Original article

Prospective Study of Computed Tomography and Ultrasound Imaging for Palpable Neck Lesions at a Tertiary Care Teaching Hospital

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Abstract

Objectives: Present study was conducted for efficacy evaluation of ultrasonography and computed tomography for palpable neck masses.50 patients (age range from 5 -70 years) were evaluated by Clinical and Radiological examinations for present study. A detailed clinical history was taken from all cases and through general physical and local examination was carried out. High-resolution real time sonography of the neck and Computed tomography scans was done in all patients. The Male to Female ratio in the present study = 1.38:1. Neck lesions are commonly encountered problem, yet there are very few established guidelines for evaluating such lesions. US should be the prime modality for evaluation of suspected neck lesions because it does not entail use of ionizing radiation, intravenous contrast material, and sedation and because of the low cost. Nevertheless, in cases of large lesions or suspected malignancy, CT is required for diagnosis and follow-up.

Key Words: Abscesses, Benign, Carcinoma, Computed tomography, Malignancy, Neck masses, Ultrasonography.

Introduction

Prior to the advent of computed tomography (CT) and ultrasound (US), radiographic diagnosis of palpable neck lesions was limited to conventional radiography of the soft tissues of the neck and clinical examination. Imaging is increasingly performed to confirm the clinical diagnosis and assess the anatomical extent of involvement before any form of treatment. Although there are overlapping features, differentiation between the lesions can usually be made based on specific imaging findings and relevant clinical information. More accurate localization and characterization of masses is necessary prior to surgical therapy.[1]

Ultrasonography is a readily available, relatively inexpensive imaging investigation. It does not involve ionizing radiations. Modern ultrasound machines equipped with high-resolution transducers provide excellent spatial and contrast resolution. Ultrasound also has the unique advantage over other imaging techniques in providing reliable, real-time guidance for fine-needle aspiration cytology (FNAC) or core biopsy.[2]

Cross-sectional imaging techniques, like magnetic resonance imaging (MRI) and computed tomography (CT), serve a supplementary role in work-up of neck masses for precise preoperative anatomical localization, particularly for more deep-seated and locally extensive lesions.

Sonography is an easily available, cost effective modality. However, it is unable to visualize skeletal structures and intrathoracic and intracranial extension

of neck lesion. Sometimes it may fail to delineate fascial planes and the extent of large neck masses with respect to surrounding structures. US is useful in differentiating solid from cystic neck lesions in both adults and children, in recording the size of nodes (at least in the upper neck), and in discriminating high-flow from low-flow vascular malformations.[3-6] US is also very helpful for image-guided biopsies of non-palpable or small lesions located superficially and for biopsies of indeterminate soft tissues. Studies have shown that US-guided fine-needle aspiration of lymph nodes can be useful in staging.[7,8]

Computed tomography gives a greatly improved soft tissue detail and air space definition. With contrast enhanced scans the vascularity of the lesion can be determined too. Also the ability of CT to give tissue attenuation values gives a fair insight into the nature of the lesion. It is most useful for large masses where it can show the entire extent of the lesion in the neck and an extension outside the neck. Skeletal involvement is also well depicted on CT. It does expose the patients to radiation but the improved visualization of the neck structures far outweighs the radiation risk. CT is extremely useful in defining both the osseous and soft tissue extent of the lesion. In several instances CT was able to show the relationship of the tumor to the spinal canal. When combined with angiography, CT demonstrated the relationship of the major cervical vascular channels to the lesions. CT can be particularly helpful in cases with bone involvement. CT is also valuable in the diagnosis as well as in determining the extent of involvement in neonatal neck masses.[9,10] Present study was conducted for efficacy evaluation of ultrasonography and computed tomography for palpable neck masses.

Materials & Methods

The present prospective study was conducted in the Department of Radio-diagnosis, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India. 50 patients (age range from 5 -70 years) were evaluated by Clinical and Radiological examinations for present study. A detailed clinical history was taken from all cases and through general physical and local examination was carried out. Relevant laboratory investigations like ESR, Serum calcium, Thyroid function Tests, were done asrequired. High-resolution real time sonography of the neck was done in all patients. The sonographic examination of the neck was performed in supine position, with the neck hyper extended and a pillow place under the shoulders for optimal exposure of the neck. Examination was done in both longitudinal and transverse planes to evaluate the mass for its size, shape, consistency (solid / cystic), echogenicity. Internal architecture, presence of septae, calcifications necrosis, margins and compressibility were also made note of. In all cases we tried to find out the site of origin, the extent of the lesion and its relation to surrounding structures.

