Principy monitorace

O2 v těle

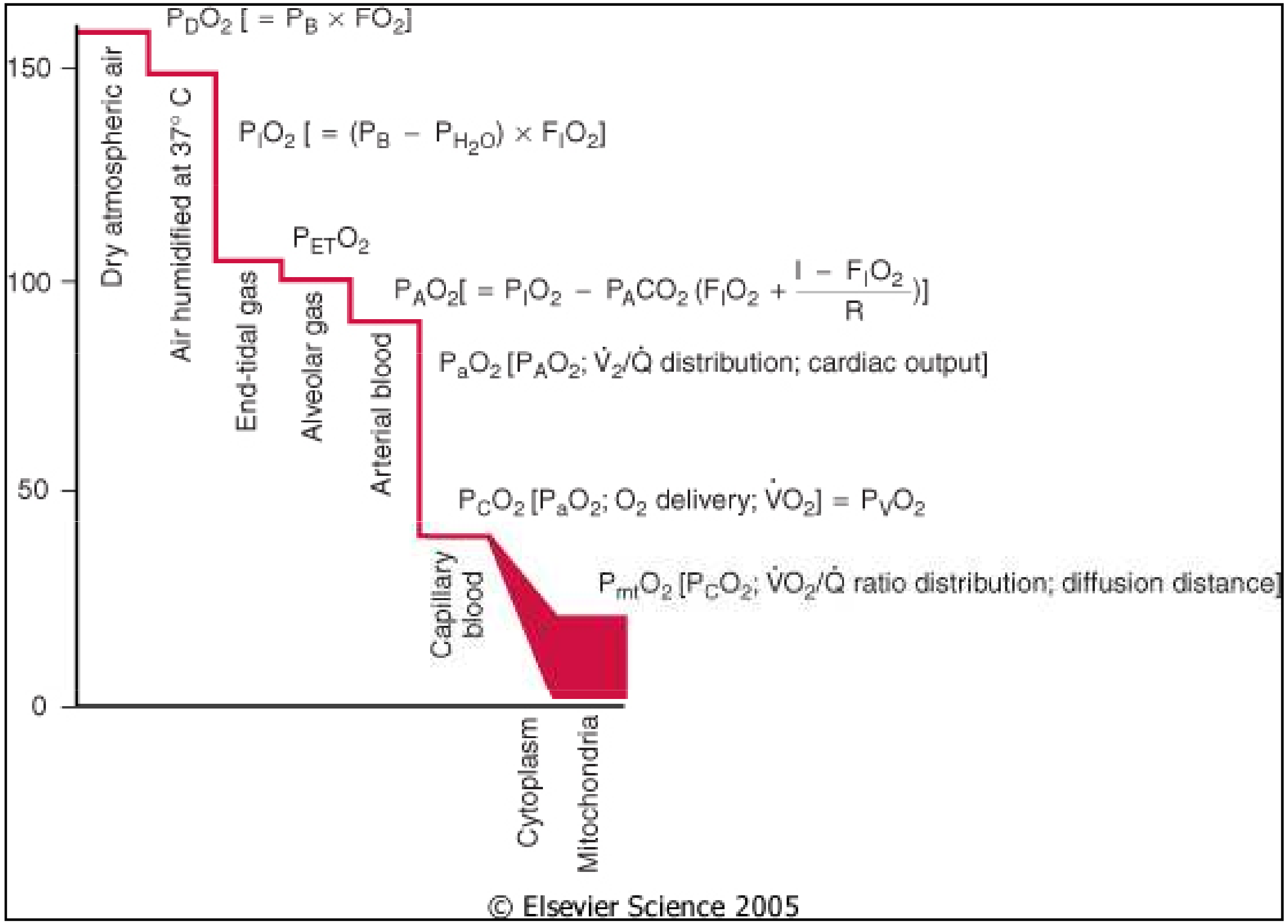


Figure 36-1 Oxygen transport cascade. A schematic view of the steps in oxygen transport from the atmosphere to the site of utilization in the mitochondrion is shown here. Approximate Po2 values are shown for each step in the cascade, and factors determining those partial pressures are shown within the square brackets. There is a distribution of tissue Po2 values depending on local capillary blood flow, tissue oxygen consumption, and diffusion distances. Mitochondrial Po2 values are depicted as a range because reported levels vary widely. (Adapted from Nunn JF: Nunn's Applied Respiratory Physiology, 4th ed. Boston, Butterworth-Heinemann, 1993.)

Oxygenace tkání

- monitorace O2 ve vdechovaném plynu
- SpO2 =saturace
- Arteriální krevní plyny = „Astrup“ - analýza krve
  - odhalení nízkého CO při dobré oxygenační fci plic

O2 je paramagnetický

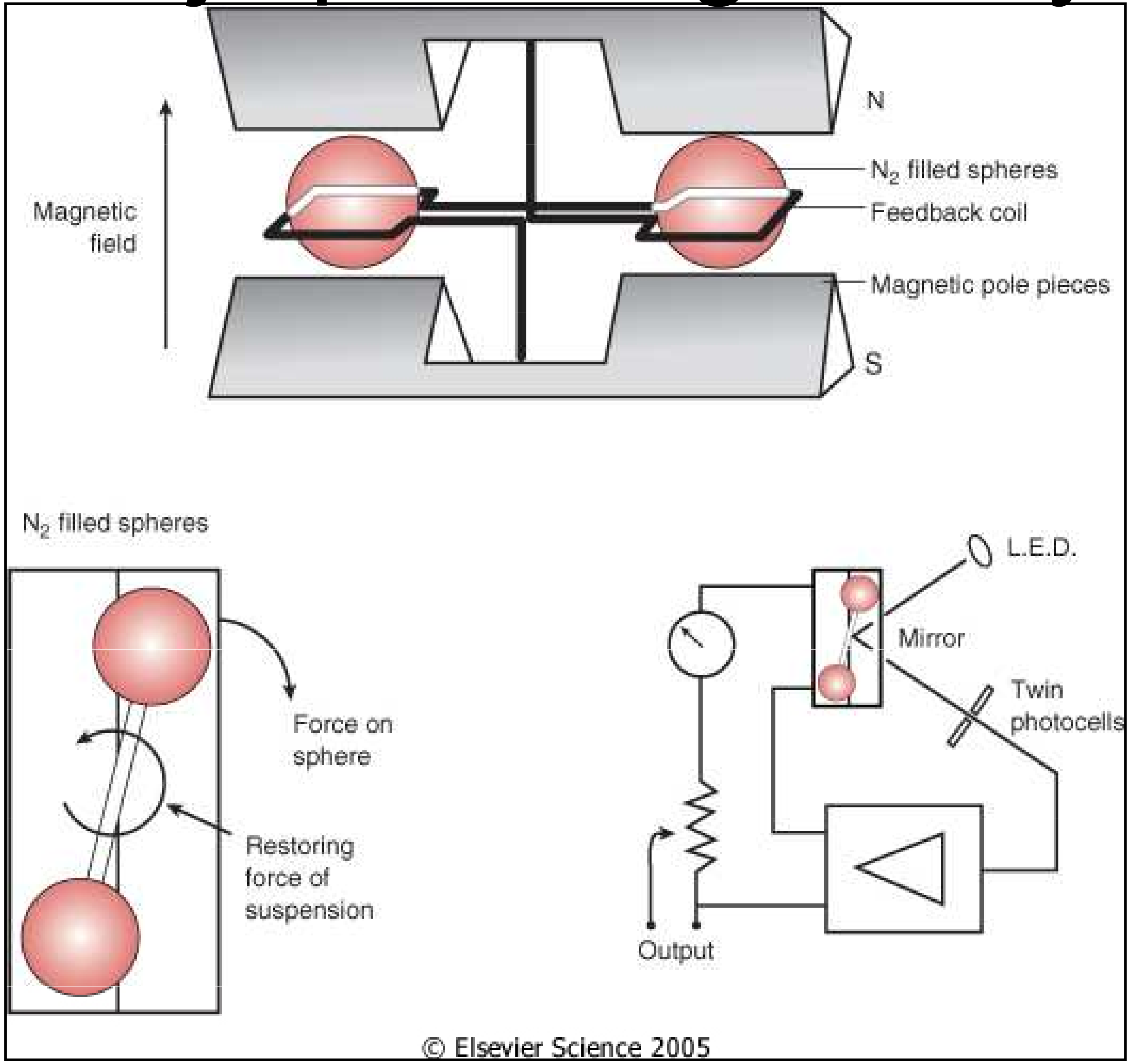


Figure 36-13 Paramagnetic oxygen analyzer. Two sealed spheres filled with nitrogen are suspended in a magnetic field. Nitrogen (N2) is slightly diamagnetic, and the resting position of the beam is such that the spheres are displaced away from the strongest portion of the field. If the surrounding gas contains oxygen, the spheres are pushed further out of the field by the relatively paramagnetic oxygen. The magnitude of the torque is related to the paramagnetism of the gas mixture and is proportional to the partial pressure of oxygen (Po2). Movement of the dumbbell is detected by photocells, and a feedback current is applied to the coil encircling the spheres, returning the dumbbell to the zero position. The restoring current and output voltage are proportional to the Po2. (Courtesy of Servomex Co., Norwood, MA.)

