DIAGNOSTIC ACCURACY OF CT SCAN FOR DETECTION OF METASTATIC CERVICAL LYMPH NODES

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ABSTRACT

Objective: To determine diagnostic accuracy of computed tomography (CT) scan in detecting metastatic cervical lymph nodes in cases of clinically N_0 stage head and neck carcinomas using histopathology as gold standard.
Study Design: Validation study.
Place and Duration of Study: Department of radiology, Military Hospital Rawalpindi - a tertiary care hospital in collaboration with AFIP from 1st Jun 2012 to 31st Jun 2013.
Material and Methods: Two hundred and seventy known cases of head and neck carcinoma with clinically N_0 stage were subjected to pre-operative CT scan with contrast. Patients with CT scan positive for cervical metastasis underwent fine needle aspiration cytology (FNAC) / neck dissection (ND) while elective neck dissection (END) was performed in patients having CT scan negative for cervical lymphadenopathy. CT findings were compared with histopathology and analyzed to determine sensitivity, specificity and diagnostic accuracy of CT scan in diagnosing cervical metastasis.
Results: The mean age of patients was 56.73 ± 8.81 years out of these 210 (78%) were male while 60 (22%) were female making male-to-female ratio 3.5:1. Sensitivity, specificity, positive and negative predictive value of CT scan were 89.7%, 90.0%, 88.1% and 92.1% respectively in prediction of cervical metastatic lymphadenopathy while overall diagnostic accuracy of CT scan was 90.4%.
Conclusion: CT scan is a reliable diagnostic tool for diagnosis of metastatic cervical lymph nodes in cases of N_0 head and neck carcinomas.

Keywords: Carcinoma, Computed tomography, Histopathology, Metastasis, Nodal involvement.

INTRODUCTION

Head and neck cancer is the sixth most prevalent cancer in the world. Every year many new cases of head and neck cancer are diagnosed worldwide[1]. Out of various types, 95% of the head and neck cancers are squamous cell carcinomas (SCC)[2]. The most challenging aspect in treatment of these carcinomas is accurate assessment of metastatic status of the cervical lymph nodes[3] which is believed to be approximately 25%[4].

The treatment option to be opted for the neck greatly affects the prognosis of the disease. END has the risk of postoperative morbidity and mortality and affects the quality of life but missing a neck metastasis can cause late recurrences with a significant impact on prognosis[5].

Various clinical tools like palpation, ultrasound (US), CT Scan, magnetic resonance imaging (MRI), positron emission tomography (PET) and FNAC are used to accurately stage cancers in the neck[6].

In this study, we aimed to determine the accuracy of CT-Scan in evaluation of nodal metastasis in cases of clinically N_0 stage in carcinomas of head and neck making CT Scan better prognosticator of the disease and repressing the clinical practice of advising unnecessary tests.

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Received: 23 Jun 2014; revised received: 15 Aug 2014; accepted: 15 Aug 2014

MATERIAL AND METHODS

This validation study was conducted at Department of Radiology, Military Hospital Rawalpindi - a tertiary care hospital in collaboration with AFIP from 1st Jun 2012 to 31st Jun 2013. After formal permission from hospital ethical committee, patients of >18 years of age and of both the gender having a histopathological proof of carcinoma in head and neck region and clinically N_0 stage i.e. patients with non-palpable neck lymph nodes were included while patients having recurrent head and neck carcinoma based on record, 2nd primary in head and neck or any other region, malignancy other than head and neck with cervical metastasis, renal failure, diabetes mellitus, known allergy to intravenous contrast agents and pregnancy leading to contraindication to CT scan were excluded. Total 270 patients were included in the study through non-probability consecutive sampling. Sample size was calculated by sensitivity specifity calculator of sample size. Patients were subjected to CT scan from base of skull to root of neck with Asteion Whole Body X-ray 64 slice CT Scanner after administration of 50 ± 100 ml of intravenous contrast medium (Omnipaque 350) in Radiology Department of Military Hospital Rawalpindi. Metastatic lymph nodes detected on CT Scan were confirmed by histopathological examination either via FNAC or ND samples while CT scan negative for cervical metastatic underwent END as a part of treatment and dissected samples were assessed. Histopathology was performed in Armed Forces Institute of Pathology.

Data has been analyzed through SPSS version 17. Descriptive statistics were used to describe the results. Diagnostic measures were calculated for CT scan using histopathology as gold standard. ROC curve was drawn and area under the curve (AUC) was calculated. A *p*-value <0.05 was considered as significant.

RESULTS

Total 270 patients were included in the study. Average age of patients was 56.73 ± 8.81 years with age range of 32-74 years. The male-to-female ratio was 3.5:1 (fig-1).

Out of 270 patients, 116 (43%) patients were diagnosed to have cervical lymph nodes through histopathology while 104 (38.5%) were picked by CT scan (table-I). Sensitivity, specificity, positive and negative predictive value (PPV, NPV) were calculated as 89.7%, 90.0%, 88.1% and 92.1% respectively. The overall diagnostic accuracy of CT scan was calculated as 90.4%. AUC of CT scan was 0.903 (*p*<0.001) (fig-2).

