Imaging Journal of Clinical and Medical Sciences

Peertechz

ISSN: 2455-8702

Editorial

Use for newer Imaging Modalities for Airway Management

Rakesh Garg[1]* and Namita Saraswat[2]

[1]*Assistant Professor, Department of Anaesthesiology, Pain and Palliative Care, Dr BRAIRCH, AIIMS, New Delhi, India*

[2]*Assistant Professor, Department of Anaesthesiology, PGIMER and Dr RML Hospital, Delhi, India*

***Corresponding author:** Dr. Rakesh Garg, Room No. 139, 1st floor, Department of Anaesthesiology, Pain and Palliative Care, Dr BRAIRCH, All India Institute of Medical Sciences, Ansari Nagar, New Delhi-110029, India, Tel: +91 9810394950, +91 9868398335; E-mail: drrgarg@hotmail.com*

Received: 17 March, 2015; **Accepted:** 20 April, 2015; **Published:** 24 April, 2015

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.

References

1. Pinsonneault C, Donati F (1999) Tracheal resection and reconstruction. Can J Anaesth 46: 439-455.
2. Kundra P, Mishra SK, Ramesh A (2011) Ultrasound of the airway. Indian J Anaesth 55: 456-462.
3. Wojtczak JA (2012) Submandibular sonography: assessment of hyomental distances and ratio, toungue size and floor of mouth musculasture using portable sonography. J Ultrasound Med 31: 523-528.
4. Ezri E Gewrutz G, Sessler I (2003) Prediction of difficult laryngoscopy in obese patients by ultrasound quantification of anterior neck soft tissue. Anaesthesia 58: 1111-1114.
5. Orr JA Stephens RS, Mitchell VM (2007) Ultrasound-guided localisation of the trachea. Anaesthesia 62: 972-973.
6. Sustic A, Kovac D , Zaljardic Z, Zupan Z, Krstulovic B (2000) Ultrasound guided percutaneous dilatation tracheostomy: a safe method to avoid cranial misplacement of the tracheostomy tube. Intensive Care Med 26: 1379-1381.
7. Lixin J, Bing H, Zigang W, Bingui Z (2010) Sonographic diagnosis features of zenkers diverticulum. Eur J Radiol 80: 13-19.
8. Shibasaki M, Nakajima Y, Ishii S, Shimizu F (2010) Prediction of pediatric endotracheal tube size by ultrasonography. Anaesthesiology 113: 819-824.
9. Sustiae A, Miletiae D, Protiae A, Ivanciae A, Cicvariae T (2008) Can ultrasound be useful for predicting the size of left double lumen bronchial tube? Tracheal width as measured by ultrasonography versus Computed tomography. J Clin Anaesth 20: 247-252.
10. Seigel HE, Sonies BC, Vega F (1999) The use of simultaneous use of ultrasound and polysomnography for diagnosis of obstructive sleep apnea. Neurology 52: A 110-111.
11. Bektas F, Soyuncu S, Yigit O, Tuhran M (2010) Sonographic diagnosis of epiglottic enlargement. Emerg Med J 27: 224-225.
12. Kopp AF, Heuschmid M, Reimann A, Kuettner A, Beck T, et al. (2005) Advances in imaging protocols for cardiac MDCT: from 16- to 64-row multidetector computed tomography. Eur Radiol 15: E71-77.
13. Choi YW, McAdams HP, Jeon SC, Park C, Lee SJ, et al. (2000) Low-dose spiral CT: application to surface-rendered three-dimensional imaging of central airways. Radiology 26:335-341.
14. Remy-Jardin M, Remy J, Artaud D, Fribourg M, Naili A (1998) Tracheobronchial tree: assessment with volume rendering-technical aspects. Radiology 208: 393-398.
15. Higgins WE, Ramaswamy K, Swift RD, McLennan G, Hoffman EA (1998) Virtual bronchoscopy for three-dimensional pulmonary image assessment: state of the art and future needs. RadioGraphics 18: 761-778.
16. Haliloglu M, Ciftci AO, Oto A, Gumus B, Tanyel FC, et al. (2003) CT virtual bronchoscopy in the evaluation of children with suspected foreign body aspiration. Eur J Radiol 48: 188-192.
17. Aquino SL, Vining DJ (1999) Virtual bronchoscopy. Clin Chest Med 20: 725-730.
18. Das CJ, Seith A, Mukhopadhyay S (2007) Thoracic Application of Multi-Detector CT. Das CJ, Seith A, Mukhopadhyay S. Indian J Chest Dis Allied Sci 49: 29-36
19. Wever W, Vandecaveye V, Lanciotti S, Verschkelen J (2004) Multidetector CT-generated virtual bronchoscopy: an illustrated review of the potential clinical indications. ERJ 23: 776-782.
20. Ali E, Gawad A, Ibrahim MA, Mubarak YS (2014) Tracheobronchial foreign body aspiration in infants and children: Diagnostic utility of multidetector CT with emphasis on virtual bronchoscopy. The Egyptian Journal of Radiology and Nuclear Medicine 45: 1141-1146.
21. Shinagawa N, Yamazaki K, Onodera Y, Miyasaka K, Kikuchi E, et al. (2004) CT-guided transbronchial biopsy using an ultrathin bronchoscope with virtual bronchoscopic navigation. Chest 125: 1138-1143.
22. McLennan G, Ferguson JS, Thomas K, Delsing AS, Cook-Granroth J, et al. (2007) The use of MDCT-based computer-aided pathway finding for mediastinal and perihilar lymph node biopsy: a randomized controlled prospective trial. Respiration 74: 423-431.
23. Lund ME, Garland R, Ernst A (2007) Airway stenting: Applications and practice management considerations. Chest 131: 579-87.
24. Boiselle PM, Ernst A (2002) Recent advances in central airway imaging. Chest 121: 1651-1660.

Citation: *Garg R, Saraswat N (2015) Use for newer Imaging Modalities for Airway Management. Imaging J Clin Med Sciences 2(1): 008-009. DOI: 10.17352/2455-8702.000019*