SpO2 – 2 vlnové délky, 2absorbce

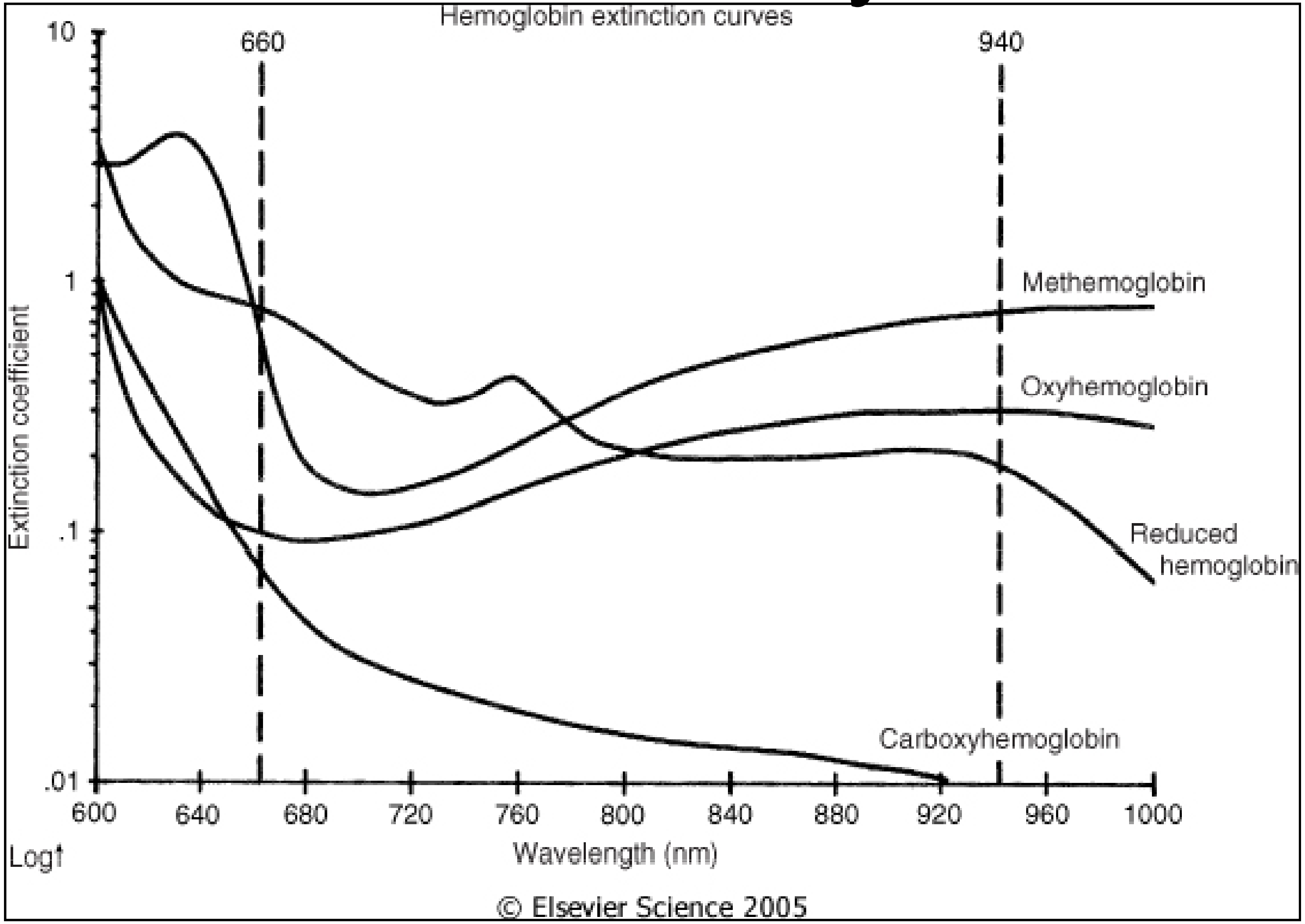


Figure 30-34 Hemoglobin extinction curves. Pulse oximetry uses the wavelengths of 660 and 940 nm because they are available in solid-state emitters (not all wavelengths are able to be emitted from diodes). Unfortunately, HbCO and HbO2 absorb equally at 660 nm. Therefore, HbCO and HbO2 both read as Sao2 to a conventional pulse oximeter. In addition, Hbmet and reduced Hb share absorption at 660 nm and interfere with correct Sao2 measurement. (Courtesy of Susan Manson, Biox/Ohmeda, Boulder, Colorado, 1986.)

1000/s měření červenou, infrač. a „pozadí“ - světlo na sále

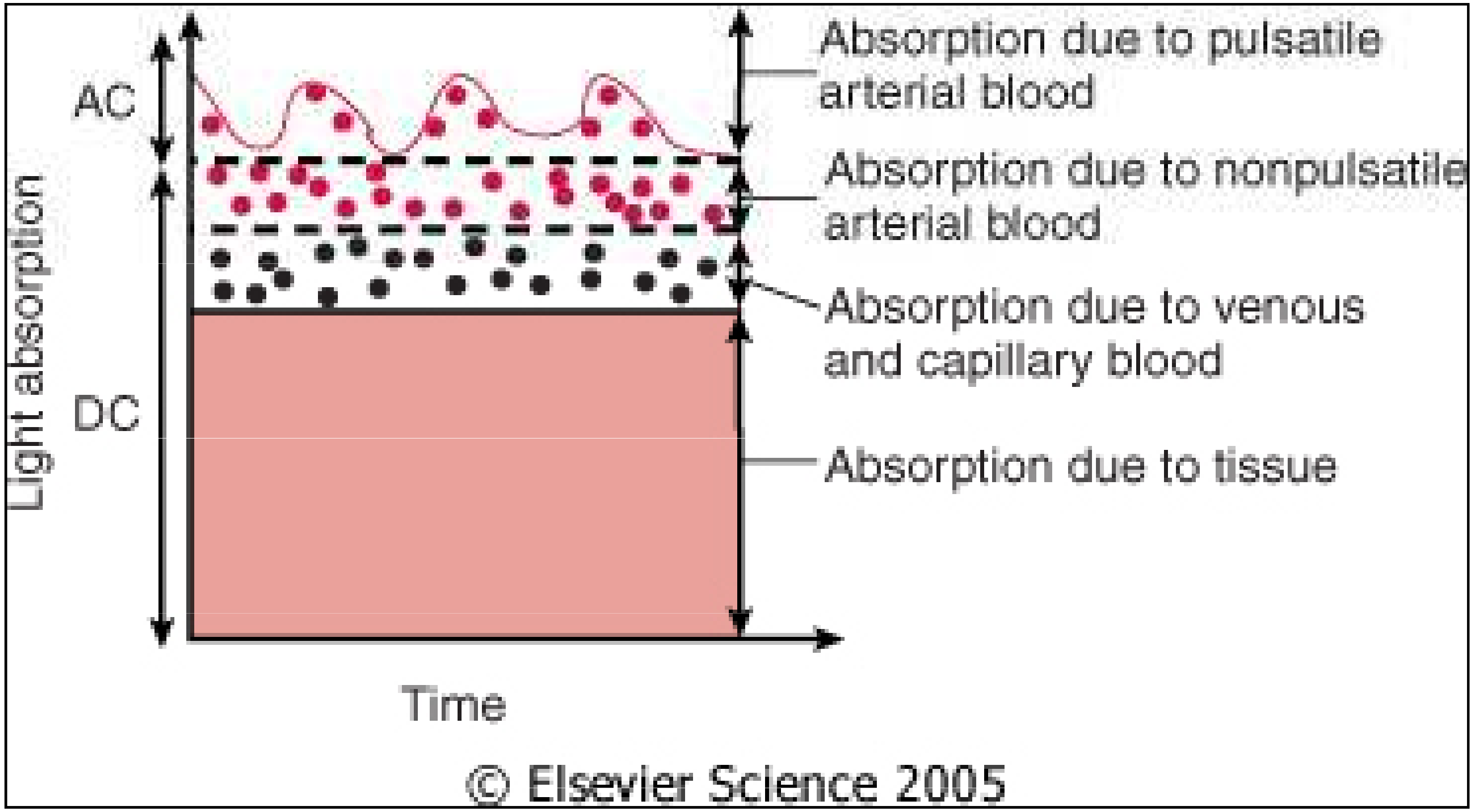


Figure 36-10 Principle of pulse oximetry. Light passing through tissue containing blood is absorbed by tissue and by arterial, capillary, and venous blood. Usually, only the arterial blood is pulsatile. Light absorption may therefore be split into a pulsatile component (AC) and a constant or nonpulsatile component (DC). Hemoglobin O2 saturation may be obtained by application of Equation 19 in the text. (Data from Tremper KK, Barker SJ: Pulse oximetry. Anesthesiology 70:98, 1989.)

