CERVICAL LYMPH NODE METASTASES IN HEAD & NECK MALIGNANCY - A CLINICAL /ULTRASONOGRAPHIC/ HISTOPATHOLOGICAL COMPARATIVE STUDY

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ABSTRACT : *A study was conducted on the value of Ultrasound (US) in the detection of cervical lymph node metastases in cases of Head and Neck malignancy; and its usefulness in planning surgical management. The clinical, ultrasonographic and histopathological examination (HPE) findings were compared in 20 patients as a preliminary assessment of this ongoing study.*

Clinically and ultrasonographically, patients were assessed for presence of nodes, their size, shape, mobility and overall positivity for malignancy. All patients then underwent neck dissection, and individual nodes from the specimens were assessed by HPE.

It was found that US, when compared with clinical examination had a sensitivity of 47.62% versus 43.75%, specificity of 77.78% versus 25.0% and an accuracy of 61.54% as opposed to 38.9%. US proved valuable in detecting sub-clinical nodes, central necrosis, extra-capsular spread, pressure on large vessels - all indicators of metastatic spread. Hence, US was found to be efficient and cost-effective pre-operatively, in planning surgical management.

Key Words : *Ultrasound, Lymph Node, Histopathology.*

INTRODUCTION

The presence of metastatic cervical lymph nodes in head and neck malignancy can lead to a drop in survival rate to nearly 50% (Shah et al, 1993). Detection of neck nodes is of paramount importance pre-operatively in planning the management of these patients. Clinical palpation for nodes has its obvious drawbacks of being unreliable and infallible (Sako et al, 1964); other investigations like computed tomography (CT), magnetic resonance imaging (MRI) and the newer positron-emission tomography (PET) are expensive for the average-income patient in our country.

The role of high resolution US was analyzed in the detection of lymph nodes their size, shape, ecogenecity, central radiolucency (necrosis), extra-capsular spread (ECS) and pressure effects on the surrounding vessels, all criteria to diagnose positivity for metastasis.

PATIENTS & METHODS

A total of 20 patients were included in the study with ages ranging from 40-67. The male to female ratio was 4 :1. 60% of cases had a primary in the larynx, 15% in the oral cavity /oropharynx, 10% in the hypopharynx, 5% in the thyroid and 10% were cases with unknown primary.

Initial confirmation of head and neck primary cancer was done by biopsy or FNAC, following which the patient was assessed for operability of the tumor. If operable, they were examined clinically by the same head and neck surgeon in all instances, who documented on a diagram the presence, number, size shape, level, consistency and mobility of the

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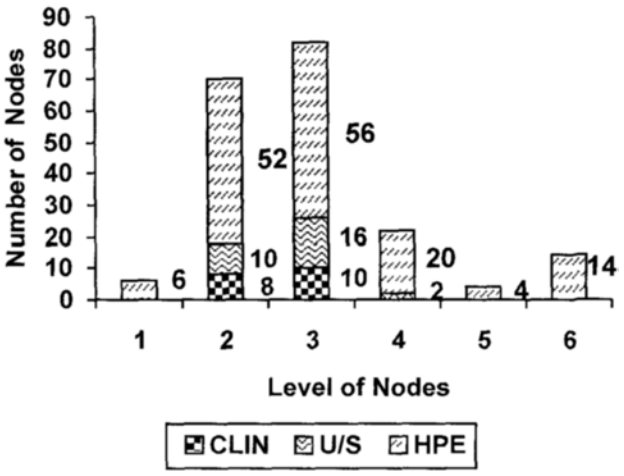

Fig I · Nodes Detected

True Positives	=	Nodes detected as positive on Clinical /Ultrasound and confirmed positive on HPE
False Positives	=	Nodes detected as positive on Clinical /Ultrasound and found to be negative on HPE
False Negatives	=	Nodes detected as negative on Clinical /Ultrasound and found to be positive on HPE
True Negatives	=	Nodes detected as negative on Clinical /Ultrasound and confirmed negative on HPE

Fig II Criteria for True/False Positives/ Negatives

nodes and over-all suspicion of nodal metastasis.

