

## Editorial

# Use for newer Imaging Modalities for Airway Management

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Airway management has made many advances in recent years. However, an unanticipated difficult airway can turn out to be a nightmare for anaesthesiologist. The various predictors include clinical assessment predictors, X-ray neck, conventional helical computed tomographic (CT) scan, indirect laryngoscopy, pulmonary function tests and fiberoptic bronchoscopy had been successfully used for delineation of airway anatomy [1]. The shortcomings of aforementioned techniques except for fiberoptic bronchoscopy are that they tell about static component without giving much information about dynamic component of airway. Fiberoptic bronchoscopy is invasive and could not be performed without prior anaesthetic preparation. However newer modalities like ultrasonography, multidetector CT (MDCT) scan with virtual 3D bronchoscopic image (VB) reconstruction are upcoming imaging modality which provides both static and dynamic or virtual airway information. Precisely they allow non-invasive intraluminal as well as extraluminal evaluation of the airway.

Ultrasound is being used by anaesthesiologist for regional blocks and vascular access for long. However recent data regarding usefulness of ultrasonography in airway management has been reported [2-5]. Ultrasonography (US) has advantages of being safe, quick, repeatable, portable, easily available, and provides real-time dynamic images in perioperative and critical situations. It is being used not only for assessment of airway but also in dynamic airway management. Ultrasound assess submandibular space, suprahyoid and infrahyoid airway related measurements and is found to be good predictor of difficult airway. Ultrasound aids in localizing cricothyroid membrane and thus aids during cricothyroidectomy and percutaneous tracheostomy [5,6]. It also localises extraluminal or intraluminal compromise of airway (tumours, diverticulum [7], growth), predicts size of endotracheal /double lumen tube [6-9]. Ultrasound detects endotracheal (US shows dense hyperechoic shadow or comet tail appearance) and oesophageal intubation [10]. In sleep apnoea, ultrasound help in visualisation of the tongue base posteriorly and inferiorly towards hypopharynx. This can assess for the cause of airway obstruction including tumor mass, abscess of larynx and pharynx and epiglottis [10,11].

Compared with a conventional CT, which has only one row of detectors the multiplanar CT, is equipped with multiple parallel detectors to obtain thinner slices. Virtual image of the tracheobronchial tree results from volumetric reconstruction of

the two-dimensional thin layers (<2 mm) obtained by multi-slice computed tomography. In addition to faster acquisition speed and computing power, high-quality multiplanar reformations (MPR) can be processed with multislice CT especially because of its near-isotropic voxel geometry [12]. This advanced function has been used for airway assessment. Airway imaging is routinely performed at the end-inspiration time with the holding of breath. Reduction in scanning time resulted as a boon for the patients with respiratory disorders and decreased breath holding time. Short scanning time is also advantageous for imaging during dynamic breathing or at end-expiration in patients with suspected tracheomalacia, a condition characterized by excessive collapse of the airway during expiration [13]. Three-dimensional reconstructions require the transfer of data to a separate workstation that allows the interactive display of 3D images in real time. There are two basic methods of 3D imaging, external rendering and internal rendering. External rendering of the airways, also referred to as CT tracheobronchography, depicts the external surface of an airway and its relationship to adjacent structures. This method has been shown to help illustrate complex airway abnormalities such as congenital airway abnormalities and to improve the detection of subtle airway stenosis [14]. Internal rendering, also referred to as virtual bronchoscopy, combines helical CT data and virtual reality computing techniques to allow the viewer to navigate through the internal lumen of the airways in a similar fashion to conventional bronchoscopy [15]. These techniques allow accurate reproduction of major endoluminal abnormalities including location, extent and deformity with an excellent correlation with fiberoptic bronchoscopy [16]. The virtual bronchoscopy accurately depict stenoses with both high sensitivity and specificity without the associated discomfort and risks associated with endoscopy. Retained secretions act as artefacts that may result in false positive findings [17]. The virtual bronchoscopy aids in predicting tracheal and bronchial diameter and thus assists for appropriate tube size selection [17]. The most significant shortcomings with MDCT are the increase in the volumetric data. The increased number of images need to be interpreted on the monitors. The MDCT with virtual bronchoscopy reconstruction is useful for the evaluation of congenital bronchial anomalies, extent of tracheal stricture or stent, tracheomalacia, external compression on larynx, trachea and bronchial wall. The cause of these deformities like extraluminal tumours, lymph nodes, fibrotic masses and foreign bodies may also be evaluated [18-20].

MDCT- virtual bronchoscopy will also be helpful in planning endoscopic biopsy from the peripheral parts of the lungs or the lymph nodes and other masses adjacent to the bronchi [21,22]. It also help in delineating variation in bronchial tree branching and will act as guide for airway stenting for the stricture which may be caused by either extrinsic mass effect or persisting bronchial stenosis after ablation of endobronchial lesion that occurs mostly in patients with inoperable bronchial carcinomas [23]. In case of thyroid, CT imaging is considered superior to plain radiographs for the assessment of laryngotracheal stenosis and retrosternal extension. However, it may underestimate the craniocaudal extent of the disease and give inadequate representation of airway stenosis orientated obliquely to the axial plane [24]. Sagittal and coronal reformatted images can be obtained in an attempt to overcome these problems. With the advent of multiplanar CT it is possible to see images in axial, coronal, saggital plane on the same screen.

The ultrasonography, multidetector computed tomographic scan, virtual 3D bronchoscopy are all considered as boon in airway imaging. These are helpful for anaesthesiologist for prior planning of the airway management and prevent from landing into catastrophe with better outcomes.

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