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Review Article

EFFECTIVENESS OF ULTRASONOGRAPHY IN THE DETECTION OF METASTATIC LYMPHNODES

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ABSTRACT
Oral cancer is the sixth most common cause of cancer related deaths in the world. The global incidence of oro-pharyngeal cancer accounts for 3, 63, 000 annual new cases worldwide and almost 2, 00, 000 deaths. Most oral cancers are squamous cell carcinomas because most of the risk factors affect the superficial layers of the mucosa and gingiva. In patients with proven head and neck carcinomas, the presence of a unilateral metastatic neck node reduces the 5-year survival rate by 50%, whereas the presence of bilateral metastatic nodes reduces the 5-year survival rate by 25%[2]. Further the incidence of clinically occult metastases in the neck can be as high as 30 – 50% depending on the sub-site and stage of the primary tumor. Different modalities for the assessment of cervical lymph nodes include clinical palpation and imaging techniques such as Ultrasonography (USG), Magnetic Resonance Imaging (MRI), Computed Tomography (CT), and Radionuclide Scintigraphy. USG is the only available imaging technique that can be used for routine follow-up. Unlike CT and MRI that depend only on the size of the node for diagnosing the metastasis, USG can evaluate various parameters like site, size, shape, boundary, internal structure, vascularization and extracapsular spread. This article reviews the effectiveness of the ultrasonography in detecting malignant neck lymphnodes in patients with oral squamous cell carcinoma.

KEYWORDS- Ultrasonography, Oral Cancer, Metastasis, Neck lymphnodes.

INTRODUCTION

Oral cancer is the sixth most common cause of cancer related deaths in the world. The global incidence of oro-pharyngeal cancer accounts for 3, 63, 000 annual new cases worldwide and almost 2, 00, 000 deaths[1]. Most oral cancers are squamous cell carcinomas because most of the risk factors affect the superficial layers of the mucosa and gingiva. It might be expected that early diagnosis would be the norm, but unfortunately majority of the patients with oral squamous cell carcinoma present with advanced disease and lymph node metastasis. Assessment of the nodal status is essential in patients with head and neck carcinomas since it predicts prognosis and helps in selection of treatment options. In patients with proven head and neck carcinomas, the presence of a unilateral metastatic neck node reduces the 5-year survival rate by 50%, whereas the presence of bilateral metastatic nodes reduces the 5-year survival rate by 25%[2]. Further the incidence of clinically occult metastases in the neck can be as high as 30 – 50% depending on the sub-site and stage of the primary tumor[3]. Different modalities for the assessment of cervical lymph nodes include clinical palpation and imaging techniques such as Ultrasonography (USG), Magnetic Resonance Imaging (MRI), Computed Tomography (CT), and Radionuclide Scintigraphy. Clinical examination of patients though easy and inexpensive has an estimated false negative result of 27 – 38% and low sensitivity and specificity[4]. USG is the only available imaging technique that can be used for routine follow-up. Unlike CT and MRI that depend only on the size of the node for diagnosing the metastasis, USG can evaluate various parameters like site, size, shape, boundary, internal structure, vascularization and extracapsular spread. This article reviews the effectiveness of the ultrasonography in detecting malignant neck lymphnodes in patients with oral squamous cell carcinoma.

Basic Principles of ultrasonography

"Sonography" means imaging with ultrasound; "ultra" means beyond or in excess; "sound" means audible sound energy. The term "ultrasound" means the form of sound energy beyond audible range. Ultrasound used for diagnostic purposes has a frequency of 2 MHz to 20 MHz[5].

Ultrasound wave is a form of longitudinal mechanical wave that needs a medium to be transmitted from one place to another. Ultrasound is produced by vibrating piezoelectric crystals using a high frequency electrical pulse that causes mechanical oscillation and produces ultrasound waves. Thus, electrical energy is converted into mechanical energy. Diagnostic ultrasound utilizes a transducer which generates a narrow focus beam. This beam is reflected from the tissue and sent back to the same transducer, which assembles these echoes into an image that can be visualized and recorded[5].

Though the principles and application of ultrasound was discovered by curie brothers in 1880, the Dussik brothers in Austria (1937) were the first to describe the use of ultrasound imaging for medical diagnosis[6]. Later in 1972,

Kossoff in Australia and others introduced grey scale USG. Vincent in 1988 found that sonography is widely applicable in the diagnosis of a variety of soft tissue abnormalities. Though the major application of USG is in cardiology, gastroenterology, obstetrics and gynaecology, it is recently gaining importance in the diagnosis of oral and maxillofacial lesions.

