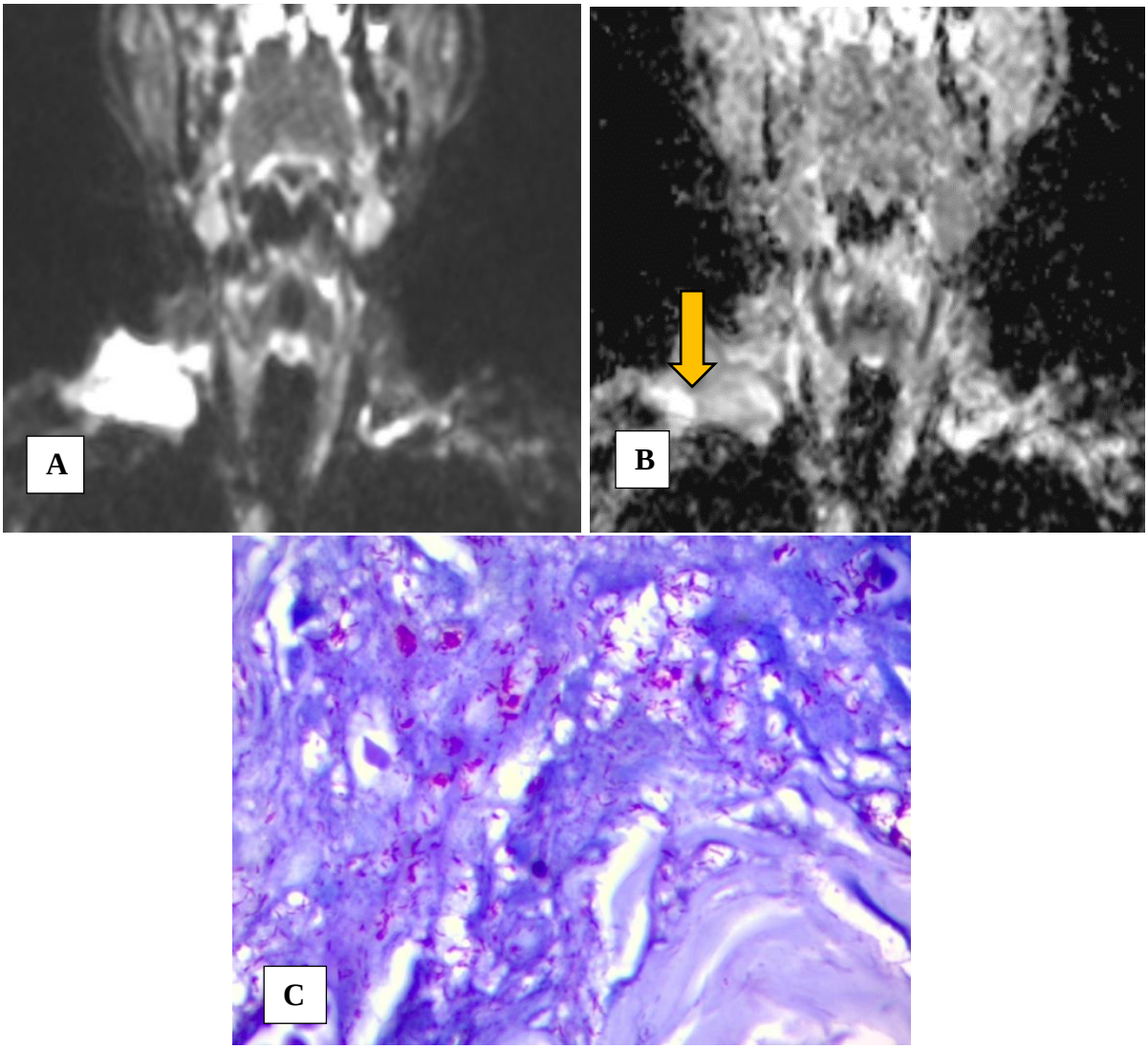
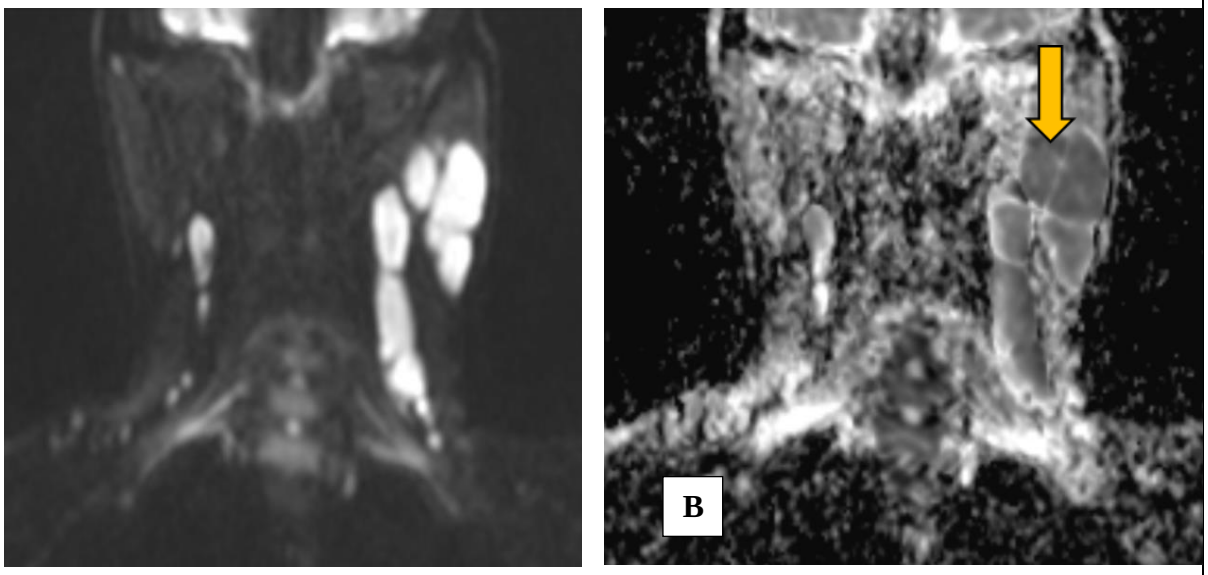