Vliv chladu na SpO2 – posun v čase

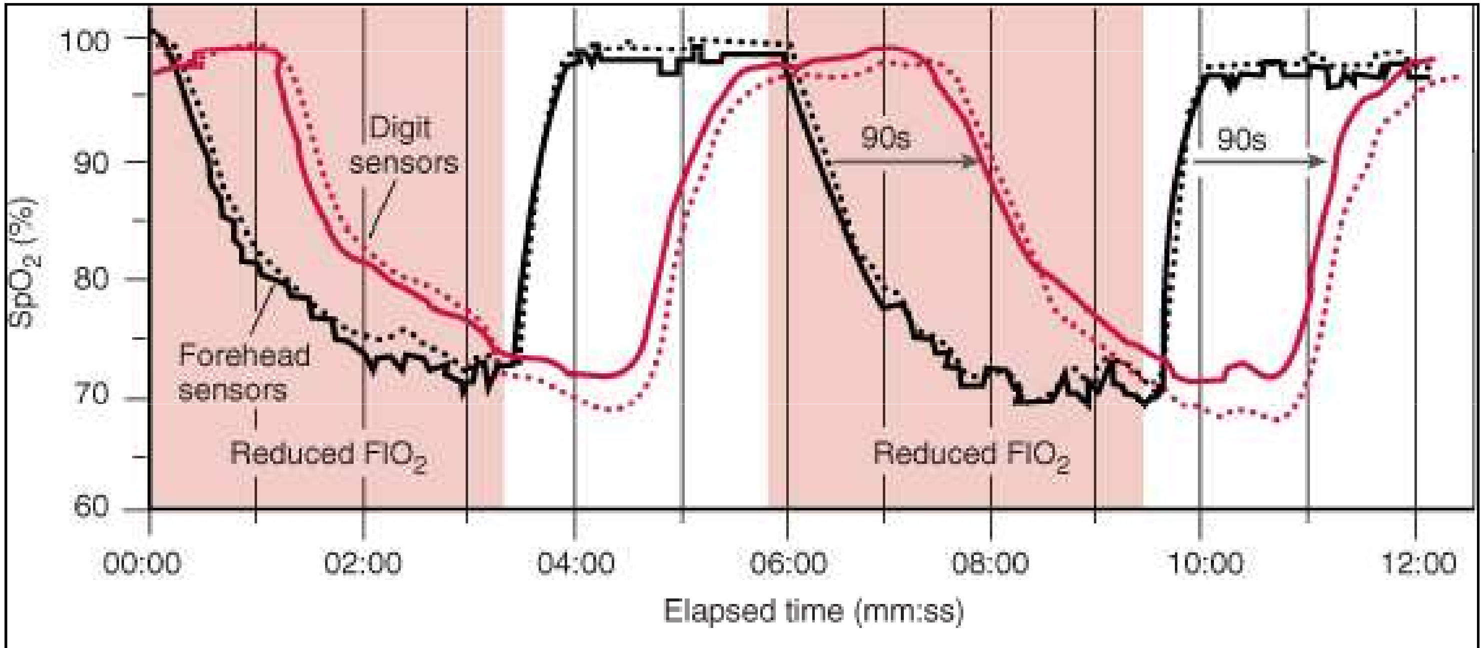


Figure 36-11 Effect of pulse oximeter probe replacement on delay from onset of hypoxemia to a drop in the measured Spo2. During cold-induced peripheral vasoconstriction in normal volunteers, the onset of hypoxemia was detected more quickly using an oximeter probe on the forehead compared with the finger. Other studies have shown a similar advantage for pulse oximeter probes placed on the ear. (From Bebout DE, Mannheimer PD, Wun C-C: Site-dependent differences in the time to detect changes in saturation during low perfusion. Crit Care Med 29:A115, 2002.)

Monitorace ventilace

- P,V, flow;
- PV křivka
- EtCO2 – kapnometrie, kapnograf
- volatilní anestetika - absorbance

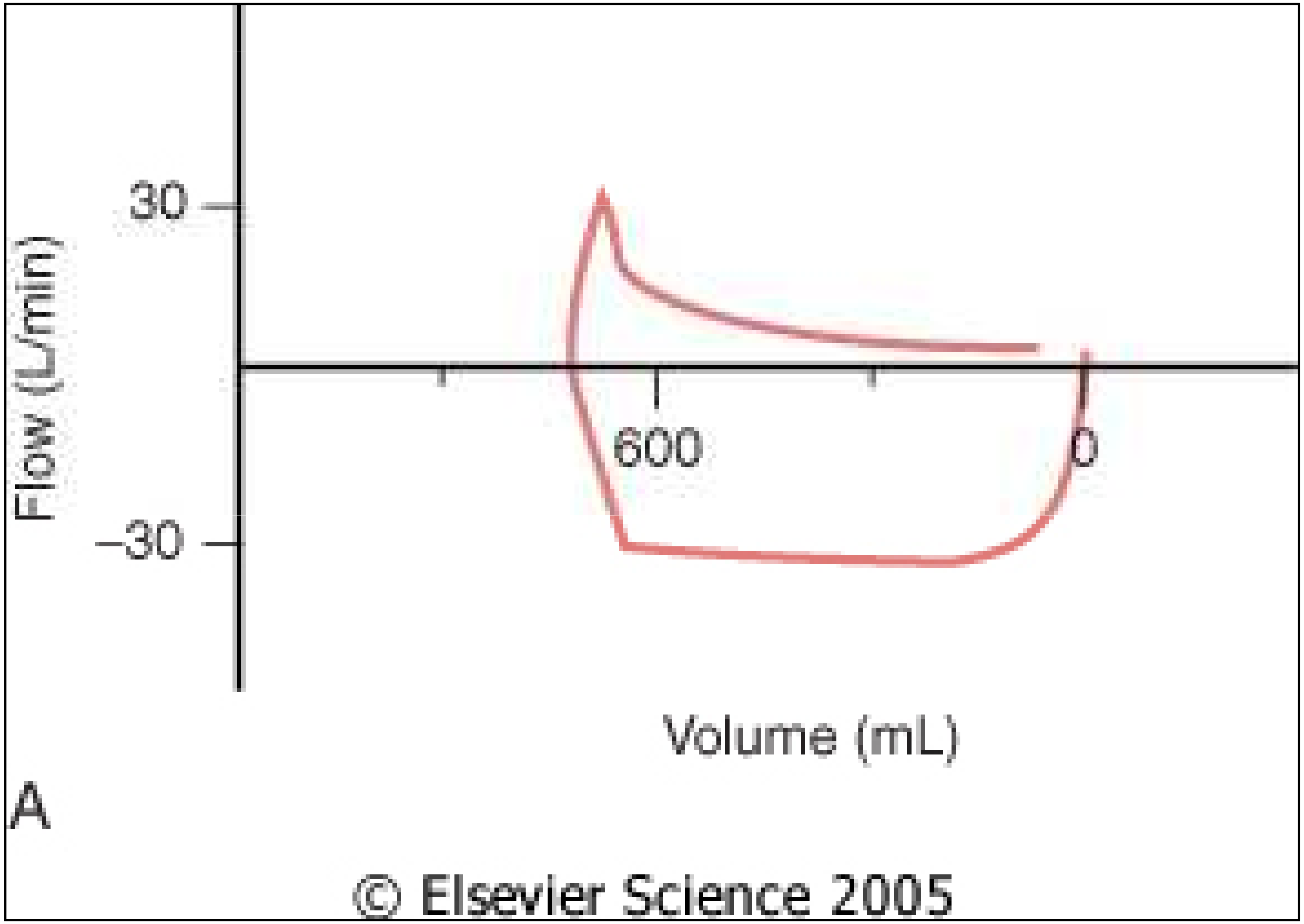
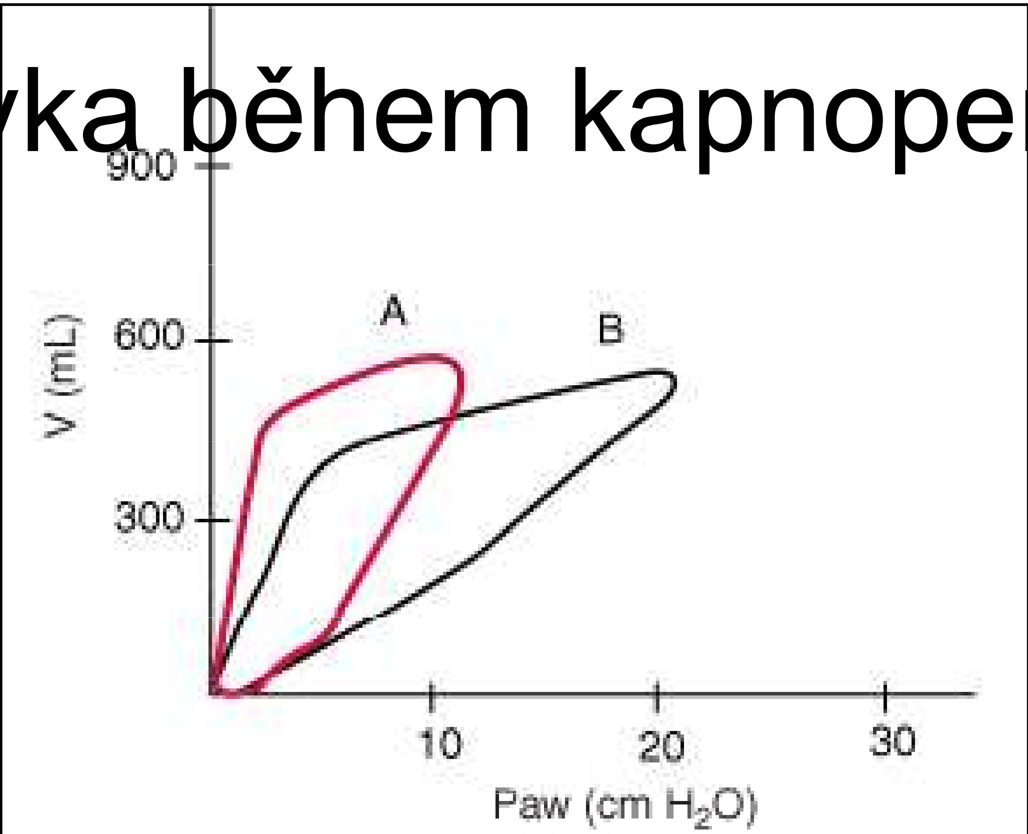


