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Research Article

RADIOLOGICAL ASSESSMENT OF DIFFICULT AIRWAY IN THYROID MALIGNANCY – A RETROSPECTIVE CASE STUDY

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A R T I C L E I N F O

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Key words:

Thyroid malignancy, Radiological assessment, Difficult airway, Tracheal compression, Retrosternal extension, CT imaging.

A B S T R A C T

Aims & Objective: To propose the importance of doing a radiological assessment for any thyroid malignancy before opting for intervention, in-order to assess the severity of the disease and also to proceed with further better management.

Materials & Methods: Study includes a total number of 4 cases of advanced thyroid malignancy, who presented to emergency department of ENT & Head - Neck Surgery, Calcutta National Medical College from March 2018 to April 2019. Patients were stabilized in emergency department & underwent ENT & systemic examinations. All cases were subjected to radiological investigations like plain radiography and Contrast enhanced CT scan of neck to better understand & study the disease extention. The parameters assessed were:

1. The extent of the disease.
2. Tracheal involvement.
3. Tracheal compression.
4. Other viscera involved.
5. Pretracheal space involvement.

Result: Tracheal compression was noted in 100% cases and tracheal involvement in 50% of total cases. Tracheal narrowing of about 70% was noticed in all cases, although the voice of the patient was absolutely normal in all the cases. Vascular involvement was seen in 75% cases and in the form of 360 degree was seen in 25%. Retrosternal extension was noted in 100% cases and pretracheal space involvement in 75% cases.

Conclusion: Thyroid malignancy especially anaplastic carcinoma can be very aggressive, where CT assessment is of utmost importance in view of management. It helps in assessing the risk for any intervention. It gives a cue if patient can be salvaged.

INTRODUCTION

Thyroid malignancy with limited disease can be managed primarily by surgery but diseases with locoregional and distant metastasis with complications is difficult to manage. Airway management in large and retro-sternal thyroid malignancy with tracheal compression is often met with challenges, where radiological assessment plays a vital role in emergent airway control. Computed tomography (CT) and magnetic resonance imaging (MRI) can play an important role in preoperative and post-treatment assessment of thyroid malignancy. The radiologist as well as the treating surgeon should be aware of the pathological behavior of thyroid carcinoma, extent of disease involvement, airway patency and the characteristic imaging appearance of the primary tumor and metastases.

Adverse prognostic factors have been well-established and include age, extrathyroidal extension, tumor histology, primary tumor size, and distant metastasis [1].

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Extrathyroidal extension has the greatest negative impact on prognosis, with 10-year overall survival rates dropping to 45% in patients who have extrathyroidal extension compared with 91% for those who have encapsulated tumors [2].

MATERIALS AND METHODS

Study includes a total number of 4 cases of advanced thyroid malignancy, who presented to emergency department of ENT Head-Neck Surgery, Calcutta National Medical College from March 2018 to April 2019. Patients were stabilized in emergency department & underwent ENT & systemic examinations. All cases were subjected to radiological investigations like plain radiography and Contrast enhanced CT scan of neck to better understand & study the disease extention. The parameters assessed were:

1. The extent of the disease.
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3. Tracheal compression.
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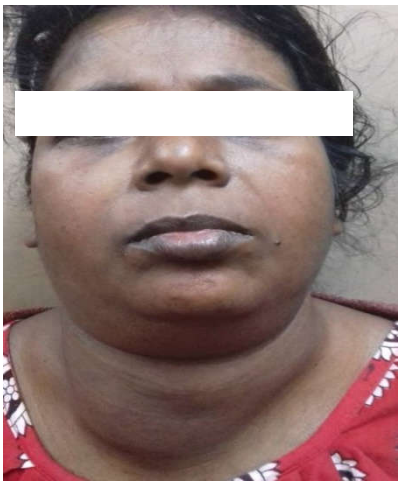
5. Pretracheal space involvement.

CT imaging at our institutions involves multidetector acquisition from the skull base to the tracheal bifurcation with or without contrast. Multiplanar 2-mm axial, coronal and sagittal images are provided for interpretation. Our MRI protocol has a similar coverage from the skull base to the tracheal bifurcation and includes the following sequences: axial and coronal T1-weighted and fat-saturated T2-weighted images, followed by post-contrast axial and coronal T1-weighted images.