ADVANTAGES OF ULTRASONOGRAPHY OVER OTHER IMAGING MODALITIES

- Widely available and easy-to-use
- Inexpensive
- Harmless since it uses no ionizing radiation and non invasive.
- Unaffected by metal artefacts such as dental restorations
- Can be performed without sedation
- Can be repeated as often as necessary
- On-screen nodal measurement is possible
- Possible to differentiate cystic from solid lesions and benign from malignant masses
- Minimally invasive procedures like FNAC and needle biopsies are possible with USG

LIMITATIONS OF ULTRASONOGRAPHY

- USG can visualize only superficial tissues to a depth of 4-6 cms.
- Lymphnodes with borderline size cannot be reliably diagnosed with USG and in those instances US guided FNAC should be performed.
- Few submandibular nodes are hidden by the body of the mandible and hence cannot be adequately evaluated by USG.
- USG cannot assess the retropharyngeal lymph nodes, which lie behind the air filled pharynx. These nodes are common sites of metastases in some head and neck cancers such as nasopharyngeal carcinoma, and these lymph nodes are evaluated with CT or MRI.
- USG cannot detect micrometastases in lymphnodes and may lead to false negative findings.
- On grey scale USG, both coagulation necrosis and the hilus appear echogenic within the lymphnode. The two can be distinguished by noting that the hilus is a linear echogenic structure continous with the surrounding fat, whereas coagulation necrosis appears as an echogenic focus and is not continous with the surrounding fat.
- Submandibular nodes are usually large and round and hence differentiating between benign and malignant nodes at this site based on the size and shape is not reliable.
- There is no specific cut-off value for the nodal size to be pathologic. An increase in the cut-off value in the nodal size results in a decrease in the sensitivity and an increase in the specificity and vice versa.
- Ultrasonography, being an user friendly, cost effective and applicable tool of diagnosis to detect cervical lymphadenopathy, many studies have been carried- out to compare USG with other imaging modalities.

Ultrasonography in the detection of metastatic lymphnodes

Shozushima M. *et al* (1990) conducted a prospective study in 57 patients treated by radical neck dissection for carcinoma of the oral cavity, maxillary sinus or oropharynx. The pre-operative USG and post-operative histopathological findings were compared in 181 lymphnodes of 5mm or more in diameter. Lymph nodes were evaluated by USG with reference to the size, shape, boundary and internal echoes. 96% of lymph nodes of 15mm or more in size were histologically positive. 95% of the oval lymph nodes were negative. The positive rate was higher for well delineated than poorly delineated lymph nodes. With respect to internal echoes the rate was similar in both homogenous and heterogenous nodes. No lymph nodes were detected by USG in 6 of the 57 patients of which 4 were true negative and 2 were false negative. They have concluded that USG is indispensable for diagnosing cervical lymph node metastasis in patients with malignant head and neck tumors[7].

Susumumu Shingaki, Ichiro Suzuki (1996) conducted a study to assess distant metastases in 103 patients with histologically proven HNSCC. They compared the primary site, tumor stage, clinical growth pattern, histological differentiation, regional lymph node status and extranodal spread with distant metastasis. They found the incidence of distant metastases was significantly higher in patients with neck metastases (40%) than those without neck metastases (4%). There was no correlation between the incidence of distant metastases and the sex, location, stage of the disease and clinical growth pattern. Their study found that the most common site for distant metastases was the lungs (56%), followed by the bone and skin (16% each). They concluded that the presence of regional lymph node metastasis is the most critical factor for the eventual development of distant metastases[8].

Atula TS, Varpula MJ, Kurki TJ, Klemi PJ, Grenman R (1997) conducted a prospective study in 105 patients with primary cancer of the head and neck. Palpation, low field MRI and CT were compared with US guided FNAC. In the subgroup of 86 patients with palpable normal necks, CT showed lymph nodes fulfilling the radiologic criteria for malignancy in 27%, MRI in 17% and USG in 14% of the patients. In the other subgroup of 19 patients with palpable metastatic necks, metastases were detected by all imaging methods. They have concluded that irrespective of the use of MRI or CT, US guided FNAC should be recommended since it provides additional information about enlarged lymph nodes and can detect malignancy in small lymph nodes not detected by other methods[9].

Michiel, W.M. Van den Brekel, Jonas A. Castelijns and Gordon B. Snow (1998) conducted a study to define a cut-off point for nodal size to determine whether cervical lymph nodes are metastatic or not with USG in 117 patients with and 131 patients without palpable neck metastases. They conclude that the current size criterion of around 1 cm for declaring a cervical lymph node metastatic is not optimal and should be smaller, particularly for patients without palpable metastases in the neck. Furthermore the size criteria for lymph nodes in levels I, III, IV and V should be smaller than that for level II. They have suggested that a minimum axial diameter of

7mm for level II and 6mm for the rest of the N0 neck represented the best compromise between sensitivity and specificity[10].

Hugh, D. Curtin, Hemant Eshwaran (1998) conducted a prospective study on 213 patients with carcinoma of the oral cavity, oropharynx, hypopharynx and larynx. The positive predictive value (PPV) of CT and MRI were 84 and 79%. The negative predictive value (NPV) of CT and MRI were 50 and 52%. They concluded that CT was more efficient than MRI in the detection of lymph node metastasis[11]. Mikami Y, Kamata S, Kawabata K, Nigauri T, Hoki K, Mitani H, Beppu T (2000) evaluated the use of USG in diagnosing metastatic cervical lymph nodes in 58 patients with SCC of the head and neck. The size, internal echoes and margins of nodes were studied by USG preoperatively. 301 lymph nodes were evaluated histopathologically. Size was found to be the best criteria (with an accuracy of 78%) for distinguishing metastatic from non-metastatic lymph nodes. Submandibular and upper internal jugular nodes larger than 7mm and middle and lower jugular nodes larger than 6mm were regarded as metastatic. Homogenous hyperechoic and heterogenous patterns were characteristic of metastatic nodes, while eccentric hyperechoic patterns were characteristic of non-metastatic nodes. Homogenous hypoechoic patterns were observed in both metastatic and non-metastatic nodes. Regular margins were found in 81% of metastatic nodes. They found that an increased size, homogeneous hyperechoic or heterogeneous echoic pattern and regular margins were characteristic of metastatic nodes. They have concluded that combining USG with palpation improved the accuracy of diagnosis to 83%[12].

Ahuja AT, Ying M. (2000) in their study on 218 patients with known cervical metastases evaluated the nodes for size, shape, internal architecture, nodal border, echogenicity, posterior enhancement, adjacent soft tissue oedema and matting with USG. They found that size, shape, echogenic hilus, hypoechogenicity or isoechogenicity, coagulation necrosis and sharp nodal borders are features helpful in identifying metastatic nodes[13].

Saravanan K, Bapuraj JR, Sharma SC, Radotra BD, khandelwal N, Suri S (2002) compared the effectiveness of palpation, USG and CT in detecting cervical lymph node metastasis in 25 patients with known head and neck malignancy. The results of pre-operative evaluation were compared with histopathological findings. They concluded that palpation, USG and CT have comparable sensitivity in detecting cervical lymph node metastasis[14].

Jank, A., Robatscher, P. (2003) conducted a prospective study to evaluate the effectiveness of USG and CT in detecting metastatic lymph nodes in patients with HNSCC. Lymph nodes from level I to level IV were evaluated with both USG and CT. The sensitivity of USG and CT were 71% and 32% respectively and the specificity of USG and CT were 87% and 96% respectively. The sensitivity of USG decreased from level I to level IV and the specificity increased from level I to level IV. They concluded that USG may be helpful in the detection of metastatic lymph nodes of levels I and II[15].

Haberal I, Celik H, Gocmen H, Akmansu H, Yoruk M, Ozeri C (2004) conducted a prospective study in 48 patients with primary head and neck malignancy to detect metastatic cervical lymph nodes. The sensitivity of palpation, USG and CT were 64%, 72%, and 81% respectively; the specificity of palpation, USG and CT were 85%, 96% and 96% respectively; the negative predictive value of palpation, USG and CT were 74%, 80% and 85% respectively; the positive predictive value of palpation, USG and CT were 78%, 94% and 90% respectively; the accuracy of palpation, USG and CT were 75%, 85% and 87% respectively. They concluded that USG and CT of the neck are essential for the diagnosis, staging and therapy choices[16].