Table-I: Comparison of CT scan and histopathology in diagnosis of cervical lymph node metastasis.

Cervical Lymph node metastasis on		Histopathology	
		Positive	Negative
CT	Positive	104	14
	Negative	12	140

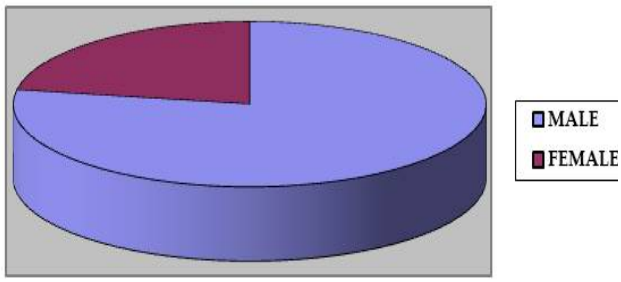

Figure-1: Gender distribution of patients (n=270).

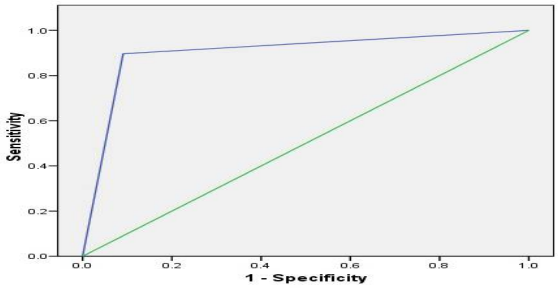

Figure-2: ROC curve for CT scan using histopathology as gold standard.

DISCUSSION

Meticulous evaluation of neck is mandatory for identification of cervical metastasis which has a major effect on the prognosis and treatment of head and neck cancer[7]. Performing END in clinically N_0 stage may be an aggressive option while missing nodal spread will lead to increased mortality[8].

Nodal metastases are detected with imaging modalities on the basis of size and shape of the node, extracapsular tumor spread and abnormality of internal architecture. A lymph node of more than 1cm in diameter which is not enhancing to the level of the vessels in the neck, jugulo-digastric and submandibular nodes of more than 1.5 cm, strong nodal enhancement, cystic change, calcification, central necrosis or three or more contiguous nodes of 8-15 mm diameters are considered malignant. Size is the most frequently used criterion for diagnosis; however, sensitivity and specificity of modalities vary widely. In contrast, the detection of nodal necrosis in patients with a primary head and neck tumor is the most reliable sign of a metastatic node[9].

Every diagnostic tool has its own advantages and disadvantages. Ultrasound (US) is a cheap and non-invasive modality having advantage of US-guided FNAC but has major disadvantages of inability to differentiate between benign and malignant nodes[10], access primary tumor and deep-seated retropharyngeal cervical nodes which is dominance of CT Scan, MRI and PET-CT[11]. PET-CT, though expensive has generally been considered the diagnostic procedure superior to other modalities in evaluation of metastatic neck[12], however, antagonistic results have also been found[13]. MRI on the other hand is time consuming, expensive than CT Scan and has almost same sensitivity and specificity as CT scan[14].

In order to select a patient for END, preoperative tool for detection of cervical metastatic nodes should have high NPV. Therefore, NPV of 92.1% determined in our study is high enough to keep CT scan as prime modality in preoperative workup. Moreover, sensitivity, specificity and diagnostic accuracy assessed in this study also supports CT scan which is similar to those found in other series. Pandeshwar et al[9]. documented 88% accuracy, 92% sensitivity and 84% specificity of CT scan in revealing cervical node metastasis. In another study, King et al[15], calculated accuracy, sensitivity and specificity of 92%, 91%, and 93% respectively for CT scan in detection of regional nodal necrosis. Merritt et al[16]. compared diagnostic accuracy of CT scan with physical examination. They found CT scan more accurate than physical examination i.e. 83% versus 77%. Moreover, few are of the opinion that CT scan has same diagnostic sensitivity as compared to PET and US considering CT scan superior to other modalities for regional nodal spread of tumor[11]. Variations in diagnostic accuracy of CT scan between our and other studies have been noticed, likely owing to various morphological presentations of diseased lymph nodes, errors in human observation, inadequate histological and surgical techniques.

Contrary to our study, it has been suggested that a more accurate imaging test for preoperative evaluation of nodal spread of tumor such as PET and PET-CT should be opted as CT scan has limited ability to stage tumor[17]. Furthermore, few studies recommend combination of modalities to lessen false positive and negative results thus improving overall prognosis of the disease. Eida et al[18]. advocates combination of US and CT while Yoon et al[14]. determined 97% accuracy on merger of CT, MRI, US and PET-CT but in our opinion it will not be cost effective.

CONCLUSION

Keeping high diagnostic accuracy of CT scan in view, it was concluded in this study that CT scan is a reliable tool for diagnosis of metastatic

cervical lymph nodes in cases of N_0 head and neck carcinomas.

Owing to limited availability and high cost of MRI and PET-CT, CT Scan should be preferred over other modalities and can be relied upon, reducing the clinical practice of advising costly and sometimes unnecessary tests.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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