

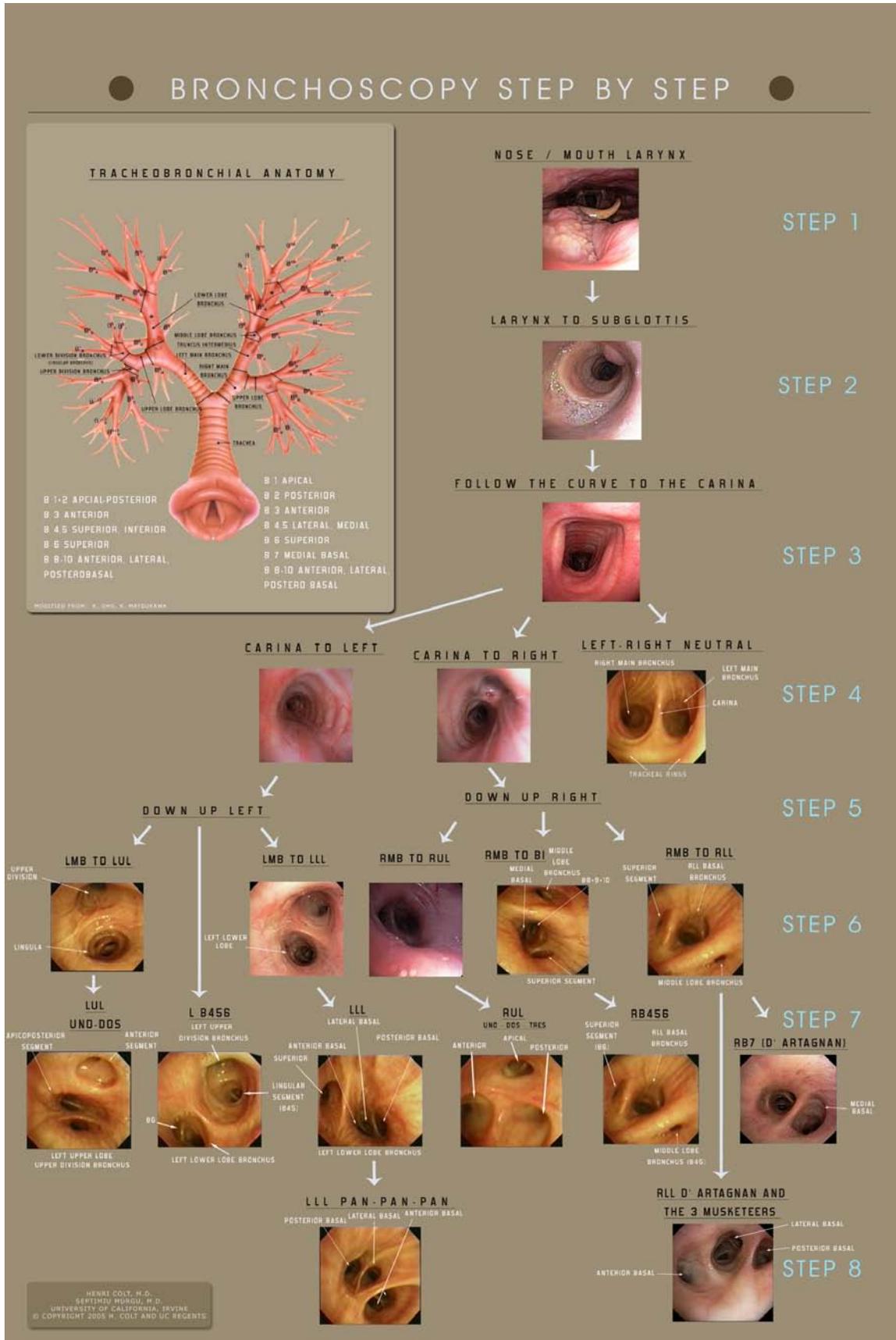
DESCRIPTION

Bronchoscopy Step-by-Step

The Bronchoscopy Step-by-Step exercises were inspired by Arthur Murray's dance education principles. The most complex dance sequences, when broken down into numbered steps, can be learned step-by-step. Gradually, the steps are combined, and the moves finessed, until an elegant dance can be performed. Bach's Goldberg variations, all 30, are some of the most difficult to master pieces written for harpsichord and piano. No pianist learned them all together; but with patience, they can be mastered note by note by note. To become a good tennis player, one cannot master the forehand, backhand, serve, volley, smash and all other strokes at the same time; separately and repeatedly, the different strokes are practiced and then combined to play a beautiful game.

