

Mechanics of breathing

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The intercostal muscles contract, causing the ribs to move upwards and outwards, thereby increasing the transverse and anteroposterior dimensions of the chest wall. Along with the diaphragm, which contracts simultaneously and flattens, increasing the vertical dimension of the chest cavity, these muscles are the muscles of respiration. In addition, the accessory muscles of respiration – the neck and spinal muscles such as sternocleidomastoid – may be used particularly during heavy breathing, such as when exercising or during periods of illness such as pneumonia (lung infection). As the volume increases, the intrathoracic pressure falls and air flows in until the alveolar pressure is the same as the atmospheric pressure. The only force used in normal expiration is the elastic recoil of the lung. Ability to cough comfortably to clear retained secretions is an essential part of recovery from surgery. In a vigorous cough, probably the only muscle in the body that is relaxed is the diaphragm; as the abdomen and chest wall and accessory muscles contract, the limbs are braced and the sphincters are tightened. When the intrathoracic and abdominal pressure is built up, the glottis is opened and the diaphragm is forced up as a piston, or like the plunger of a syringe, to expel air at high velocity.

Lingula Apical lower Apical Middle lower lobe Basal Basal lower lower Figure 60.2 Surgical anatomy of the bronchial tree. To surgically remove the right lower lobe and conserve the middle lobe, the surgeon must be prepared to dissect and separately divide the apical bronchial segment (red line).
1 Supraclavicular zone Station 1: low cervical, supraclavicular sternal notch 4 Upper zone Station 2: upper paratracheal Station 3: prevascular/retrotracheal 10 Station 4: lower paratracheal Subcarinal zone 11 Station 7: subcarinal 8 Hilar/interlobular zone Station 10: hilar Station 11: interlobar Lower zone Station 8: paraoesophageal Station 9: pulmonary ligament Figure 60.3 Lymph node stations related to the bronchial tree are particularly important in the staging of lung cancer, with N1 nodes (10–14) and N2 nodes (2–9) shown. AP, anteroposterior.

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