Image1 :DWI & ADC sequences of a patient with tuberculous lymphadenitis:
(A) DWI and (B) corresponding ADC images showing no restriction of diffusion within the lymph node present in left supraclavicular region (Yellow arrow) Mean ADC value obtained was 1.4 x 10-3 mm2/s. – suggestive of benign etiology (C) Histopathology revealed features suggestive of tuberculous lymphadenitis.



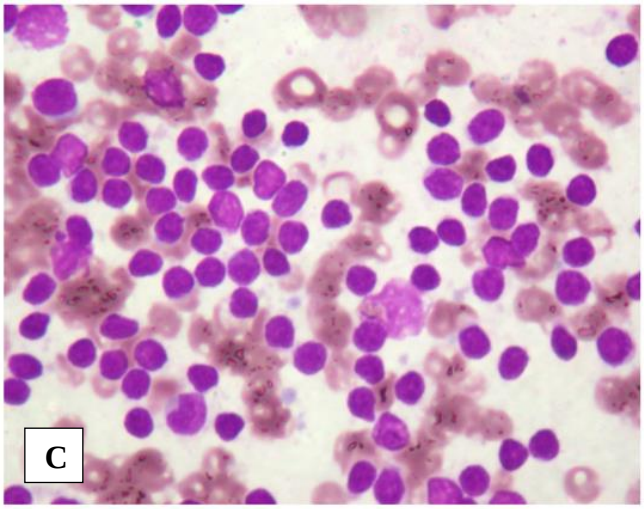


Image 2: DWI & ADC sequences of a patient with Non-Hodgkin's lymphoma:
(A) DWI and (B) corresponding ADC images showing restriction of diffusion within the lymph node present in left level II, III & IV (Yellow arrow) Mean ADC value obtained was 0.6 x 10-3 mm^2/s – suggestive of malignant etiology (C) Histopathology revealed features suggestive of Non-Hodgkin's lymphoma.