What these examples have in common is:

- *Systematic Approach:* Deconstructing complex tasks into constituent elements
- *Development of Muscle Memory:* Motor learning through the sub-conscious process of improving motor skills, smoothness and accuracy of movements, thus creating maximum efficiency and economy of movement. The major prerequisite for development of muscle memory is *repeated, deliberate practice*.
- *Development of Spatial Awareness:* To learn to flow in space, always occupying the desired position. In bronchoscopy, this additionally requires the accurate identification of airway anatomy.



The Bronchoscopy Step-by-Step Exercises

All exercises are done while observing basic principles. Optimum hand position and posture should be maintained at all times. The bronchoscope should be kept midline, minimizing white-out and red-out. The airway wall should be respected and trauma avoided. Steps should be practiced while standing both at the “patient’s” head and side. It is best that practice be done initially on inanimate models and/or a virtual reality (VR) simulator.

Remember: Decision; Intent; Control; Confidence; Economy of Movement.

Step 1: Practice advancing from the nares or oral cavity (through a bite block) to the larynx. Identify structures as you proceed: nasal turbinates, hard and soft palate, uvula, posterior tongue, vallecula, epiglottis and frenulum, aryepiglottic folds and arythenoid cartilages, false and true vocal cords separated by the vestibule. Assess the movement and symmetry of the vocal cords upon tidal and deep respiration and phonation.

Step 2: Practice delivery of topical anesthetic (lidocaine) in small 1-2 ml. aliquots until anesthesia has been achieved. Observing the timing of breathing, during maximum abduction of the vocal cords, proceed beyond the vocal cords into the subglottic space (the widest point is usually near the posterior commissure). Examine the subglottic space while passing through the subglottic funnel, beyond the thyroid and cricoid cartilages, and the first tracheal ring. Stopping in the subglottis is uncomfortable, and induces cough and should be avoided.

Step 3: Navigate from the subglottis, following the tracheal curve, to the carina. Repeat up and down many times.

Step 4: Turn from the neutral position at the carina to the left, then back to the neutral position. Repeat many times. Then, turn from the neutral position at the carina to the right, then back to the neutral position. Repeat many times. Then practice doing each exercise both possible ways (“forward” and backward”). Then do the two exercises intermittently, one to the left, then to the right, then to the left, and so on. Then shuffle the exercises randomly, left and right and forward and backward.

Step 5: Turn from the neutral position at the carina to the left, down to the end of the LMB, and back up to neutral position at the carina. Do this exercise both possible ways (“forward” and backward”). Repeat many times. Then, turn from the neutral position at the carina to the right, down to the end of the RMB, then down the BI, and back up to neutral position at the carina. Do this exercise both possible ways (“forward” and backward”). Repeat many times. Then do the two exercises intermittently, one to the left, then to the right, then to the left, and so on. Then shuffle the exercises randomly, left and right and forward and backward.

Step 6: From the carina, follow the LMB, entering the two lobar bronchi (LLL and LUL) and return back to the LMB and carina. Repeat several times. Then, from the carina, follow the RMB and BI, entering the three lobar bronchi (RML, RLL, and RUL) and return back to the RMB and carina. Repeat several times.

Steps 7 & 8: On the left, from the LMB, enter the LLL, first the Sup segment, then the basilar pyramid (Ant, Lat, Post). Then, from the LMB, enter the LUL, then each of the two divisions (Upper Div and Lingula), then each segment (Ant, Apic-Post, Sup-Ling, Inf-Ling). Then, perform the B-4-5-6 exercise, entering the Sup and Inf segments of the Lingula, followed by the Sup segment of the LLL. On the right, from the RMB, follow the BI to the RML, and enter both segments of the RML (Med, Lat). Then, enter the RLL, first the Sup segment, then the basilar pyramid (Med, Ant, Lat, Post). Then, perform the B-4-5-6 exercise, entering the Med and Lat segments of the RML, followed by the Sup segment of the RLL. Follow the BI up and enter the RUL, entering all three segments (Ant, Post, Apic). Shuffle left and right exercises.

You are now ready to perform a complete flexible bronchoscopy.
Remember, there is usually no need to enter a segment more than once.