RESULTS AND DISCUSSION

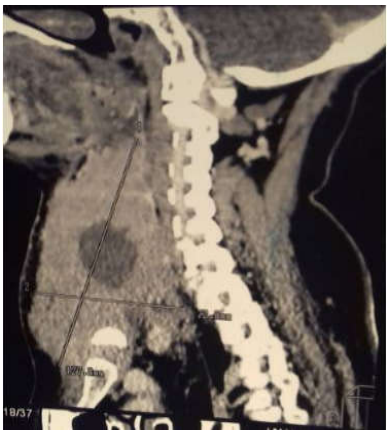
CASE 1: A 45 years old female came to the emergency department with stridor and respiratory distress, with a large swelling of the thyroid region more on the right, extending from the chin to the suprasternal notch. The swelling has been progressive in nature and the patient was on alternative medicine. An urgent CECT revealed involvement of both the lobes with tracheal deviation to the left and near total occlusion. There was retrosternal and pretracheal extension of the disease with compression and 360^{o} encompassment of carotid artery. The features shows the inoperability of the disease and also the patient was anesthetically unfit due to difficult airway, where a trial of intubation was failed.



(a)

(b)

Fig 1 (a) CP of the patient showing a large thyroid mass R > L; (b) Coronal section of CECT shows involvement of both the lobes with central necrosis and tracheal shift to the left.



(a)

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Fig 2 (a)Sagittal section of CECT showing the mass extending from the base of tongue upto the suprasternal notch,with central necrosis.The airway is compressed anteroposteriorly; (b) Sagittal section of CECT shows compression of the common carotid artery at the level of bifurcation.

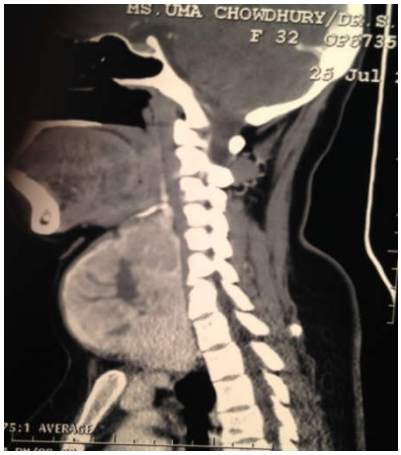
(a)

(b)

Fig 3 (a) Axial section of the CECT shows involvement of both the lobes ,tracheal compression and shift to the left with 360^{o} encompassment of right carotid artery and pretracheal extension of the tumor. (b) Axial section shows retrosternal extension of the tumor.

CASE 2: A 32 years old female came to the emergency with stridor and respiratory distress and a large swelling of the thyroid region. This patient was also on alternative medicine. Urgent CECT reveals enlargement of the right lobe of the thyroid with mediastinal and pretracheal extension. The airway was shifted to left and compression of the vessels was seen on the right. The features precluded surgery and indicated difficult airway. Intubation was failed.

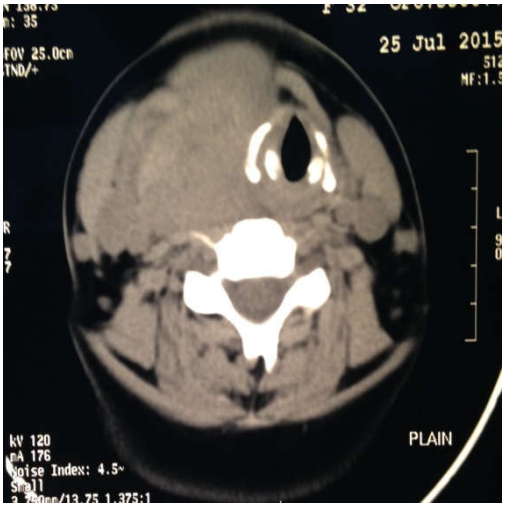
(a)



(b)