Computed tomography scans were carried out in all patients. Serial axial sections were taken from the base of the skull to the thoracic inlet with a 1 second scan time and 5 mm collimation at the interval of 5 mm. Thin collimation (3 mm) and 3 mm interval was used in areas where high spatial resolution was required. 60% Sodium and Meglumine salts of Urograffin contrast was used in quantities varying with the body weight. The site, size and extent of the lesion were evaluated. The margins, relation to adjacent structures and the tissue attenuation values were also made note of Intra-cranial and intra-

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thoracic extension of lesion was carefully looked for.[11]

Results & Discussion

Table 1: Ultrasonic finding in present study

Nature of lesion	**No. of Cases**
Inflammatory	
Adenopathy	8
Abscess	6
Malignant Neoplasms	
Poorly differentiated carcinoma	6
Sq. Cell Carcinoma	3
Benign neoplasms	
Haemangioma	6
Lymphangioma	3
Parathyroid adenoma	3
Epidermoid inclusion cyst	2
Chemodectoma	2
Plexiformneurofibroma	1
Ectopic Thyroid rest	1
Lymphoma	**3**
Miscellaneous	
Parotitis	2
Encephalocele	2
Normal lymph node	1
Thyroglossal duct remnant	1
Total	50

Table 2: Age and Sex distribution.

Age group (In years)	**Male**	**Female**	**Total**
0-20	4	2	6
21-40	11	9	20
41-60	8	7	15
>60	6	3	9
Total	29	21	50

Palpable neck masses are commonly encountered clinical problems with wide pathologic spectrum. These lesions are easily accessible because of their superficial location but complicated by the fact that structures of multiple organ systems are in such close proximity in the neck. Radiological imaging thus becomes a mainstay in diagnosing and in planning the management of these lesions.

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Clinical examination alone does not reliably indicate the true nature and extent of a neck lesion. Imaging plays an essential role in the management of neck disease. It allows us to identify true disease v/s pseudo masses and to show exact location and extent of a lesion and to predict the nature of the lesion.[11,12]

Sonography is commonly the first imaging modality after clinical examination. It is inexpensive and well tolerated by patients and allows guidance for fine needle aspiration. Sonographyof superficial soft tissue structures was first started by Howry et al.[13] They predicted an important role of sonography in visualization of benign and malignant tumors of the neck. Sackler et al. showed usefulness of US to distinguish thyroid from extra thyroid lesions.[14]Itzchak Y et al evaluated 26 patients of with neck masses with ultrasound and achieved accurate diagnosis of solid and fluid filled masses, both with and without pulsatile components.[9] US has been shown to be useful in the evaluation of neck masses in children. In adenitis, US typically shows a homogeneous, hypoechoic mass. Abscesses are seen as lobulated, complex masses with partially anechoic centers.[15,16]

Most of the soft tissues in head and neck can be easily evaluated by ultrasonography. The advantages of US include good availability, multiplanar visualization, repeatable (no ionizing radiation), fast, and it provides real-time imaging. US can determine whether a mass is cystic or solid, and therefore able to differentiate between cellulitis and abscess. With Doppler function, direction and velocity of flow in neck vessels can be determined. Doppler-US also can provide information about the vascularization of a neck mass.

However, it fails to delineate fascial planes and the extent of the lesions with respect to surrounding structure. It does not explore deep structures. Sonography alone was not sufficient for a reliable diagnosis about nature of space occupying lesions in the neck.

Previous clinical reports have documented that CT can detect the normal morphology and anatomy of the neck and thyroid gland.[17,18]

CT has several advantages over traditional 2D medical imaging: provides cross-sectional imaging; eliminates the superimposition of images of structures outside the area of interest; provides good soft tissue resolution when intravenous contrast is administered; visualizes bony detail in complex fractures and bone destruction. Multidetector-row CT (MDCT) - with its sub millimeter spatial resolution - is also capable of creating multiplanar reformatted imaging. Disadvantages of CT include high radiation-dose (which is approx. hundred times higher than that of conventional radiographs), and artifacts related to dental fillings. Nowadays, Paranasal CT is performed in supine position, which constructs primarily axial images. Coronal view – which has similar appearance to sinus radiography, can be later digitally reconstructed. Noncontrastparanasal CT plays important role to assess more complicated, recurrent disorders, e.g. chronic sinusitis. Contrast-enhanced paranasal CT is a helpful imaging tool in soft tissue evaluation, e.g. in inflammation and tumours. However, in these cases, MRI provides an even better soft tissue resolution. HRCT excels in the evaluation of air spaces and fine bone structures – including ossicles of the temporal bone. HRCT is primarily performed at sub millimeter intervals, which allows reconstructions in all three planes. CT angiography is performed to evaluate neck vessels. Carotid arteries can be examined from aortic arch to skull base by bolus technique in arterial phase.

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Conclusion

Neck lesions are commonly encountered problem, yet there are very few established guidelines for evaluating such lesions. US should be the prime modality for evaluation of suspected neck lesions because it does not entail use of ionizing radiation, intravenous contrast material, and sedation and because of the low cost. Nevertheless, in cases of large lesions or suspected malignancy, CT is required for diagnosis and follow-up.

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