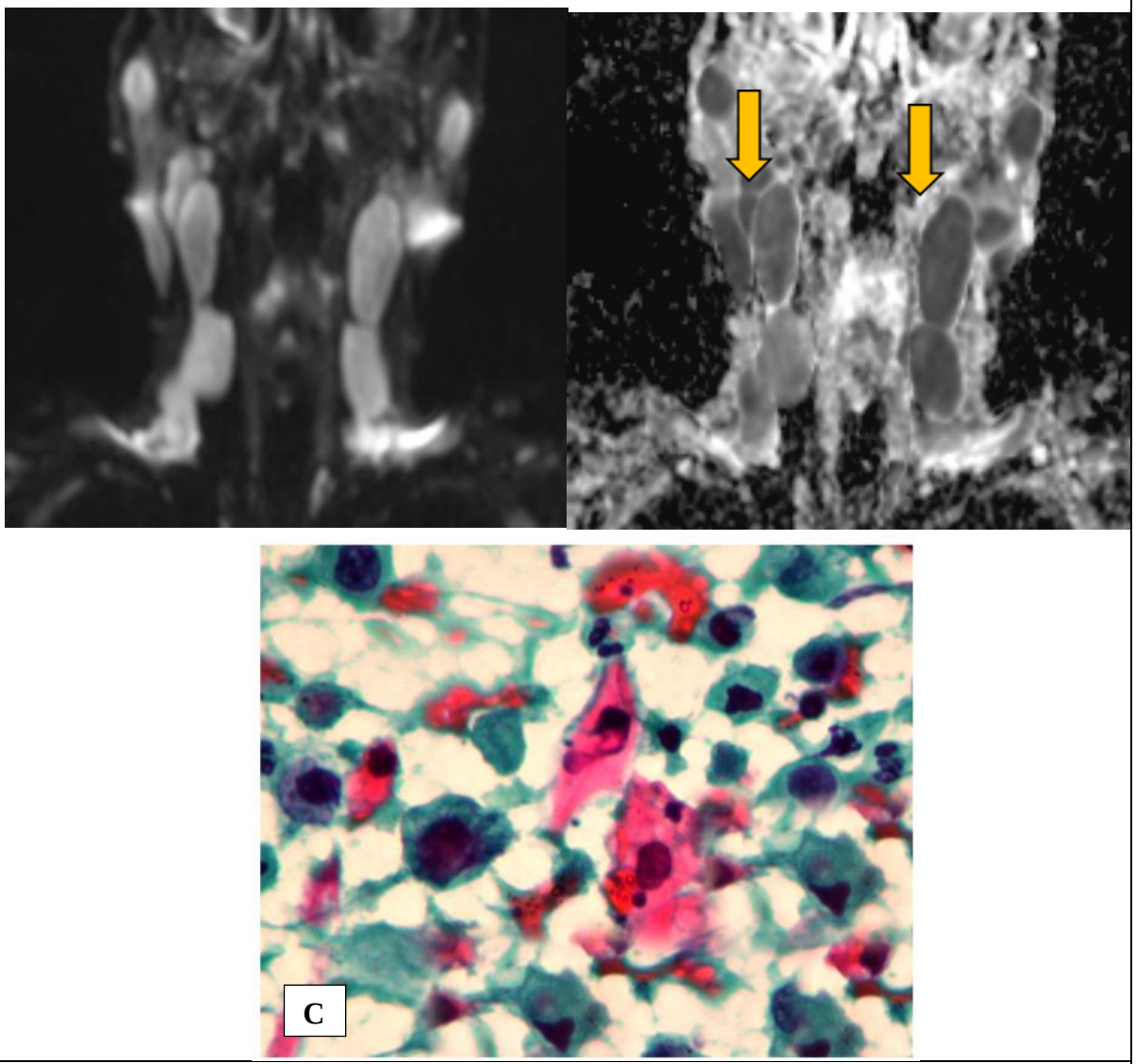


Image 3: DWI & ADC sequences of a patient with metastatic squamous cell carcinoma:(A) DWI and (B) corresponding ADC images showing no restriction of diffusion within the lesion present in bilateral level Ib, II, III & IV (Yellow arrows). Mean ADC value obtained was 0.8 x 10^{-3} mm^2/s– suggestive of malignant etiology (C).Histopathology revealed features suggestive of metastatic squamous cell carcinoma.