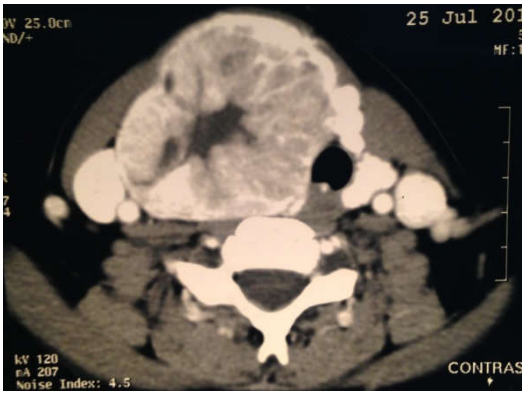
Fig 4 (a) CP of the patient with large thyroid mass. (b) Sagittal section of CECT shows the mass extending from the base of tongue upto the suprasternal notch. The airway is anteroposteriorly compressed.

(a)



(b)

Fig 5(a) Sagittal section shows near total occlusion of the airway. (b) Axial section of NCCT at the level of thyroid cartilage shows the mass of the right lobe shifting the airway to the left and compression of the vascular compartment on the right.



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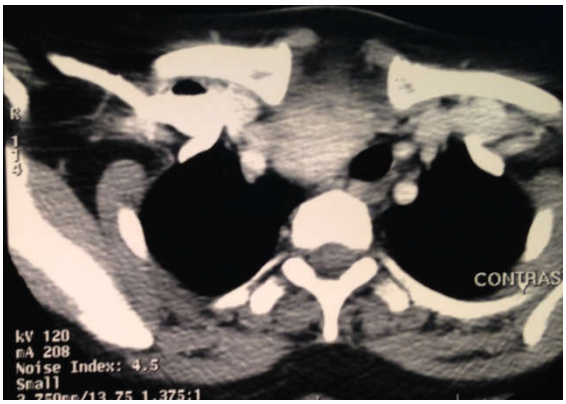
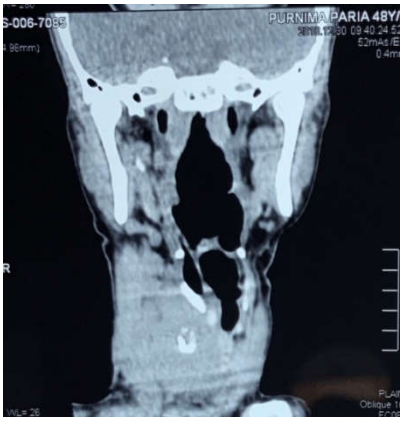


(b)

Fig 6 (a) Axial section of CECT shows the huge mass of the right lobe shifting the airway to the left and the extension of the tumor to the pretracheal space. (b) Axial section at the level of clavicle shows the retrosternal involvement of the disease.

CASE 3: A 48 year old female with severe respiratory distress came to the emergency department with a large neck swelling extending from the level of hyoid to the suprasternal notch. The disease has been progressive in nature and the patient was on alternative medicine. Urgent CECT showed gross enlargement of the right lobe of thyroid with tracheal shift and near total occlusion of the airway. The lumen was seen infiltrated by the tumor and there was retrosternal and pretracheal extension. As the patient was inoperable and as per the patient attendant's informed consent, no intervention was done.

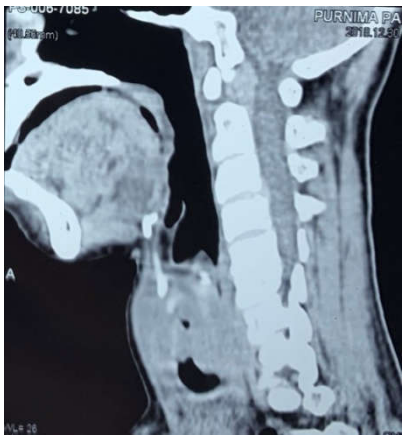
(a)



(b)

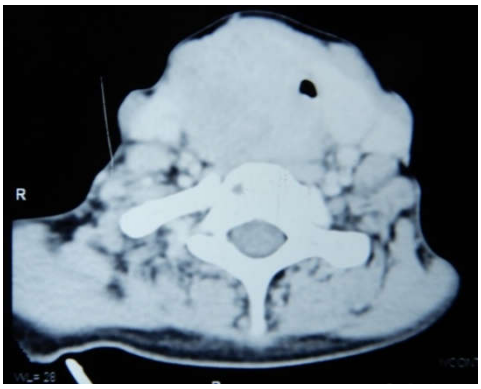
Fig 7 (a) CP of the patient; (b) Coronal section of the CT shows the mass involving the right lobe,shifting the trachea to the left with the lumen occluded.