US scan of all 6 levels of the neck was then carried out using the WIPRO-GE 7.5 megahertz linear probe / RT 3200 Advantage II US machine. The nodes detected were numbered and mapped out, and echogenecity, central lucency, ECS, roundness index, {calculated by longitudinal diameter /axial diameter (Sakai, et al, 1988)} and pressure on surrounding vessels were noted.

Following this, all patients underwent a neck dissection : radical in 8 cases (40%), functional in 3 patients, (15%) and inter-jugular clearance in 9 cases (45%). Totally 152 lymph nodes were dissected out of the gross surgical specimens, marked individually and sent for HPE for presence of metastases and confirmation of diagnostic criteria.

The clinical, US and HP findings were then compared to estimate the degree of accuracy of US evaluation.

RESULTS

On clinical examination, 18 cervical nodes were considered to have metastatic spread. On ultrasound, 28 nodes were detected, of which 12 (42.9%) were considered positive for malignancy and 16(57.1%) negative.

Histopathological Findings : Of the 20 neck dissection specimens, totally, 152 nodes were dissected out and evaluated for metastasis. Of these, 36 (23.7%) were found positive and 116 (76.3%) were negative for malignancy.

The individual criteria for detection of malignancy on US were compared with the histopathological findings.

a) Axial Diameter or Size : On US, size of the nodes detected ranged from 0.7 x 0.3 cm. to 5.7 x 3.8 cm, (longitudinal diameter x axial diameter). All nodes considered positive for malignancy on US had an axial diameter of >1.2 cm while those negative for malignancy were < 0.5 cm. On HPE, all nodes positive for malignancy had an axial diameter of >1.2 cm while those negative were < 0.4 cm.

b) Shape : Of the 28 nodes detected on US, 16 were found positive for malignancy on HPE, and all 16 (100%) were

$$\text{Sensitivity} = \frac{\text{Number of true Positives}}{(\text{Number of True Negatives} + \text{Number of False Positives})} \times 100\%$$

$$\text{Specificity} = \frac{\text{Number of True Negatives}}{(\text{Number of True Negatives} + \text{Number of False Positives})} \times 100\%$$

$$\text{Accuracy} = \frac{\text{Number of True Positives} + \text{Number of True Negatives}}{\text{Total}} \times 100\%$$

Fig III Formulae

oval. 12 nodes were found negative on HPE ; of these, 10 (83.3%) were oval and 2 (16.7%) were round.

c) Echogenecity : Of the 28 nodes detected on US, 16 were found positive for malignancy on HPE ; of these, 8 (50%) were hyper-echoic and 8 (50%) were hypo-echoic. Of those negative on HPE, 5 (41.7%) were hyper-echoic and 7 (58.3%) wer hypoechoic.

d) Necrosis : Of the nodes detected on US and found positive on HPE, 78.6% showed no necrosis, while 21.4% showed necrosis. Of the nodes found negative on HPE, all 12 (100%) had no necrosis. Another 6 nodes showed necrosis on HPE, which was not detected on US.

e) Extra-capsular Spread (ECS) : Of the nodes detected on US and found positive for malignancy on HPE, 14 (87.5%) did not show ECS while 2 (12.5%) showed ECS. Of the nodes found negative on HPE, all 12 (100%) did not show ECS.

f) Pressure on Blood vessels : On US, of the positive nodes found in relation to the Carotid sheath (levels 2, 3, 4) only 2 (12.5%) were pressing on the Internal Jugular Vein which was confirmed as tumor invasion of the vein on HPE. This was not seen in the other positive or negative nodes along the vessels.

g) Roundness Index (RI) : On US, malignant nodes had a mean RI of 1.58 and the average RI of benign nodes was 2.03. On HPE, positive nodes had a mean RI of 1.58 and negative nodes had a mean RI of 2.07.

On a comparative assessment, (See fig. II) clinical examination showed 14 true positive, 4 false positive and 18 false negative nodes. On US, there were 10 true positives, 4 false positives, 14 true negatives and 11 false negatives. The sensitivity, specificity and accuracy of both methods was then calculated (See Fig. III).

DISCUSSION

High frequency US imaging can detect most diseased nodes (Solbiati, et al 1988), and in many cases, distinguish benign or reactive from metastatic nodes, using certain diagnostic criteria.