Ann D King, Gary MK (2004) conducted a prospective study to compare the diagnostic accuracy of USG, CT and MRI in patients with head and neck cancer to detect necrosis in metastatic cervical nodes. The sensitivity of USG, MRI and CT were 77%, 93% and 91% respectively, the specificity of USG, MRI and CT were 93%, 89%, and 93% respectively and the accuracy of USG, MRI and CT were 85%, 91% and 92% respectively. The results showed that CT and MRI are more sensitive than USG[17].

Michael Ying, Anil Ahuja (2004) conducted a prospective study that included 270 patients with cervical lymphadenopathy to evaluate the accuracy of power doppler sonography (PDS) in differentiating reactive, tuberculous, lymphomatous and metastatic nodes. The diagnosis was established by FNAC or by excisional biopsy. The nodes were evaluated for vascular pattern, displacement of vascularity and vascular resistance (resistance index [RI] and pulsatility index [PI]). The results showed that vascular pattern was more useful in differentiating reactive nodes from malignant nodes and displacement of vascularity was helpful in differentiating tuberculous nodes from reactive and lymphomatous nodes. They concluded that PDS is a valuable tool in the evaluation of cervical lymphadenopathy[18].

Michael Ying, Anil T (2004) conducted a prospective study to assess the effectiveness USG and power Doppler sonography (PDS) in detecting cervical lymphadenopathy from various causes. The distribution, size, shape, echogenicity, internal architecture and vascular pattern of the lymph nodes were assessed. Their results indicated that no specific USG feature was helpful in differentiating metastatic nodes from other causes. They concluded that definitive diagnosis should be based on cytology and US guided FNAC will guide for a more accurate cytologic examination[19].

13. Rottey S, Petrovic M, Bauters W, Mervillie K, Vanherreweghe E, Bonte K, Van Belle S, Vermeersch H (2006) conducted a retrospective study in 78 pts treated for head and neck cancer with neck dissection. The sensitivity of palpation, USG, US guided FNAC and CT were 48.7%,65.8%, 86.7% and 52.5% respectively; the specificity of palpation, USG, US guided FNAC and CT were 95.5%, 83%, 87.5% and 83.6% respectively; the positive predictive value of palpation, USG, US guided FNAC and CT were 79.2%, 56.8%, 81.3% and 53.9% respectively; the negative predictive value of palpation, USG, US guided FNAC and CT were 84.1%, 87.7%, 23 91.3% and 82.9% respectively; the efficacy of palpation, USG, US guided FNAC and CT were 83.3%, 78.7%, 87.2% and 75.3% respectively. The values were comparable between USG and CT but was higher for US guided FNAC and hence more effective[20].

Hohl Weg-Majert B et al (2006) conducted a study to compare the efficiency of CT and USG in the detection of neck metastasis in 25 patients with HNSCC. Pre-operative findings were compared with the histopathology of the specimen. The results showed that the rate of sonographically detected malignant lymph nodes was significantly higher when compared to CT. They found that with a linear transducer only the uppermost regions of the neck were accessible. They concluded that USG is a cheap, easy-to-handle and cost effective diagnostic method[21].

P.S. Richards and T.E. Peacock (2007) in their review article on the role of USG in the detection of cervical lymph node metastases in clinically N0 patients with SCC of the head and neck. They have concluded that USG with US guided FNAC is the most accurate method currently available although cross-sectional imaging is still required to assess nodes at in accessible locations. They formulated the USG features suggestive of lymph node metastases that include an L/T ratio of less than 2, non-hilar vascular pattern, parenchymal granular echoes, necrosis, extracapsular spread and three or more normal looking nodes grouped in a high risk area are indicators of macrometastatic disease[22].

De Bondt R. B. J. and P.J. Nelemans (2007) conducted a retrospective study to compare the efficiency of USG, US guided FNAC, MRI and CT for the detection of lymph node metastases in head and neck cancer patients. They concluded that US guided FNAC was the most accurate imaging modality to detect cervical lymph node metastasis[23].

Sundar R, Rajesh P (2007) assessed the efficacy of clinical palpation, USG and CT for staging the neck in patients with OSCC. The pre-operative findings were compared with the histopathology of the specimen. The sensitivity of palpation, USG and CT were 54.5%, 72.7% and 81.8% respectively. The specificity of palpation, USG and CT were 100%, 71.4% and 71.4% respectively. CT was found to be the most sensitive and accurate modality for the detection of cervical metastasis[24].