Figure 36-24 Flow (ordinate) versus volume (abscissa). A, Closed-chest positive-pressure ventilation under general anesthesia in a patient with severe airways obstruction and hyperinflation before surgery to reduce lung volume. The flow-volume curve shows inspiratory (negative) and expiratory (positive) flow on the ordinate, plotted clockwise from zero volume on the abscissa. Expiratory flow started with a sharp upward peak and then fell immediately to a low flow rate with convexity toward the volume axis, suggesting expiratory flow limitation. expiratory flow rate was so low that inflation of the next positive-pressure breath was initiated before expiratory flow reached zero. Because expiratory flow continued up to this point, there must have been intrinsic positive end-expiratory pressure (PEEPi). B, A similar closed-check flow-volume curve after lung resection shows that the characteristic pattern of expiratory flow limitation has disappeared and that expiratory flow rate fell to zero before inflation started for the next breath (i.e., no suggestion of PEEPi). (Adapted from Dueck R: Assessment and monitoring of flow limitation and other parameters from flow/volume loops. J Clin Monit Comput 16:425, 2000.)

PV křivka během kapnoperitonea



	TV	Ppeak	Pplat	C	$P_{ET}CO_2$
A	522	12	9	56	31
B	525	21	19	27	39

Figure 57-1 Change in total respiratory compliance during pneumoperitoneum for laparoscopic cholecystectomy. The intra-abdominal pressure was 14 mm Hg, and the head-up tilt was 10 degrees. The airway pressure (Paw) versus volume (V) curves and data were obtained from the screen of a Datex Ultima monitoring device. Curves are generated for before insufflation (A) and 30 minutes after insufflation (B). Values are given for tidal volume (TV, in mL); peak airway pressure (Ppeak, in cm H2O); plateau airway pressure (Pplat, in cm H2O); total respiratory compliance (C, in mL/cm H2O); and end-tidal carbon dioxide tension (PetCO2, in mm Hg).

edition

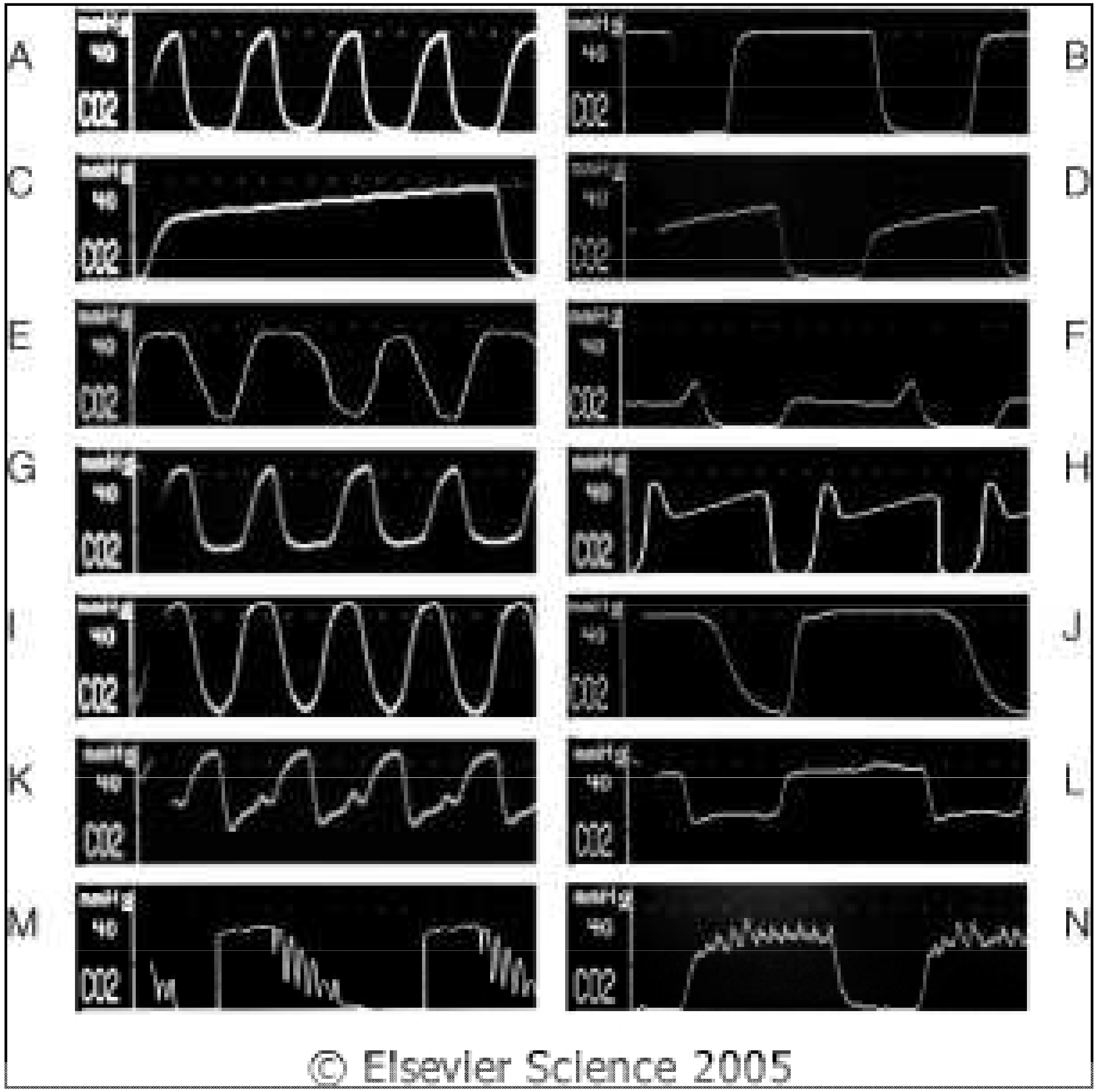


Figure 36-18 Examples of capnograph waves. A, Normal spontaneous breathing. B, Normal mechanical ventilation. C, Prolonged exhalation during spontaneous breathing. As CO2 diffuses from the mixed venous blood into the alveoli, its concentration progressively rises (see Fig. 36-19). D, Increased slope of phase III in a mechanically ventilated patient with emphysema. E, Added dead space during spontaneous ventilation. F, Dual plateau (i.e. tails-up pattern) caused by a leak in the sample line.325 The alveolar plateau is artifactually low because of dilution of exhaled gas with air leaking inward. During each mechanical breath, the leak is reduced because of higher pressure within the airway and tubing, explaining the rise in the CO2 concentration at the end of the alveolar plateau. This pattern is not seen during spontaneous ventilation because the required increase in airway pressure is absent. G, Exhausted CO2 absorbent produces an inhaled CO2 concentration greater than zero. H, Double peak for a patient with a single lung transplant. The first peak represents CO2 from the transplanted (normal) lung. CO2 exhalation from the remaining (obstructed) lung is delayed, producing the second peak. I, Inspiratory valve stuck open during spontaneous breathing. Some backflow into the inspired limb of the circuit causes a rise in the level of inspired CO2. J, Inspiratory valve stuck open during mechanical ventilation. The "slurred" downslope during inspiration represents a small amount of inspired CO2 in the inspired limb of the circuit. K and L, Expiratory valve stuck open during spontaneous breathing or mechanical ventilation. Inhalation of exhaled gas causes an increase in inspired CO2. M, Cardiogenic oscillations, when seen, usually occur with sidestream capnographs for spontaneously breathing patients at the end of each exhalation. Cardiac action causes to-and-fro movement of the interface between exhaled and fresh gas. The CO2 concentration in gas entering the sampling line therefore alternates between high and low values. N, Electrical noise resulting from a malfunctioning component. The seemingly random nature of the signal perturbations (about three per second) implies a nonbiologic cause.

zdravé plíce, alveoly vyprázdněny současně

Různá ventilace alveolů nejprve vyprázdněny dobře ventilované pak špatně ventilované

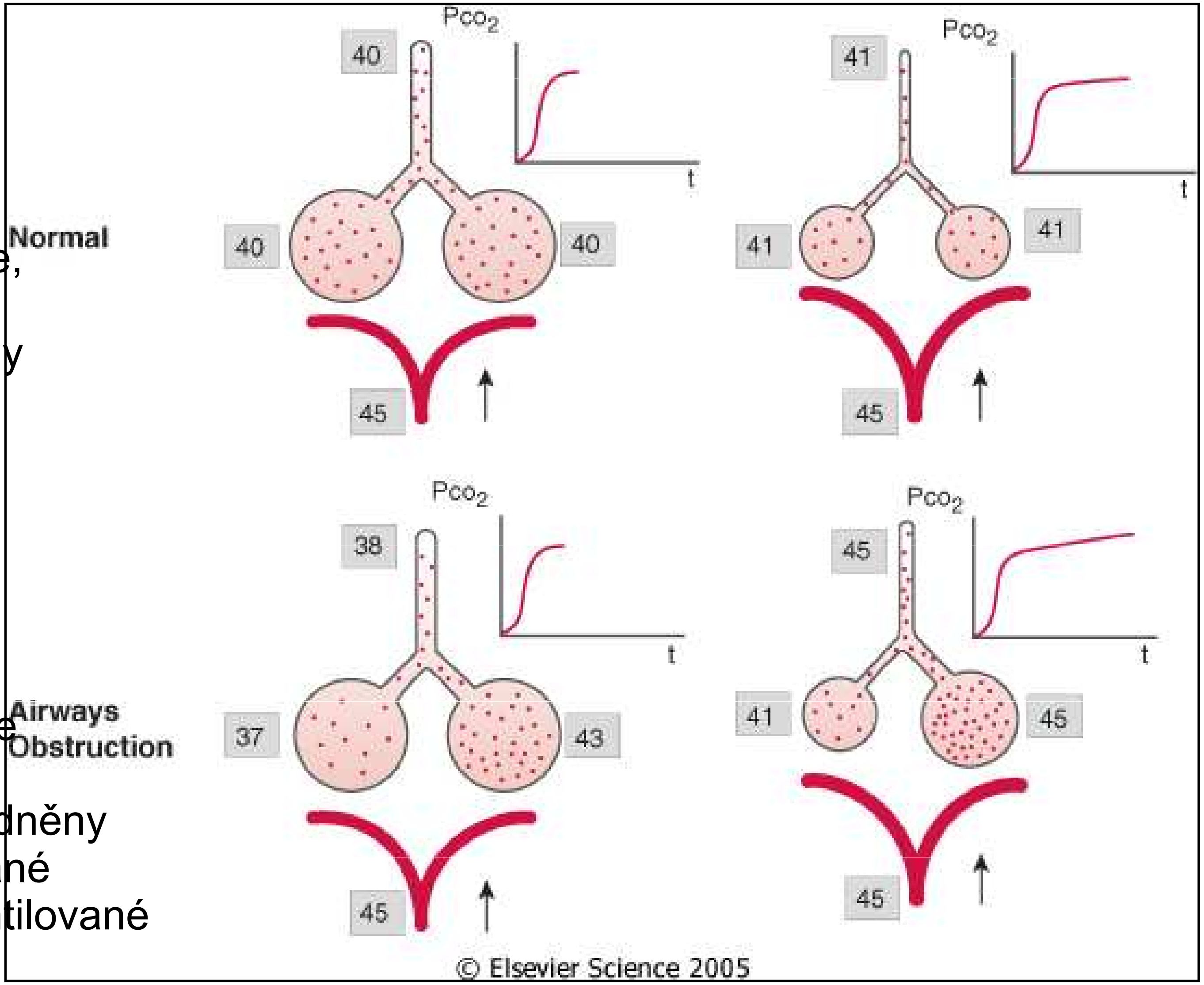


Figure 36-19 Mechanisms of airways obstruction producing an upsloping phase III capnogram. In a normal, healthy person (upper panel), there is a narrow range of [Vdot]a/[Qdot] ratios with values close to 1. Gas exchange units therefore have similar Pco2 and tend to empty synchronously, and the expired Pco2 remains relatively constant. During the course of exhalation, the alveolar Pco2 slowly rises as CO2 continuously diffuses from the blood. This causes a slight increase in Pco2 toward the end of expiration, and this increase can be pronounced if the exhalation is prolonged (see Fig. 36-18C). In a patient with diffuse airways obstruction (lower panel), the airway pathology is heterogeneous, with gas exchange units having a wide range of [Vdot]a/[Qdot] ratios. Well-ventilated gas exchange units, with gas containing a lower Pco2, empty first; poorly ventilated units, with a higher Pco2, empty last. In addition to the continuous rise in Pco2 mentioned previously, there is a progressive increase caused by asynchronous exhalation.

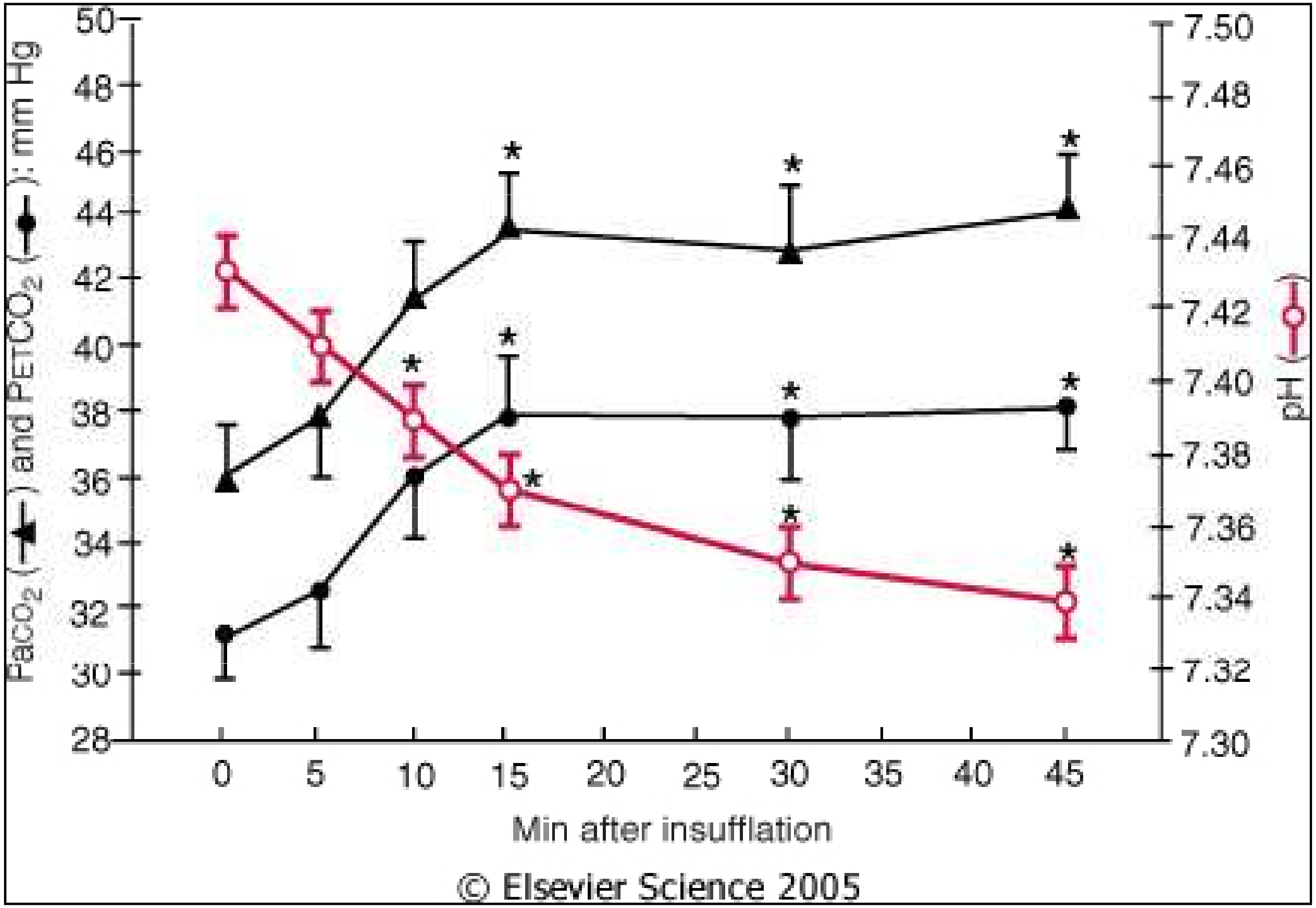


Figure 57-2 Ventilatory changes (pH, Paco2, and PetCO2) during CO2 pneumoperitoneum for laparoscopic cholecystectomy. For 13 American Society of Anesthesiologists (ASA) class I and II patients, minute ventilation was kept constant at 100 mL/kg/min with a respiratory rate of 12 per minute during the study. Intra-abdominal pressure was 14 mm Hg. Data are given as the mean ± SEM.*, P .05 compared with time 0.

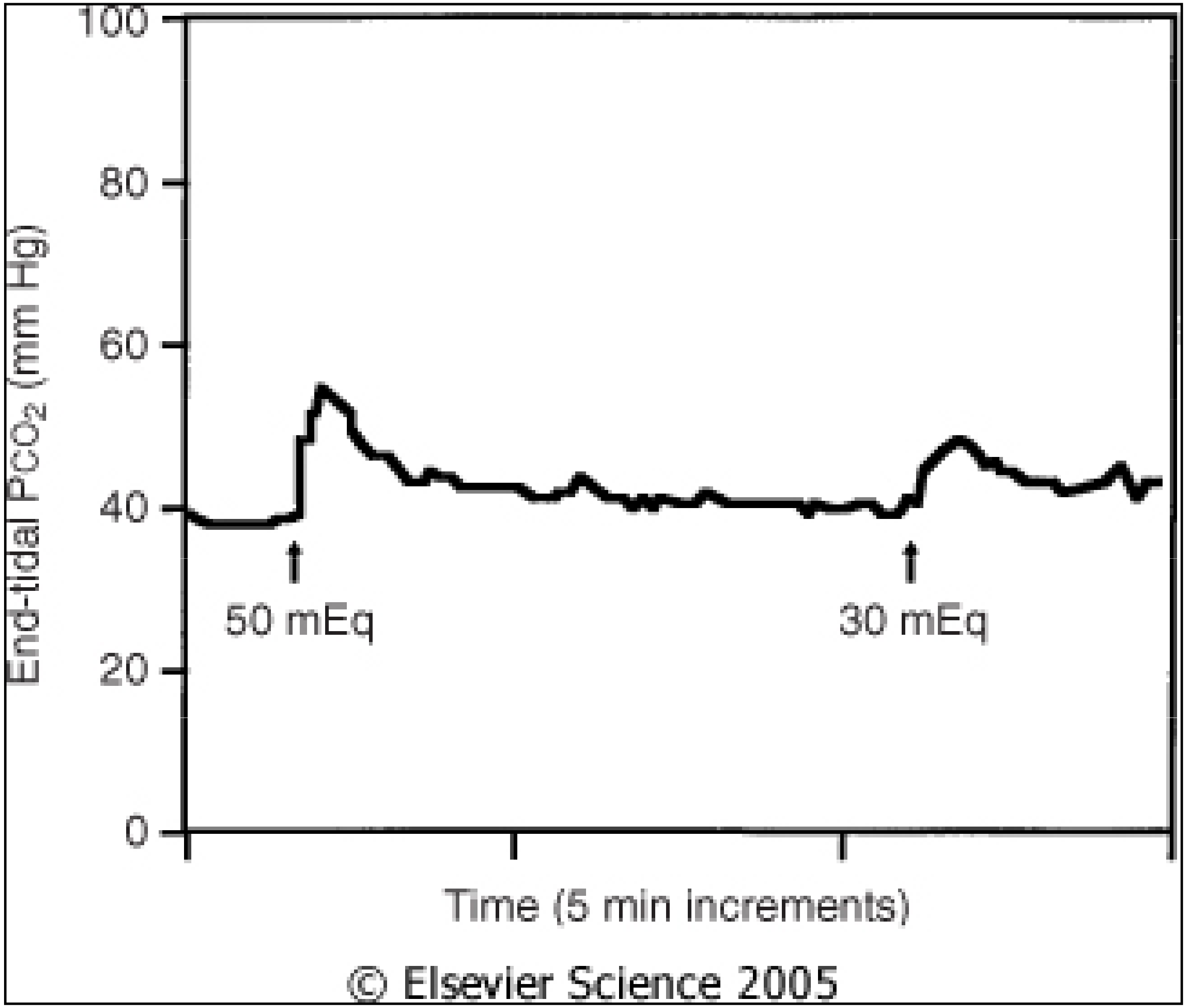


Figure 36-20 The effect of$NaHCO_3^-$ administration on end-tidal Pco2. A continuous tracing of end-tidal Pco2 is shown as a function of time. Intravenous administration of 50 mEq followed by 30 mEq of NaHCO3 results in an abrupt increase in expired CO2 because of neutralization of bicarbonate by hydrogen ions.

Monitorace tělesné teploty

- u výkonů delších 60 minut
- aktivní ohřívání – podložkou, prouděním teplého vzduchu

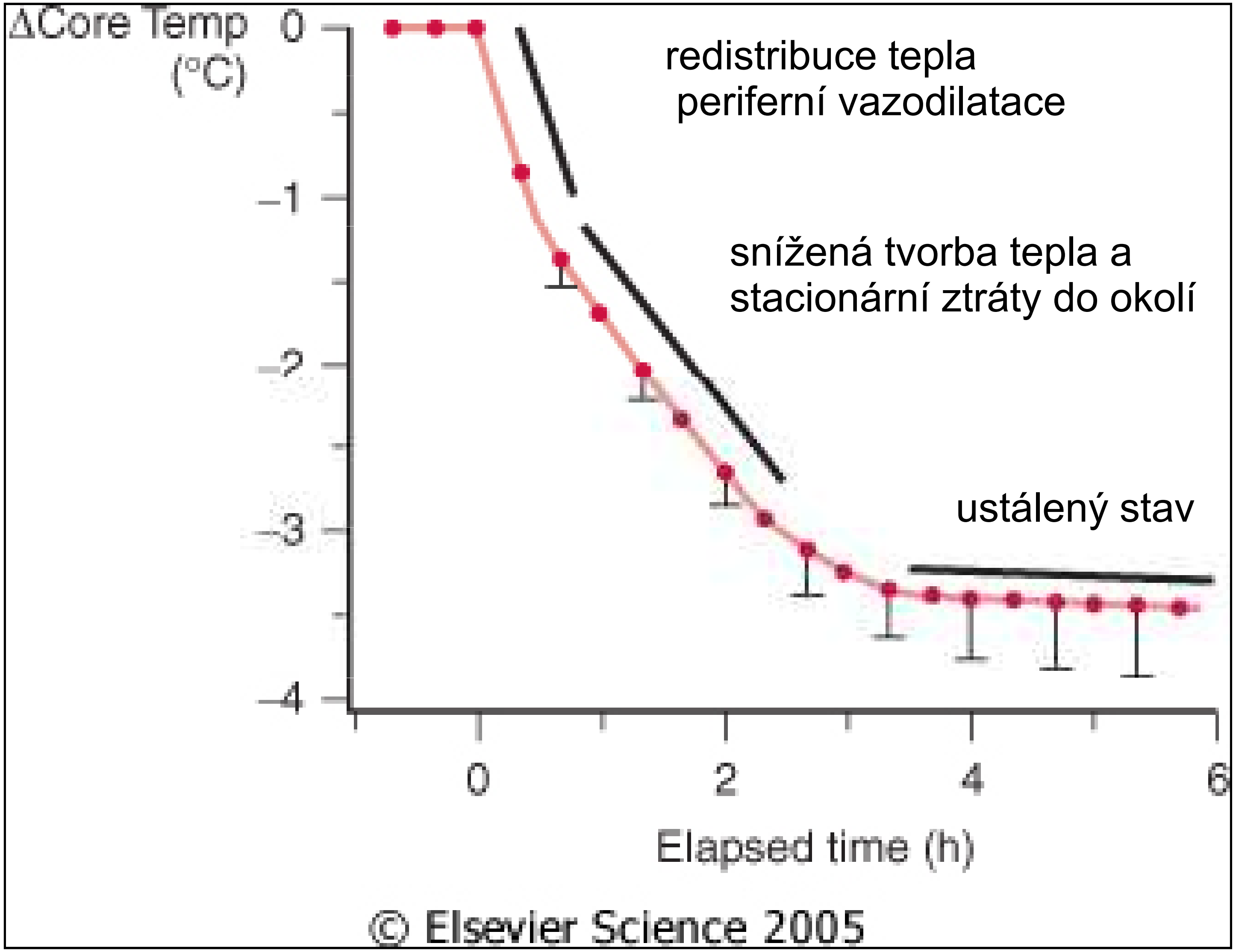
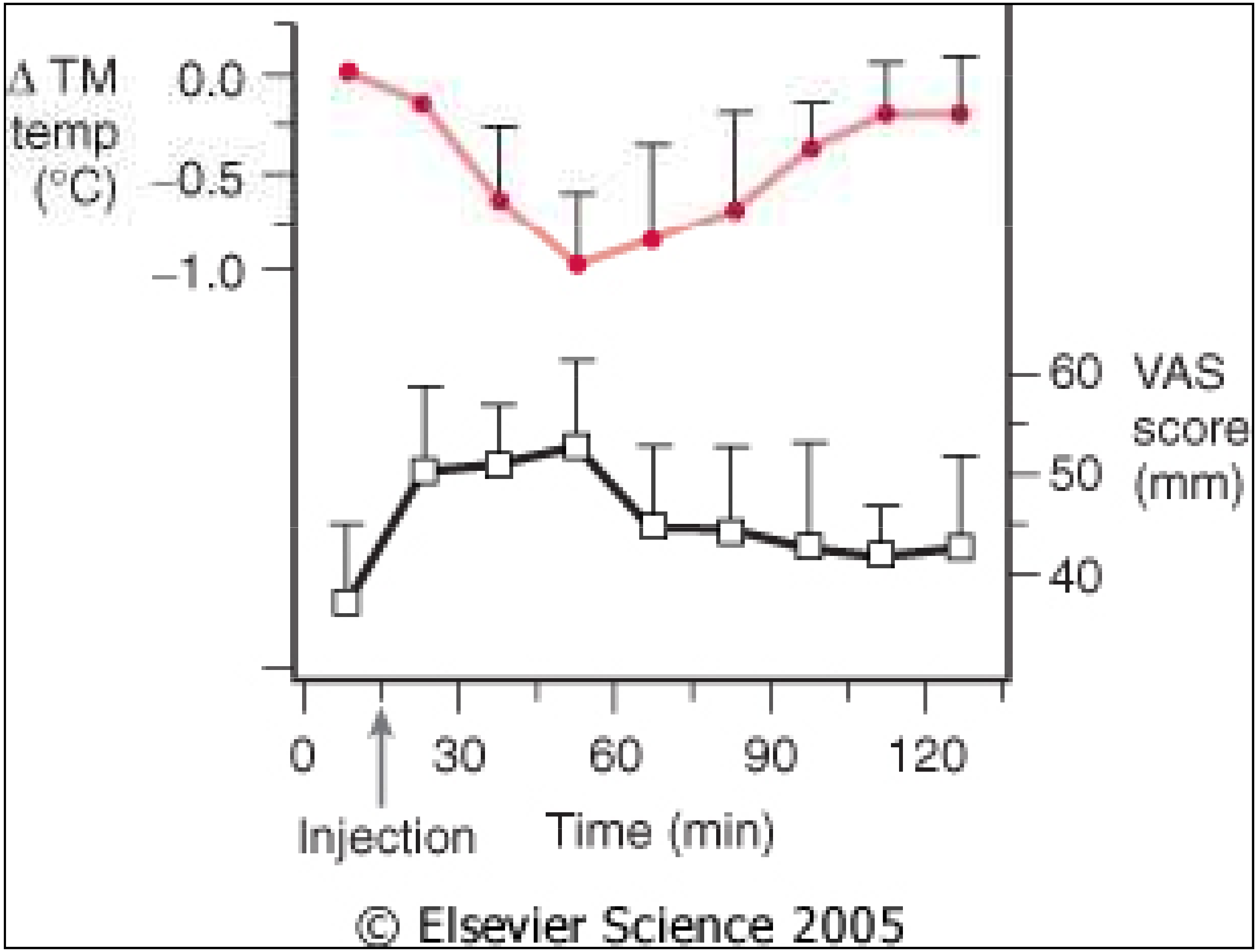