(1) US was useful in diagnosing malignancy using Axial diameter or size only if the size was <0.5 or >1.2 cm. Nodes ranging in size between these two figures were not accurately assessed. According to our study, all nodes positive for malignancy had an axial diameter of >1.2 cm. on US. According to Van den Brekel, et al, 1990, this figure was >1 cm. in the sub-digastric region and >1.1 cm. in the rest of the neck. Sakai, et al, 1988, got corresponding figures of 0.7 cm and 0.9cm respectively. since clinical palpation usually picks up nodes of >1cm. US proves valuable in this.

(2) Shape was not found to be a useful criterion, though metastatic nodes were considered "Roundish" by some authors, (Van den Brekel, et al 1990 ; Solbiati, et al, 1992) while reactive or benign nodes were oval.

(3) US was accurate in assessing echogenicity in cervical lymph nodes, though it was not helpful in diagnosis of malignancy. The sonographic pattern of metastatic nodes varies from hypo-echoic to iso-echoic and can even be hyper-echoic following radiotherapy ; due to adipose infiltration. Some malignant nodes can show an an-echoic picture due to necrosis or cystic changes. (Solbiati, et al, 1992).

(4) All nodes showing necrosis on US were positive for malignancy. Absence of necrosis was seen in both benign and malignant nodes (Van den Brekel, et al 1990. Solbiati, et al, 1992). The same authors were able to detect necrosis of 0.3 cm or more and this was only in metastatic nodes. No reactive nodes showed necrosis. US was only able to detect 25% of necrotic nodes in this study, but it is diagnostic of malignancy.

(5) All nodes showing extra-capsular spread were positive for malignancy, though US was only 50% accurate in detecting this. According to Shah, et al, 1993, ECS can occur even in very small nodes. The node does not have to be totally replaced by tumor before ECS occurs. They also found that approximately 40-60% of all positive lymph nodes would show ECS. This compares with 12.5% in our study. ECS is associated with a 50% reduction in patient survival rate, and is hence an indicator of poor prognosis.

(6) US was 100% accurate in assessing pressure on bloood vessels by malignant lymph nodes. This was an improvement over clinical examination, which only labelled the nodes as positive without assessing blood vessel invasion. Shah et al, 1993, found that invasion of the juglar vein by tumor is usually seen only in massively enlarged nodes and is usually obvious to the naked eye during neck dissection. According to Gritzmann and Grasl, 1990, the

wall of the carotid artery was hypo-echogenic in 11 of 12 patients with surgically proved tumor invasion of the artery Pre-operative knowledge of vessel invasion is important, as in synchronous bilateral neck dissection, the vein free of disease can be preserved.

(7) Roundness Index - From this study, nodes with a RI of <1.58 on US were considered positive for malignancy while negative nodes had a RI of >2 03. This compares with studies done by Solbiati, et al 1992, and Sakai, et al 1988 An average of <1 5 has been taken as positive for malignancy, while >2.0 is negative Nodes with a RI between 1.5 and 2 could be either positive or negative for malignancy

In this study, clinical palpation of nodes had sensitivity of 43.75%, specificity of 25%, and accuracy of 38.9% Ultrasound evaluation of nodes had a sensitivity of 47.62%, specificity of 77 78% and overall accuracy of 61.54%. 64.2%. of nodes detected on US were accurately assessed for both positivity and negativity, while 35 8% were incorrectly assessed Hence, some nodes were missed by US, but those detected were quite accurately assessed for malignancy as seen in other studies of Bruneton, et al, 1984, Steinkamp, et al, 1991, and Van den Brekel, et al, 1991

CONCLUSION

In conclusion, US offers a higher degree of sensitivity, specificity and accuracy over clinical examination The useful diagnostic criteria for malignancy in lymph nodes on US were · axial diameter, necrosis, extra-capsular spread, pressure on surrounding vessels and Roundness Index.

We use US routinely pre-operatively in all cases of head and neck cancer where curative surgery with or without neck dissection is planned US used in combination with F N A C. (Van den Brekel, et al, 1991) or color Doppler studies (Chang, et al, 1994) may further increase accuracy in detecting metastatic nodes

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