DISCUSSION

Diffusion weighted imaging, a well-known MRI technique which is reliable non-invasive imaging technique for tissue characterization. DWI exploits the random motion of water in the targeted tissue, which reflects the tissue specific diffusion capacity. In biologic tissues, the diffusivity of water molecules is confined by the intra-cellular and inter-cellular spaces. Hyper cellular tissue, such as malignant tumours, results in decreased mobility of water protons and consequently in a restricted diffusion capacity of the tissue. Thus, tumours present with increased signal on DWI and low ADC values. Non-tumoral tissues such as oedema, inflammation, fibrosis, and necrosis are expected to show low cellularity in strong contrast with viable tumour. In these tissues, the diffusion capacity is not restricted. This results consecutively in a signal loss on DWI and high ADC.[14,15]

The evaluation of cervical lymphadenopathies is important as they serve

as an excellent clue to underlying problems. They could be due to infections, autoimmune disorders or malignancies (metastatic or lymphomas).[16] Ultrasound image, contrast-enhanced computed tomographic and contrast-enhanced MRI allow the detection of cervical lymphadenopathies. None of these methods reach the ideal accuracy in diagnosis. These imaging methods use standard parameters (shape, size, internal architecture, extranodal diffusion and vascular features). The size is the most used criterion for the diagnosis.[17]The criterion of a short-axis diameter of 10 mm has gained widespread acceptance and thus used in our study.[18]To date, the diagnosis of lymph node metastases is based mainly on size criteria; however, non-enlarged nodes may harbour malignancy and also reactive nodes may be enlarged. Promising results with DW imaging to help detect cervical lymph node metastases and differentiate between benign and malignant enlarged nodes have been reported by Theony et al.[19]

Our hospital based cross-sectional study was conducted on 72 patients. Commonest age group with lymphadenopathy was 50 - 59 (17/23.6 %) years followed by 60 - 69 years (15/20.8 %). Mean age of the patients was 45.13 ± 17.08 years and age range was 9 – 78 years. There was an increasing number of malignant lymph nodes with increase in age group, 79.1 % in > 30-year age group as opposed to 20.9 % in < 30-year age group. Similar observation was also made by Elsaid et al. where the age of patients ranged from 6 – 76 years, mean age being 45 ± 18.8 years.[20]

We found that among 72 (100 %) patients, majority of the patients were males (44/61.1%) as compared to females (28/38.9 %). We did not find any statistically significant association between aetiology and gender of the patients. A similar observance was made by Ragheb et al. where majority of subjects were males (M - 70 %, F - 30 %).[21]

We recognized that there was higher lymphoma: metastatic lymph node ratio in < 30 years age group as compared to middle and older age groups. All malignant lymph nodes (100%) in younger age group (<30 years) were lymphoma cases and all of the malignant nodes in middle age group (30-60 years) and elderly age group were metastatic. This observation was consistent with study by Serour et al.[22] They also observed that, lymphoma cases were predominantly found in younger age group as opposed to middle and elderly age groups, which showed predominantly metastatic lymph nodes. Among malignant cervical lymph nodes, both Hodgkin's lymphoma (HL) and Non-Hodgkin's lymphoma (NHL) showed male predominance. An Indian study conducted by Mondal SK et al. on 455 patients with lymphoma observed that, male: female ratio was 3.1:1 and NHL: HL ratio was 3.2:1.[23]

Considering the location of the lymph nodes among study population, we observed out of 72 patients, majority of patients, that is, 30 patients (41.7 %) had bilateral lymph nodal involvement, about 22 patients (30.6 %) had right side involvement and about 20 patients (27.8 %) had left side involvement. In our study we found that laterality had significant correlation with nodal staging in head and neck carcinoma with nodal metastasis which is in agreement with study by Hoang et al.[24]

In our study, out of 72 cases, 42 cases (58.3 %) had lymph node size measuring 1 – 2 cm and about 30 cases (41.7 %) had size of lymph node > 2 cm. Among 30 malignant lymph nodes 10 cases had lymph nodes size between 1 - 2 cm, whereas among 42 benign cases 10 cases had lymph nodes size > 2 cm. In our study, we found that size is not a reliable marker of malignancy. Small nodes can harbour small metastases that do not expand the node, and, conversely, benign nodes can commonly be enlarged due to hyperplasia or inflammation. A study by Curtin et al. found that the radiologist's choice of size cut-off simply changes sensitivity and specificity for detection of nodal metastases. A 1.0 cm size cut-off in the largest axial diameter achieved 88% sensitivity and 39% specificity, whereas a 1.5-cm cut-off resulted in 56% sensitivity and 84% specificity which is in concordance with our study.[25]

In our study, majority of the patients i.e., 37 patients (51.4%) had Conglomerate/multiple lymph nodes, 22 patients (30.6 %) had 1 lymph node and 13 patients (18.1 %) had 2 lymph nodes. We found that the majority, 21 cases (29.2 %) had level 2,3,4 lymph nodes, followed by multilevel involvement in 20 cases (27.8 %), 17 cases (23.6 %) had level 1 lymph nodes, about 13 cases (18.1 %) had level 5 and only 1 patient (1.4 %) had level 4 lymph node. These morphological characteristics observation was consistent with study by Serour et al. In a study by Liu Z et al. on 138 patients concluded that magnetic resonance imaging (MRI) is more sensitive than ultrasonography in diagnosis of central lymph nodal metastases, whereas there is no significant difference between the sensitivity of MRI &ultrasonography (USG) in differentiating lateral cervical lymph nodes.[26]

In our study, in 49 cases (68.1 %), the lymph nodes had smooth margins whereas irregular margin in lymph nodes was noted in 23 patients (31.9 %). Nodular contour can have a greater discriminatory value. Ill-defined irregular margins in a lymph node are a sign of malignancy secondary/due to extracapsular spread of tumour. This has been shown to be more accurate than nodal size.

Out of 72 cases, 50 cases (69.4 %) of had oval shaped lymph nodes and remaining 22 cases (30.6 %) had rounded lymph nodes. Among 42 benign cases, 20 cases had oval shaped lymph nodes and 10 cases had rounded lymph nodes. Among 30 malignant cases, 20 cases had oval shaped lymph nodes and 10 cases had rounded lymph nodes. Metastatic disease can change the shape of the node by infiltrating nodal tissue and expanding the nodal capsule. Thus, rounded rather than oval nodes are suspicious. Sub-centimetric small oval nodes can harbour small metastases that do not expand the node, and conversely, benign nodes can commonly be enlarged due to hyperplasia or inflammation. In our study, we found that shape of the lymph node has not much significance in differentiating benign and malignant lymph nodes which is in agreement with study by Hoang et al.

In the present study, reactive lymphadenitis was the commonest pathological diagnosis seen in 23 cases, (31.9 %) followed by 19 cases (26.4 %), metastatic SCC, 10 cases (13.9 %) of tuberculous lymphadenitis, 7 cases (9.7%) of acute suppurative lymphadenitis, 5 cases (6.9%) of metastatic adeno carcinoma in Hodgkin's lymphoma in 3 cases (4.2 %), 2 (2.8 %) non-Hodgkin's lymphoma, 2 (2.8 %) granulomatous lymphadenitis and 1 (1.4 %) acute chronic lymphadenitis. In a study done by Ragheb et al. pathological examination of the studied lymph nodes in the examined 30 patients revealed: benign cases (5 cases of inflammatory, 3 cases granulomatous), 12 lymphomatous cases including 9 cases of Non-Hodgkin lymphoma and 3 cases of Hodgkin lymphoma and 9 metastatic cases.

In our research, malignant lymph nodes had been subdivided into subgroups of metastatic lymph nodes and lymphoma based upon the histopathology. An attempt was made to distinguish between them according to their ADC values. The mean ADC value for metastatic lymph nodes ($0.93 \times 10^{-3} mm^2/s$) was little higher than that of the lymphoma ($0.65 \times 10{-}3\ mm^2/s$) which is in agreement with study by Serour et al.