Figure 40-7 Hypothermia during general anesthesia develops with a characteristic pattern. An initial rapid decrease in core temperature results from a core-to-peripheral redistribution of body heat. This redistribution is followed by a slow, linear reduction in core temperature that results simply from heat loss exceeding heat production. Finally, core temperature stabilizes and subsequently remains virtually unchanged. This plateau phase may be a passive thermal steady state or might result when sufficient hypothermia triggers thermoregulatory vasoconstriction. Results are presented as means ± SD.



15 minutes po EPI anestezii pokles teploty jádra, vzestup pocitu tepelné pohody (visual analog scale -VAS). Interestingly, however, maximal thermal comfort coincided with the minimum core temperature. Tympanálně měřená teplota. (Redrawn with modification from Sessler DI, Ponte J: Shivering during epidural anesthesia. Anesthesiology 72:816-821, 1990.)

Zvláštnosti hrudních výkonů

Selektivní ventilace,
poloha na boku

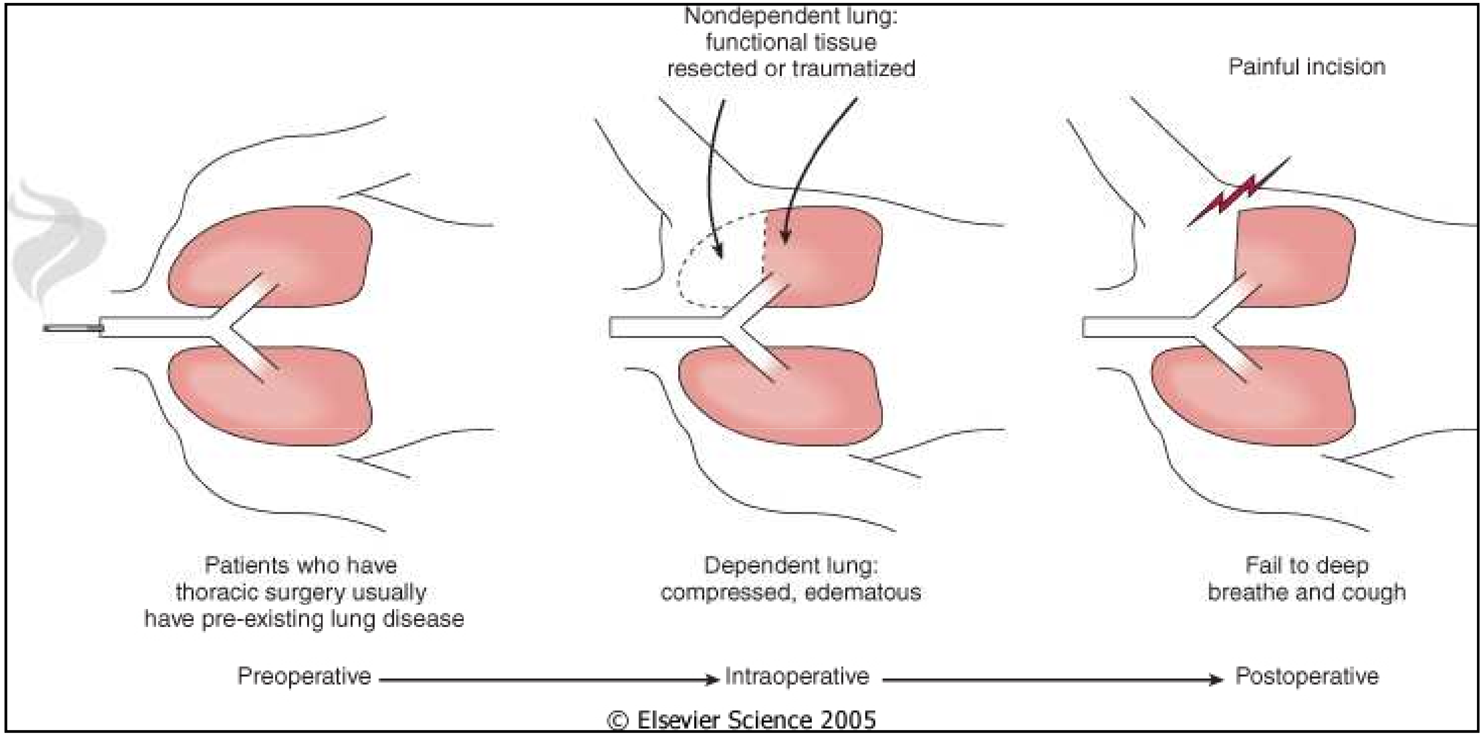


Figure 49-3 Thoracic surgery can impair postoperative lung function because of preoperative, intraoperative, and postoperative factors (see the text for details). (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

Speciální předoperační vyšetření a zhodnocení

- Zjištění anamnézy se zvláštním zřetelem na onemocnění plic, srdce a oběhu, včetně posouzení celkového stavu organismu
- fyzikální vyšetření
- laboratoř, zejména vyš. krevních plynů a hematokrit
- Ekg,pozor na zn. zatížení pravého srdce
- RTG hrudníku
- funkční vyšetření plic: nízká VC menší než 50% NH a sníž. FEV1 pod 800 ml , příp. FEV pod 35% se považují za kritické, ale samy o sobě nemohou nijak absolutně vypovídat o toleranci a operabilitě
- měření tlaku v a. pulmonalis-plicní arterie postižené plíce se dočasně uzavře balonkem, a tak se simulují očekávané plicní art. tlaky po pneumonektomii ,jestliže vzroste střední arteriální tlak v a. pulm. prox. od okluze na hodnoty vyšší než 40 mm Hg ,nebo vznikne hypoxie je to KI pneumonektomie.Zmenšení plicního řečiště o více než 50-60% povede pravděpodobně již ke klidové plicní hypertenzi.