(a)



(b)

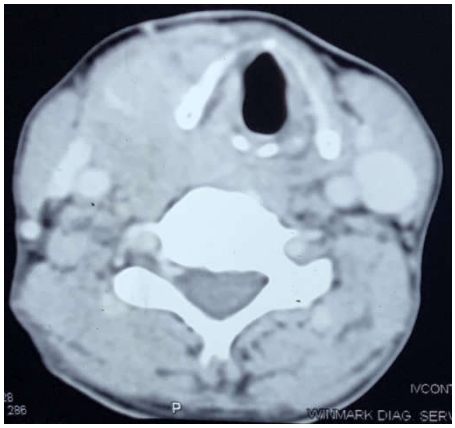
Fig 8 (a) Coronal section shows the tumor infiltrating the lumen of the trachea. (b) Sagittal section shows the near total occlusion of the tracheal lumen.



(a)

(b)

Fig 9 (a) Axial section shows the tumor on the right compressing and shifting the airway to the left. (b) Axial section shows the infiltration of the tracheal lumen.



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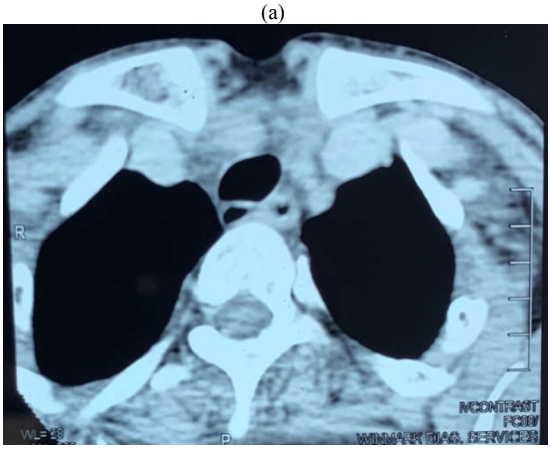
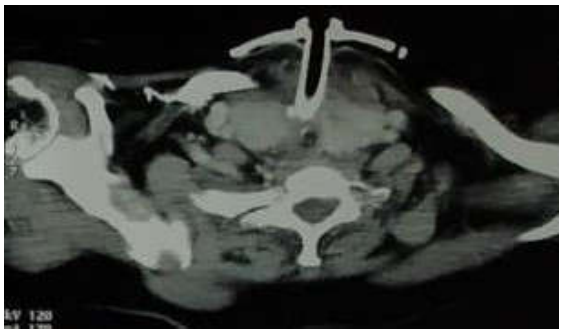


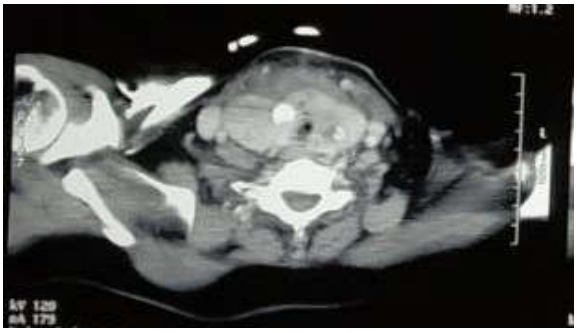
(b)

Fig 10 (a) Axial section at the level of tracheal cartilage shows the involvement of the pretracheal space. (b) Axial section at the level of clavicle shows the retrosternal extension of the tumor.

CASE 4: A 43 year old female came to the emergency department with severe respiratory distress, where an emergency tracheostomy was performed. CECT revealed involvement of both the lobes of thyroid with retrosternal extension and 360^{o} encompassment of the trachea with compression of airway. Later debulking surgery was performed but the patient died a week post-op due to tracheomalacia.



