Title: C-MAC D-Blade Video laryngoscope for awake double lumen tube
Placement: A case report.
Key Words: Awake Intubation; Bronchopleural fistula; Video laryngoscope; C-MAC D-blade.

Abstract:
Awake intubation for double lumen tube placement is a challenging task even for experienced clinicians, for smooth intubation different techniques and equipment are always desired. We report the successful use of C-MAC videolaryngoscope as a tool for awake intubation and double lumen tube placement.

Introduction:
Awake intubation is mainly indicated in difficult airway, whereas awake placement of double lumen tube (DLT) have different sets of indications like proximal bronchopleural fistula (BPF), symptomatic mediastinal masses, complex hydatid cyst surgery, giant bullae etc.\textsuperscript{1}
Massive BPF posted for surgical intervention requires awake DLT placement to prevent volume loss, early desaturation and soiling of healthy lung.\textsuperscript{1} Awake DLT placement is not as straight forward as awake intubation, but is more perplexing due to patient’s non-cooperation, intact airway reflexes, preserved muscle tone, suboptimal glottic view, wider size of tube and more tube manipulation during intubation. We report successful intubation of two patients in first attempt by using C-MAC videolaryngoscope (C-MAC-VL) [C-MAC®D-blade, Karl Storz, Tuttlingen, Germany] for awake DLT placement.

Case Report:
Case 1: A 54-year-old man underwent a right sided bi-lobectomy of lung with mediastinal lymph node dissection. On postoperative day 5, patient developed low-grade fever, copious tracheal secretions, and persistent drainage of purulent pleural fluid from the chest tube. BPF was diagnosed with increasing air fluid level in the right pleural cavity on CT scan. Fiberoptic bronchoscopy (FOB) demonstrated purulent material trickling from a 5-mm-diameter BPF in the bronchial stump. The ongoing treatment included, intravenous antibiotics, chest
tube drainage and chest physiotherapy. Even after continuous conservative treatment over next couple of weeks, BPF still persisted. Patient had respiratory distress, flaring of alae nasi along with right sided intercostal retraction and was unable to maintain SpO\textsubscript{2} more than 90% on hi-flow oxygen mask. His over-all condition deteriorated, dyspnoea aggravated even on slightest effort (not able to vocalize without efforts), which necessitates surgical intervention for fistula closure. Airway assessment revealed adequate mouth opening, Mallampatti grade I (MPG-I), normal dentition and lower jaw protrusion was possible. Considering high probabilities of aspiration and desaturation, awake intubation was planned. We selected C-MAC VL instead of Macintosh laryngoscope for awake intubation, as C-MAC VL provides better glottic view with lesser manipulation of airway.

Case II: A 30-year-old lady with a history of hydatid cyst excision of right middle lobe of lung, presented with empyema and BPF of right middle bronchus. She was managed conservatively on thoracostomy tube drainage, intravenous antibiotics and oxygenation with hi-flow face mask for more than 3 weeks. Patient developed productive cough, tachypnoea (respiratory rate 28/minute) and intercostal retraction (which aggravates on lying down position and on mild exertion), worsening of her condition was progressive. CT chest revealed the collapse of right middle and lower lobe and increase in air fluid level. FOB revealed purulent material in the right main bronchus and fistula in the right middle bronchus. Massive air leak, which was not resolving spontaneously on conservative management, necessitated thoracotomy and fistula closure. Airway assessment revealed MPG-I, normal dentition and adequate mouth opening and lower jaw protrusion. In view of the similar clinical profile and risk factors as that of the first patient, awake intubation was planned with C-MAC VL.

For successful awake intubations, patient cooperation is a prerequisite along with sedation and local anaesthesia of laryngo-tracheal mucosa. We counselled the patient in both cases and provided detailed explanation about the procedure and written informed consent was taken.

Technique of DLT placement: After attaching routine monitors, oxygenation was maintained with nasal cannula. Patient was prepared for awake intubation with 4ml lignocaine 4% nebulization, superior laryngeal nerve block with 2.5ml lignocaine 2% on either side and transtracheal block with 4 ml of lignocaine 4% and tongue and posterior pharyngeal wall was sprayed with lignocaine 10% to provide topical anaesthesia. After pre-oxygenation for 3
minutes with 100% Oxygen, conscious sedation was provided with injection midazolam 1mg, injection fentanyl 0.5 mcg/kg in both cases. Spontaneous respiration was preserved in both cases, Bi Spectral Index (Aspect Medical Inc., Newton, MA, USA) score observed in 1st and 2nd case were 82 and 78, while Ramsey score were 3 and 2 respectively. The stylet of left sided DLT (Mallinckrodt, Broncho-Cath®, Covidien, Mansfield, MA) was shaped according to the curvature of D-blade by passing it through the channel of C-MAC VL and lubricated with lignocaine 2% jelly to shape the DLT. (Figure1) Now the VL was inserted in sniffing position from the centre of the mouth above the tongue and blade was glided down till the glottic aperture was visualized. In both cases percentage of glottis opening score was 100%, the pre-shaped DLT was inserted into the oral cavity from the right side after retracting the right angle of mouth and bronchial cuff was passed to cross the vocal cords , (Figure 2) DLT was stabilized and stylet was removed. After removing the stylet DLT was rotated at 90° towards left and slid down the trachea, correct placement was finally confirmed by fiberoptic bronchoscopy (FOB). Both patients were successfully intubated in first attempt without any repositioning, airway trauma, cuff rupture and mal-positioning.