Among 72 (100 %) patients, restricted diffusion was present in about 32 cases (44.4 %). Restriction of diffusion was present in all 30 pathologically proven malignant cases. Similar observation was made in a study done by Elsaid et al.where all malignant cases showed restricted diffusion. Out of 72 cases (100 %), 30 pathologically proven malignant cases had ADC value of $< 1.0 \times 10^{-3} mm^2/s$. Out of 42 pathologically proven benign cases, 40 cases had ADC value of $>1.0 \times 10^{-3} mm^2/s$, however 2 cases with ADC value of $< 1.0 \times 10^{-3} mm^2/s$ which were considered to be malignant turned out to be pathologically proven benign cases of tuberculous abscess. In spite of this discrepancy, there was a statistically significant association between ADC and pathological findings noted in this study. These findings were in concordance

with a study done by Ragheb et al. which showed similar results.

In our study, ADC value of 1.0 x $10^{-3}$$mm^2$/s was taken as cut-off in differentiating benign from malignant cervical lymph nodes. These values were found to be corresponding with histopathological findings. The ADC cut-off value of 1.0 x $10^{-3}$$mm^2$/s had an overall sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of 100 %, 95.2 %, 93.7 %, 100 % and 97.2 % respectively. Hence, it was proven that the use of ADC values in combination with the other MRI criteria significantly improves thediscrimination between malignant and benign lymph nodes. Similar results were shown in a study done by Ragheb et al. wherein optimal ADC cut off value of 1.0 x $10^{-3}$$mm^2$/s had an accuracy of 96.7 %, sensitivity 100 %, specificity 88.9 %, PPV 95.4 % and NPV 100 % for differentiation between benign and malignant lymph nodes.

Holzapfel et al. and De Bondt et al. showed that an ADC cut off value of 1.02 x 10^{-3}mm2 /s had diagnostic accuracy of 94 %, sensitivity of 100 % and specificity of 87.0 % of in differentiating benign and malignant cervical lymph nodes.[27,28]Astudy done by Sumi et al. reported a low ADC threshold for metastatic nodes (> 0.400 x 10-3 mm2 /s) which yielded a moderate negative predictive value (71 %) and high positive predictive value (93 %), which did not match with our results.[29]

Razek et al. reported slightly higher threshold (ADC = 1.38 x 10-3 mm2 /s) for reliably characterizing suspected malignant lymph nodes with an accuracy of 96 %, sensitivity of 98 % and specificity of 88 %.[30]Kanmaz et al.showed that an ADC value of 1.13 × 10−3 mm2/s had a sensitivity of 93.33 %, specificity of 82.35 %, positive predictive value of 82.35 %, and a negative predictive value of 93.33 % in differentiating malignant from benign lymph nodes.

Serour et al. concluded that mean ADC value of 0.9 × 10^{-3}mm2/s as a cut-off value in differentiation between benign and malignant cervical lymph nodes with accuracy, sensitivity and specificity of 97%, 90% and 75 % which is concordance with our study.

A recent study conducted by Eldabry et al. in 2022 concluded that ADC value of 1.13 × 10^{-3}mm2/s as a cut-off value in differentiation between benign and malignant cervical lymph nodes, with resultant accuracy, sensitivity and specificity of 94%, 100% and 87 %which is in agreement with our study.[31]

Hence, in our study it has been concluded that conventional MRI features such as size, shape, characteristics & site of lymph nodes along with DWMRI and ADC cut-off value further improves the diagnostic accuracy of benign and malignant cervical lymph nodes. Hence it can be concluded that, using histopathological examination as the standard reference; we found that diffusion weighted MRI with ADC cut-off value of 1.0 × $10^{-3}$$mm^2$/s had excellent predictive validity (P - value < 0.001) in differentiating benign and malignant cervical lymph nodes.

CONCLUSION

DWI is an MRI technique, which is non-invasive and helps in differentiating benign from malignant cervical lymph nodes. ADC is an objective parameter derived from DWI techniques, which helps to evaluate tissue-specific diffusion capacity and, in turn, determine malignant potential of cervical lymph nodes.

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