(a)



(b)

Fig 11(a) Axial section shows the involvement of both the lobes of the thyroid and retrosternal extension of the tumor with tracheostomy in-situ. (b) Axial section shows compression of vascular components on the right and near total occlusion of the airway.

(a)

Fig 12 (a) Axial section shows 360^{o} encompassment of the tracheal by the tumor.

Primary thyroid carcinoma arising from epithelial follicular cells are classified into Papillary and Follicular thyroid carcinoma which is differentiated and Anaplastic thyroid carcinoma which is undifferentiated. Medullary thyroid carcinoma arises from thyroid parafollicular cells. Papillary carcinoma is the most common and least aggressive whereas Anaplastic carcinoma is the least common and most aggressive. Janeesh Sekkath *et al* (3) in their study has revealed that the incidence of thyroid cancer in India has increased over a decade and is 3 times more common in women.

Though thyroid cancers can be treated with prompt Intervention, the delayed presentation with complications precludes intervention, the reasons of which are negligence, alternative treatment modalities, fear of surgery and financial constraints [4] Patient can develop various distressing symptoms such as pain, Hoarseness, dyspnea, dysphonia, hemoptysis, and dysphagia, due to local structure invasion.

Ultrasound is the gold standard at most institutions for the initial evaluation of thyroid disease and can be combined with fine-needle aspiration biopsy for diagnostic purposes. Though USG is most commonly used, the high frequency ultrasound used for thyroid examination has less depth penetration and so the undersurface and extracapsular extension cannot be clearly assessed [5,6,7]. Hence a higher imaging tool such as CT or MRI is required, which gives details of thyroid malignancy, extrathyroid extension, retrosternal extension, lymph node status especially the central compartment (LN level VI) and invasion of trachea, oesophagus and vascular components. Computed tomography, a modality especially useful because it is directly interpretable by the managing surgeon, allows for a direct visual assessment of the thyroid tumor with respect to adjacent neck structures and is optimal for the assessment of tracheal or cricoid cartilage involvement while also providing excellent resolution of cervical and paratracheal lymph nodes[8].

Radiological features of 4 case scenarios with varied thyroid enlargements extending from the base of the tongue(BOT) to the level of sternum and with retro-sternal extension; Involvement of viscera, vascular components and pretracheal space has been studied (Table-1).

Table 1

	Characteristics	Result
1.	Gender	
	Male	0
	Female	4
2.	Age of presentation	30 to 50 years
3.	Symptom at the time of presentation	
	Respiratory distress	4
	Stridor	3
4.	Radiological investigation done	
	CXR	4
	USG	0
	NCCT NECK	0
	CECT NECK	4
5.	Parameters assessed	
	a. Extent of the disease	
	B/L lobe involvement	2
	U/L lobe involvement	2
	Right	2
	Left	-
	Retrosternal Extension	4
	b. Tracheal involvement	2
	c. Tracheal compression	4
	d. Other viscera involved	3
	e. Pretracheal space involvement	3
6.	Intervention done	
	Emergency Tracheostomy	1
	Surgical debulking	1

Tracheal compression was noted in 100% cases and tracheal involvement in 50% of total cases. Tracheal narrowing of about 70% was noticed in all cases, although the voice of the patient was absolutely normal in all the cases. Vascular involvement was seen in 75% cases and in the form of 360 degree was seen in 25%. Retrosternal extension was noted in 100% cases and pretracheal space involvement in 75% cases. Although intubation was tried in 2 cases and surgical

debulking was done in one, all the patients succumbed to the disease due to the lack of airway control.

CONCLUSION

It is wiser to use CT than Ultrasound in extensive disease. CT helps diagnostically and therapeutically in terms of management and decision making and it ought to be done even in case of emergencies, before any kind of intervention, in-order to avoid any undue circumstances such as on-table death, difficult intubation and deferring-OT. Especially anaplastic carcinoma can be very aggressive, where CT assessment is of utmost importance in view of management. It helps in assessing the risk for any intervention. It gives a cue if patient can be salvaged. Lastly it is of great medico-legal importance for the treating surgeon.

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