Discussion:

DLT placement demands technical skills and expertise to perform smooth intubation, awake intubations further complicates the situation. For optimal view with direct laryngoscopy, alignment of airway axes (oral-pharyngeal-laryngeal) is obligatory, which requires lifting force up-to 50 N and manipulations like optimal external laryngeal movement.² These manipulations could lead to significant hemodynamic disturbance and soft tissue injury. In contrast VL due to indirect laryngoscopy via its camera, eliminates the need to align the airway axes for better glottic view. Moreover, VL requires significantly lesser lifting force (5-14 N) to the base of the tongue.² VL could be potentially beneficial tool to guide awake intubations, due to higher first attempt success for intubation, improved glottis view, lesser intubation difficulties and complications.³ Moreover VL provides comfort of direct laryngoscopy and view of FOB. In patients receiving general anaesthesia with adequate mouth opening, Macintosh laryngoscope is preferred for DLT placement, but for awake intubations, it may be associated with difficulty in tracheal intubation, accidental oesophageal intubation and increased intubation failure due to insufficient laryngoscopic view.⁴ FOB guided DLT placement through oral route in a sedated but spontaneous breathing patient is associated with difficult negotiation of scope, as scope must make a sharp turn in the posterior oropharynx before entering the hypopharynx.⁵
Onrubia et al. successfully inserted DLT in an awake patient with difficult airway using GlideScope® VL (Verathon Inc., Bothell, WA, USA), which was not a smooth intubation requiring multiple attempts and associated with soft tissue injury. In Swiss video-intubation trial, C-MAC VL was reported to be superior to GlideScope® VL for laryngeal view, successful intubation in first attempt and lesser complication, therefore we were interested in its application for awake DLT placement, as no report were published to our knowledge. C-MAC VL has an inbuilt pronounced curvature of D-blade with increased angulation up-to 80°, enabling the superior view of glottis as compared to Macintosh laryngoscope. In view of the above advantages, we preferred C-MAC VL over Macintosh laryngoscope and FOB for awake DLT placement. In both cases, DLT with stylet was shaped to simulate the curvature of C-MAC D-Blade® VL, the appropriate shape was the key factor for successful intubation. Ömür et al. have compared different shapes of stylet to aid intubation by C-MAC VL and emphasized the importance of appropriately shaped stylet for the success. Intubations that were not performed with appropriately shaped stylet, have more attempts and higher duration of intubation, soft tissue trauma and intubation failure.

Clinical pearls for successful DLT placement with C-MAC VL:

DLT with pronounced angle that mimics the curvature of D blade would cause the tip to impinge against the anterior wall of trachea thus preventing further tube advancement into the trachea. To overcome this, stylet should be removed once the bronchial cuff crosses the VC, and tube is rotated in clockwise or counter-clockwise direction so that longitudinal axis of tube aligns with the axis of trachea. Once the tip of DLT is in the trachea, it should be rotated to align bronchial lumen towards left bronchus. As chances of mal-placement of DLT into wrong side has been reported, final position should be confirmed by FOB.

Oesophageal intubation of DLT is easily possible:

1. When curvature of DLT does not replicate the curvature of D-Blade.
2. Advancement of VL beyond the first seen view of entire glottis leads to mal alignment of laryngeal axis with pharyngeal axis due to anterior lifting of larynx.
3. Removal of stylet from bronchial lumen of DLT before the tip of bronchial cuff crosses the VC.

Advancement of DLT beyond the glottis opening with hyper-acute angulated stylet could lead to soft-tissue and airway trauma, to prevent such dreadful complication, it is suggested to take out stylet sooner the bronchial cuff have crossed the VC.

Though we had not encountered any of the above problem, perhaps previous experience of DLT placement under anaesthesia with C-MAC VL was the saviour.
Conclusion:
We suggest awake DLT intubation using C-MAC VL as possible and safe way to place a DLT in the trachea. Ease of conventional direct laryngoscopy and view of FOB makes C-MAC VL as an ideal tool for awake intubation. DLT replicating the shape of D-blade is key important pivotal factor for successful intubation. Coordinated motor skills to stabilize DLT at laryngeal inlet and simultaneous removal of stylet prevents DLT dislodgement and injury to soft tissue. Clinicians having previous experience of DLT placement and video laryngoscopy can easily master the skills of DLT placement using C-MAC VL as learning curve is fast. Once proficient for VL assisted DLT placement under anaesthesia, awake placement of DLT can be smoothly managed by C-MAC VL.

References:


Captions:
Figure1: Double Lumen Tube stylet curved in the channel of C-MAC videolaryngoscope to shape the tube simulating D-Blade, angulation of double lumen tube tip simulates the tip of D-blade.
Figure2: Bronchial cuff of double lumen tube is crossing the glottic opening and tracheal cuff is resting in the oral cavity.
Figure 2: