ORIGINAL RESEARCH PAPER

Radiology

KEY WORDS: Nodal metastasis, Ultrasound, MRI.

COMPARISON OF USG AND MRI IN EVALUATION OF METASTATIC NECK LYMPHADENOPATHY

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ABSTRACT

Nodal metastases are an adverse prognostic factor in patients with head and neck squamous cell carcinoma (HNSCC) and require accurate detection for optimized treatment. Accurate evaluation of primary tumors and the cervical lymph node status of head and neck tumors is important for treatment planning and prognosis prediction So it is important to evaluate cervical lymph nodes by imaging examination such as MRI, ultrasonography etc. for metastases. The purpose of this study was to compare the diagnostic capabilities of magnetic resonance imaging and ultrasonography for cervical lymph nodal metastases in a known case of head and neck malignancy.

Introduction:-

Detection of cervical nodal metastasis is more accurately performed with imaging than with clinical palpation; therefore, imaging is widely used in pre treatment staging and in the detection of nodal recurrence. It has a great impact on treatment of head and neck cancers if it discloses an unexpected metastatic node, especially when that node is located outside of the planned treatment field. Accurate evaluation of primary tumors and the cervical lymph node status of head and neck tumors is important for treatment planning and prognosis prediction So it is important to evaluate cervical lymph nodes by imaging examination such as MRI, ultrasonography etc. for metastases.

Materials and Methods

All USG and MRI evaluations were preceded by consultation with our ENT colleagues. Fifty patients visiting ENT OPD of Sir J.J.group of Hospitals diagnosed with primary malignancies with cervical lymphadenopathy were studied from July 2012 and October 2014. Patients with recurrent malignancy after surgical treatment were also included in the study.

Patient Inclusion criteria:

1) All patients with known primary malignant lesion with suspected cervical metastatic lymph nodes.

Patient exclusion criteria:

1) Patients with non-removable metallic implants & cardiac pacemakers.
2) K/c/o Claustrophobia
3) Paediatric patients with need of sedation for MRI examination.

Pathological–radiological correlation: -

The neck was subdivided according to the six different levels in agreement with the classification of the American Joint Committee on Cancer; this classification was used by the radiologists when viewing the USG and MR images and used by the pathologist when interpreting the specimen after neck dissection.

The results of the USG and MRI were compared with the results of the pathological examination of the neck dissection specimens. By recording the exact location of each lymph node per neck level, it was possible to perform a topographic correlation for each lymph node between the pathological examination and the MR images.

ULTRASONOGRAPHY EQUIPMENT AND SCANNING TECHNIQUE

Ultrasonography was done using a high frequency linear transducer on Voluson E8 (11L -D, SP 10-16-D).

The scanning technique used by us for evaluating cervical lymph nodes is one that is systematic and thorough. After properly positioning the patient supine with neck support resulting in neck extension, one can begin in the submental area, continue to the submandibular and parotid areas, examine the upper cervical, middle, and lower cervical levels, and conclude the examination in the supraclavicular fossa and posterior triangle. Virtually all of the 8 neck areas can be evaluated by the transverse ultrasound plane, with the exception of the parotid and posterior triangle, which both can be assessed using the longitudinal plane as well.

MR TECHNIQUE AND IMAGE ANALYSIS

All examinations were performed on 1.5 T MR scanner (Avanto, Siemens Medical Systems, Enlargen, Germany) using a standard head–neck coil.

The Head–Neck coil was used for both the conventional and diffusion-weighted MR imaging; the range from the base of skull to the level of the clavicles. To ascertain correlation of the conventional images and DWI, all sequences were acquired with similar geometry. In all patients the following protocol was used:

Parameters of the head and neck MRI protocol

Parameters	Sequences		
	TSE T1-weighted	STIR	Diffusion weighted
Field of view(mm)	300x300	300x300	230x230
Slice orientation	Transverse	Coronal	Coronal
Section thickness	3mm	4mm	5mm
No. of sections			
No. of signals acquired	2	2	4
TR factor	616	4210	3000
TE(ms)	19	339	89
Interslice thickness	40	10	30
Flip angle	150	150	None

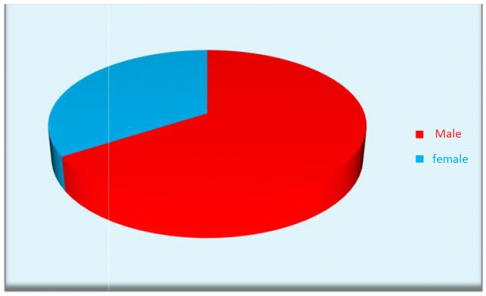
Single-Shot Echo-planar diffusion sensitized sequences (DWI) (TR 3000, TE 89, Matrix 230x230,slice-thickness 5mm) were acquired on the axial and coronal plane. The diffusion-sensitizing gradients were applied in all three orthogonal planes (X, Y, Z) with a b factor of 0, 400 and 800s/mm2 per axis in each patient. The ADC value was automatically reconstructed by a standard software imager in the main console. The whole-node ADC value was obtained drawing a region of interest (ROI) covering all the pathologic node in all sections in which it was present and averaging the results. Analysis was performed in regions of interest (ROIs) placed in each of the lymph nodes. Each ROI was placed manually in the lymph node on one to four sections that contained the maximal area of the node. Each ROI was variable so that it included as much of the nodal parenchyma as possible. In the study,we chose only the largest abnormal adenopathies and excluded from analysis the necrotic areas. The diagnosis of all the tumors and selected lymph node.metastases were confirmed by a biopsy of the surgical neck dissection specimen and FNAC of the most representative

lymph nodes.No contrast was administered in either USG or MRI.Histopathologic analysis was performed. The histopathologic and radiologic findings were correlated after all image analyses had been completed.

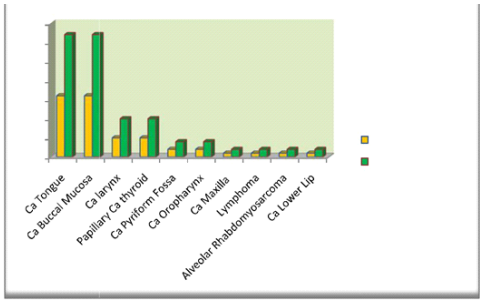
Results: -

Gender Distribution

There were 33 males and 17 females in our study. Hence majority of the patients were males constituting 66 % of cases.

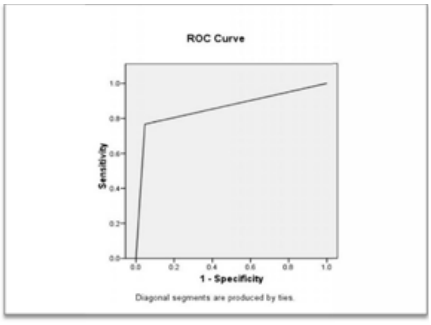


Diagnosis



Majority of the malignancies in our study was of tongue and buccal mucosa (64%).

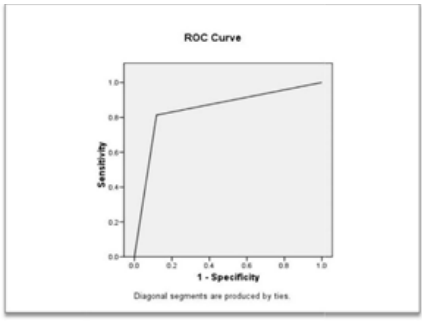
USG



ROC USG

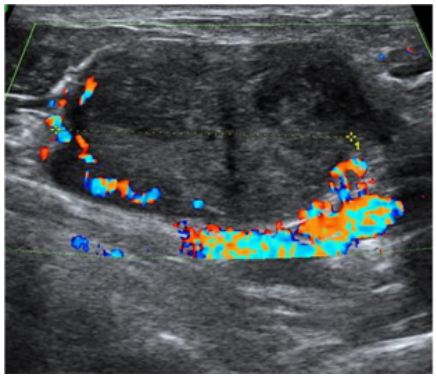
Area under		
Curve	Signifi cance	95% Confidence Interval
.860	.000	.801 - .919

MRI

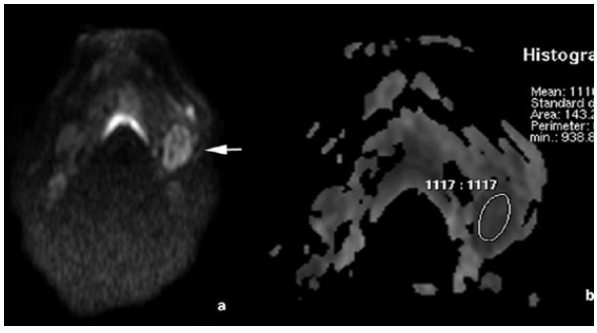


Area under		
Curve	Signifi cance	95% Confidence Interval
.847	.000	.787 - .908

The AUC for p redictive model using size, shape of lym ph node and hilar vascularity criteria for USG was 0.860 (95% CI .801 - .919) while that for MRI using size, border irr egularity, heterogeneity of signal, ADC value criteria was 0.847 (95% CI .787 - .908) suggesting that the discriminative ability of USG is slightly higher than that of MRI.



Metastatic heterogeneous lymph node in a case of Ca oropharynx.



Diffusion- weighted images and ADC map show lymph node metastasis due to carcinoma buccal mucosa.

CONCLUSION

Primary head and neck malignancies were more common in males than in females. Majority of the malignancies in our study was of tongue and buccal mucosa. mucosa which can be correlated with high incidence of tobacco chewing practices in Indian subset of population.

The size, shape and hilar vascularity of lymph node on USG independently significantly predict whether the lymph node is malignant or reactive.

The shape of lymph node, type of signal, apparent diffusion coefficient and lymph node size on MRI significantly predicts whether the lymph node is malignant or reactive.. Out of these, ADC value showed the highest predictive value. Diffusion weighted imaging when combined with ADC threshold value of 1.0x10-3 mm^2/s may be supportive for discriminating metastatic nodes in the neck.

MRI showed high sensitivity and negative predictive value but low specificity and positive predictive value for detection of neck lymph nodal metas-tases.

Ultrasound had a high specificity and positive predictive value but a low sensitivity and negative predictive value in the diagnosis of lymph nodal metastases.

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