Nitin Anand, Neena Chaudhary, M. K. Mittal and Rajni Prasad (2007) conducted a prospective study in 100 pts with head and neck cancers who had cervical lymph node metastases. Pre-operative findings of clinical examination, USG and CT were compared with the histopathologic study of the specimen. The sensitivity of clinical examination, CT and USG were 67.4%, 77.5%, and 82% respectively; the specificity of clinical examination, CT and USG were 90.1%, 92.4%, and 92.5% respectively; the positive predictive value (PPV) of clinical palpation, CT and USG were 92.3%, 94.5% and 94.8% respectively; the negative predictive value (NPV) of clinical palpation, CT and USG were 62.3%, 71% and 75.4% respectively; the accuracy of clinical examination, CT and USG were76%, 83% and 85.9%. In addition to the good results they found that USG is advantageous for its low cost, minimum stress to the patients, ease of application and possibility of frequent repetition with no exposure to radiation[4].

Jagdeep S. Thakur, M. L. Sharma, C. Mohan, N. K. Mohindroo, N. K. Kaushik (2007) conducted a prospective randomized study to assess the role of palpation, USG and CT in the detection of cervical lymph node metastasis in 25 patients with head and neck malignancy. It was observed that clinical examination was least sensitive (73.33%) when compared with CT (80%) and USG (93.93%). CT (90%) was found to be more specific when compared to clinical examination (70%) and USG (70%). They concluded that in the evaluation of cervical metastasis, clinical examination must be supplemented with USG and CT[25].

Gokul Venkateshwar, Mukul Padhye (2007) compared clinical palpation, USG and HPE in 15 patients who underwent neck dissection for oral cancer. In their series histopathological examination revealed maximum nodes and metastasis when compared to clinical palpation and USG and hence it remains the gold standard for evaluating the neck status[26].

A. T. Ahuja, M. Ying, S. Y. Ho, G. Antonio, Y. P. Lee, A. D. King and K. T. Wong (2008) in their review article, evaluated the various grey scale sonographic parameters like size, shape, border, echogenicity, echogenic hilus, intranodal necrosis and calcification, in differentiating reactive from metastatic cervical lymph nodes. They have concluded that USG helps in identifying abnormal nodes, confirms the nature (with guided FNAC) and objectively assesses the response to treatment[2].

Md. Mizanur Rahman, Sadeque, Eliza Omar and Sonjoy Kumar Bhakta (2009) conducted a study for differentiating benign from malignant cervical lymph nodes using a high frequency USG probe. The criteria chosen were size, shape, L/S ratio, marginal clarity, internal echo pattern and hilar echogenicity. Totally 65 nodes were studied. In their study all the nodes (100%) with a short axis diameter more than 1cm were malignant. In contrast 79.5% of the nodes with a short axis diameter of less than 1cm were benign. 82.8% of nodes with a L/S ratio of less than 2 were malignant and 87.1% of nodes with an L/S ratio of more than were benign. 71.8% of the nodes with regular margin were benign while 88.5% of nodes with irregular margin are malignant. 87.5% of the nodes with a homogenous hypoechoic pattern are benign and 90.9% of nodes with a heterogenous echopattern were malignant. 72.1% of nodes with hilar echogenicity were benign while 100% of nodes without hilar echogenicity were all malignant. Their findings suggested that high resolution USG might assist in the differentiation of benign and malignant enlarged cervical lymph nodes[27].

Saraswathi M. C. Dayanand, Rajendra Desai and Praveen B. Reddy (2010) assessed the value of USG in detecting cervical lymph node metastasis in 20 patients with carcinoma of the oral cavity. 92 lymph nodes of 5mm or more in diameter were detected by USG. Sonographic parameters of size, shape, internal echoes and boundaries of the lymph nodes were recorded. The histologic positive rate was 25%, 80% and 93% for nodes between 5 – 10mm, 11 – 15mm and nodes more than 15mm respectively. 86% of round nodes more than 9mm size were histologically positive. The positive rate was 93% for well-delineated nodes and 68% for poorly delineated nodes. 88% of hypoechoic and 83% of homogenous nodes were positive. They found that USG when compared with histopathology showed a sensitivity of 86%, specificity of 73% and an accuracy of 82%% in detecting cervical lymph node metastasis[28].

Geetha NT, Neelakamal Hallur, Gayathri Goudar, Sikkerimath BC, Santhosh S Gudi (2010) assessed the accuracy of clinical palpation, CT, USG, and US guided FNAC in predicting lymph node metastasis in 10 patients with OSCC. The sensitivity of palpation, CT, USG and US guided FNAC were 83%, 50%, 100% and 67% respectively. The specificity of palpation, CT, USG and US guided FNAC were 50%, 100%, 25% and 100% respectively. They concluded that palpation, CT and USG are equally accurate but US guided FNAC is the most accurate technique in assessing cervical lymph node metastasis in patients with OSCC[1].

R. Chandak, S. Degwekar, R R Bhowte, M Motwani, P Banode, M Chandak and S Rawlani (2011) used USG to evaluate 70 patients with clinically obvious swellings in the head and neck. Ultrasonographic parameters for evaluation were shape, boundary, echo intensity, ultrasound architecture of the lesion, posterior echoes and ultrasound characteristic of tissues. Comparisons were made between inflammatory, cystic, benign and malignant swellings. The sensitivity of clinical diagnosis and USG diagnosis were 85.7% and 97.1% respectively, the specificity of clinical diagnosis and USG diagnosis were 85.7% and 100% respectively, the positive predictive value (PPV) of clinical diagnosis and USG diagnosis were 85.7% and 100% respectively, the negative predictive value of clinical diagnosis and USG diagnosis were 85.7% and 97.2% respectively and the accuracy of clinical diagnosis and USG diagnosis were 85.7% and 98.5% respectively[5].

Rahul Khanna, Avinash Dutt Sharma, Seema Khanna, Mohan Kumar, Ram C Shukla (2011) conducted a study to evaluate the role of USG in 192 patients for differentiating cervical lymphadenopathy due to tuberculosis, metastasis and lymphoma. The USG findings were correlated with FNAC or lymph node biopsy. They found that the most significant distinguishing feature was strong internal echoes seen in 84% of tubercular lymph nodes but only in 11% of metastatic nodes and absent in lymphomatous nodes. The other findings such as L/S ratio, irregular margins, hypoechoic centre, fusion tendency, peripheral halo and absent hilus were helpful in differentiating reactive from diseased nodes. The authors concluded that USG can give clues in the diagnosis of cervical lymphadenopathy but should be interpreted in conjugation with FNAC result[29].

Li-Jen Liao, Wi-Chia Lo, Wan-Lun Hsu, Chi-Te Wang and Mei-Shu Lai (2012) in their review article compared the diagnostic accuracy of different imaging modalities in the detection of cervical lymph node metastasis in head and neck cancer patients with clinically N0 neck. The sensitivity of CT, MRI, PET and USG were 52%, 65%, 66% and 66% respectively. The specificity of CT, MRI, PET and USG were 93%, 81%, 87% and 78% respectively. They concluded that USG, CT, MRI and PET offer similar diagnostic accuracy in N0 neck[30].

Ashutosh Chauhan, Pranjal Kulshrestha, Sanjay Kapoor, Harkirat Singh, M. J. Jacob, Maneel Patel, and Manomoy Ganguly (2012) in their prospective study compared the accuracy of PET-CT with USG and CECT for evaluating clinically N0 neck in 49 patients with SCC of the upper aero digestive tract. Post-operative histopathology was correlated with pre-operative nodal status. The sensitivity of USG, CECT and PET-CT was 4.76%, 23.80% and 71.43% respectively while the specificity was 93.33%, 93.33% and 96.67% respectively. The positive predictive value (PPV) for USG, CECT and PET-CT was 33.33%, 71%, 93.5% respectively while the negative predictive value (NPV) was 58.33%, 63.33%, 82.85% respectively. They concluded that though PET-CT is more accurate than either USG or CECT in staging of the neck but it is not accurate enough to alter the current treatment paradigm[3].

M. Ying, K. S. S. Bhatia, Y. P. Lee, H. Y. Yuen, A. T. Ahuja (2013) in their article reviewed the value of grey scale, doppler, contrast enhanced ultrasonography and elastography in the assessment of malignant nodes of the neck. They concluded that USG is a useful and reliable imaging method in the assessment of malignant cervical nodes in patients with head and neck cancer. It further helps in evaluating treatment response[31].

Magdy Eisa Saafan, Ahmed Samy Elguindy, Mahmoud Fouad Abdel-Aziz, Ahmed Abdel-Rahman Younes, Osama Amin Albirmawy, Mahmoud Mandour and Khalid El-Shafey (2013) compared the effectiveness of clinical palpation, USG and CT in 100 patients with histologically proven HNSCC in detecting cervical lymph node metastasis. The sensitivity of clinical palpation, CT and USG were 71.43%, 82.9% and 97.1% respectively; the specificity of clinical palpation, CT and USG were 75.86%, 89.66%, and 93% respectively; the positive predictive value (PPV) of clinical palpation, CT and USG were 87.7%, 95% and 97.1%; the negative predictive value (NPV) of clinical palpation, CT and USG were 52.4%, 68.4% and 93% respectively and the accuracy of clinical palpation, CT and USG were 72.7%, 84.85% and 95.96% respectively. It was concluded that USG is the best modality in assessment of metastatic cervical lymph nodes[32].

Chintamaneni Raja Lakshmi, M. Sudhakara Rao, A. Ravikiran, Sivan Sathish and Sujana Mulk Bhavana (2014) conducted a study that included 45 patients to determine the efficacy of USG in differentiating between benign and metastatic group of cervical lymph nodes. They found that sonographic features such as round shape, absence of hilar echo, sharp nodal borders, hypoechoic internal echogenicity and presence of intranodal necrosis were highly suggestive of metastatic cervical lymph nodes[33].

Ionela Genes, Carmen Aurelia Mogoanta, Gabriel Lostun, Alexandra Lostun, Huba Mozes, and Gheorghe Muhlfay (2014) conducted a study in 100 patients to evaluate the role of USG in the assessment of malignant cervical lymph nodes. Both Grey-scale US and color Doppler US were used to evaluate the nodes. Pre-operative USG findings were correlated with histopathological study. The grey-scale USG features included in this study were echogenicity, border, size, necrosis and shape. The sixth USG character was the evaluation of the vascular pattern of the lesion. Nodes were considered malignant if there was hypoechoic echogenicity, sharply demarcated border, size > 10mm, round contour, presence of necrosis and abnormal vascular pattern. Benign features were considered to be the opposite of these findings. The sensitivity of USG in detecting benign and malignant neck nodes with respect to echogenicity, border, shape, size, necrosis and vascular pattern was 78.07%, 39.47%,

84.21%, 73.68%, 35.96%, and 97.37%; the specificity of USG with respect to echogenicity, border, shape, size, necrosis and vascular pattern was 77.27%, 54.47%, 52.47%, 68.88%, 100% and 47.73%; the positive predictive value (PPV) of USG with respect to echogenicity, border, shape, size, necrosis and vascular pattern was 89.9%, 82.05%, 82.05%, 85.71%, 100% and 82.84%; the negative predictive value of USG with respect to echogenicity, border, shape, size, necrosis and vascular pattern was 57.63%, 56.1%, 56.1%, 50%, 37.61% and 87.5%[34].

Ophellia D. Souza, Suhel Hasan, Geetha Chary, V. Ravi Hoisala, Marjorie Correa (2014) conducted a prospective study to assess the value of USG in detecting cervical lymph node metastasis in 20 patients with head and neck malignancy. After the patients underwent neck dissection, individual nodes from the specimen were assessed by HPE. The sensitivity of USG and clinical examination were 47.62% and 43.75% respectively; the specificity of USG and clinical examination were 77.78% and 25% respectively and the accuracy of USG and clinical examination were 61.54% and 38.9% respectively. USG proved valuable in detecting sub-clinical nodes, central necrosis, extra-capsular spread, pressure on large vessels which are all indicators of metastatic spread[35].

CONCLUSION

Through our review of literature, certain findings could be firmly established using USG. No single ultrasound sign is absolutely accurate in diagnosing cervical lymph node malignancy. The association of signs (size/ shape/ echogenicity/ lymph node metastasis etc), however, produces a highly suggestive appearance in most cases and this makes ultrasonography an extremely useful diagnostic means. Critical appraisal of grey-scale signs is crucial for an accurate diagnostic approach. Doppler ultrasonography and US guided FNAC contributes to the diagnostic confidence. Other new techniques are on the way to further enhance the applications of US in lymph node disease

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