Zvýšené riziko operační a pooperační

- FVC pod 50% NH
- FEV1 pod 50% nebo pod 2 l
- MVV pod 50% nebo menší než 50l/min
- RV/TLC větší než 50%

Předoperační příprava

je ovlivněna neodkladností zákroku, zahrnuje:

- zanechat kouření
- cílená léčba plicních infekcí ATB
- odstranění bronchospasmu
- sekretolýza
- dech. rehabilitace
- kyslíková terapie
- léčba cor pulmonale

Hypoxická plicní vasokonstrikce

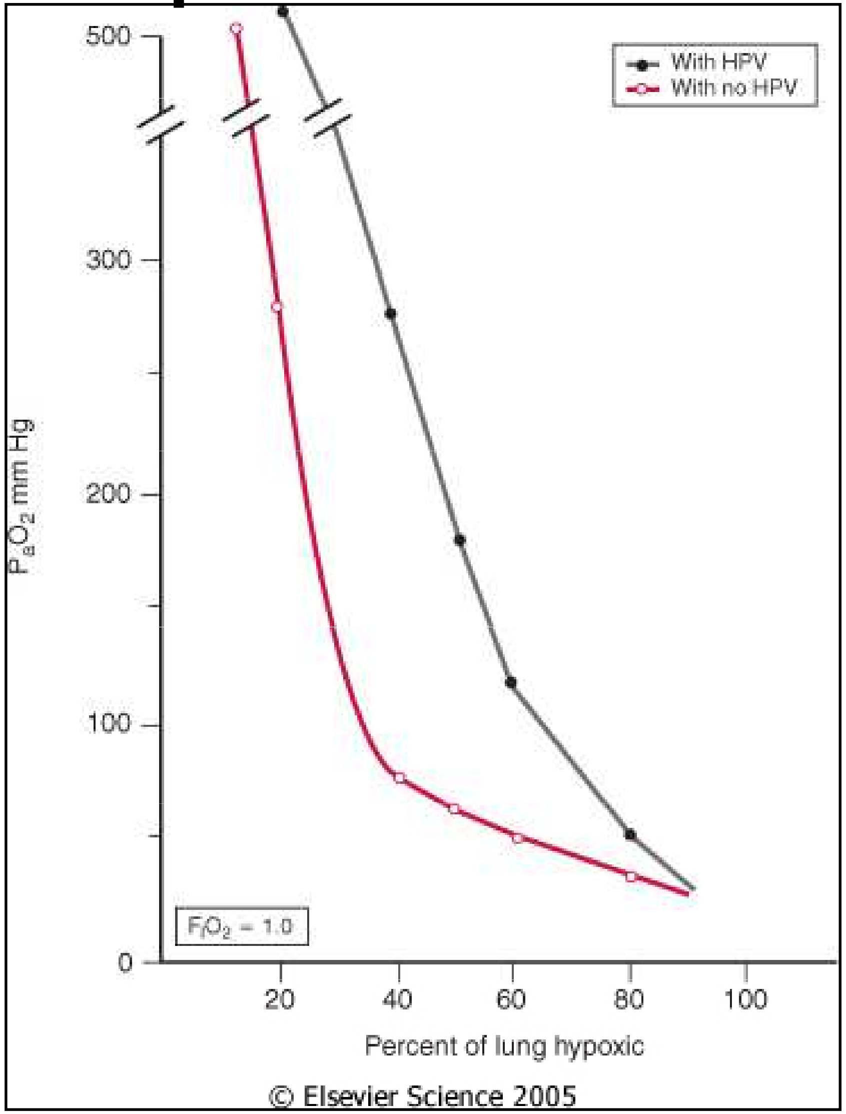


Figure 49-6 Effect of hypoxic pulmonary vasoconstriction (HPV) on Pao2. As the amount of lung that is made hypoxic is increased (x axis), arterial oxygen tension (Pao2) decreases (y axis). In the range of 30% to 70% hypoxic lung, the normal expected amount of HPV increases Pao2 from arrhythmogenic levels to much higher and safer levels. Normal cardiac output, hemoglobin concentration, and mixed venous oxygen tension (Pvo2) are assumed. (Data from Marshall BE, Marshall C: Continuity of response to hypoxic pulmonary vasoconstriction. J Appl Physiol 59:189, 1980.)

Pokles hypox.plicní vasokonstr

- vzestup stř. tlaku v AP více než 18 mm Hg
- nitroprusid,nitroglycerin,kalcioví blokátoři,
- inhalační anestetika
- aminofylin, izoprenalin
- hyperventilace s paCO2 pod 4 kPa

- vzestup shuntu

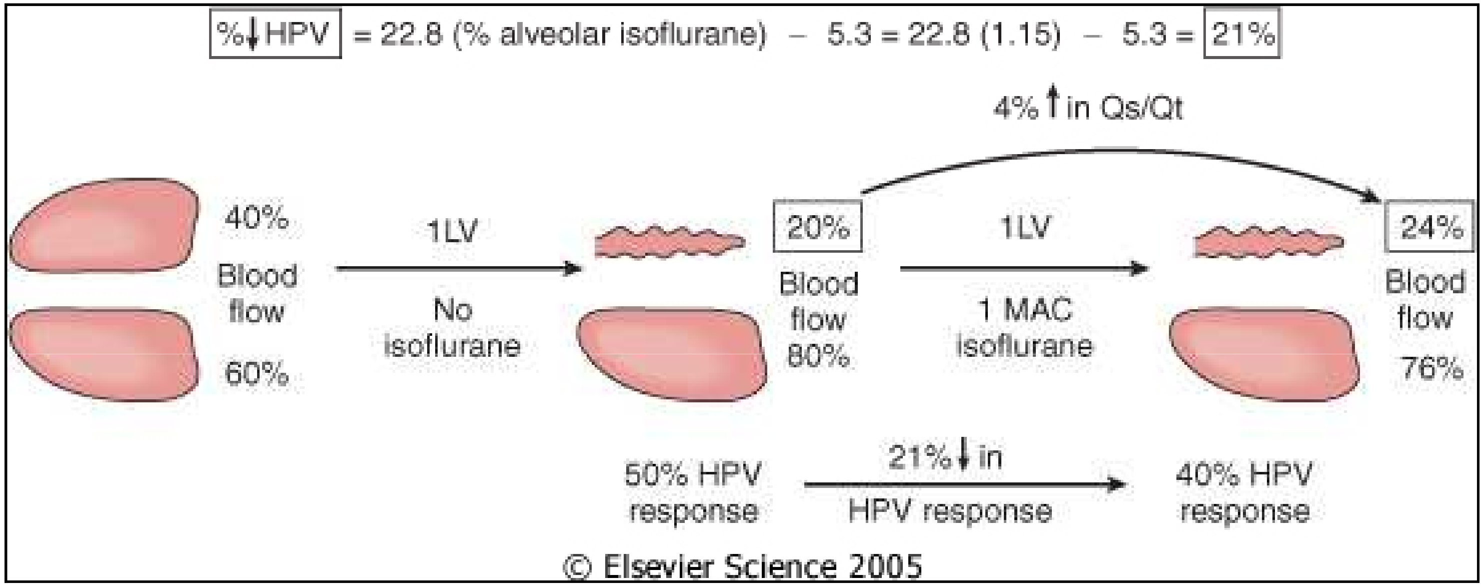


Figure 49-7 Effect of 1 minimum alveolar concentration (MAC) isoflurane anesthesia on shunt during one-lung ventilation (1LV) of normal lungs. This diagram shows that for two-lung ventilation, the ratio of the percentages of blood flow to the nondependent and dependent lungs is 40:60(left-hand side). When two-lung ventilation is converted to one-lung ventilation (as indicated by atelectasis of the nondependent lung), the hypoxic pulmonary vasoconstriction (HPV) response decreases blood flow to the nondependent lung by 50%, so the nondependent-dependent lung blood flow ratio is now 20:80 (middle). According to the data of Domino and colleagues,186 administration of 1 MAC isoflurane anesthesia should cause a 21% decrease in the HPV response, which would decrease the blood flow reduction from 50% to 40%. Consequently, the nondependent-dependent lung blood flow ratio would now become 24:76, which represents a 4% increase in total shunt across the lungs (right-hand side). (From Benumof JL: Isoflurane anesthesia and arterial oxygenation during one-lung ventilation. Anesthesiology 64:419, 1986.)

Poloha pacienta na boku

- Jestliže pac. spontánně dýchá, a je otočen na bok , V/P poměr se až tak nemění, dolní plíce je lépe jak perfundovaná, tak i ventilovaná než horní.
- Během anestezie se snižuje FRC.Relaxace odstraňuje rozdíly odporu mezi oběma polovinami bránice a orgány dutiny břišní tlačí na spodní plíci, jež je rovněž utiskována tlakem mediastina.
- Výsledkem je, že horní plíce bude ventilována více než dependentní, V/P poměr se mění , protože perfuze přednostně do depend. plíce přetrvává.Přetlaková ventilace upřednostňuje horní plíci v laterální pozici,protože je poddajnější než spodní.To vše predisponuje pacienty k hypoxii.

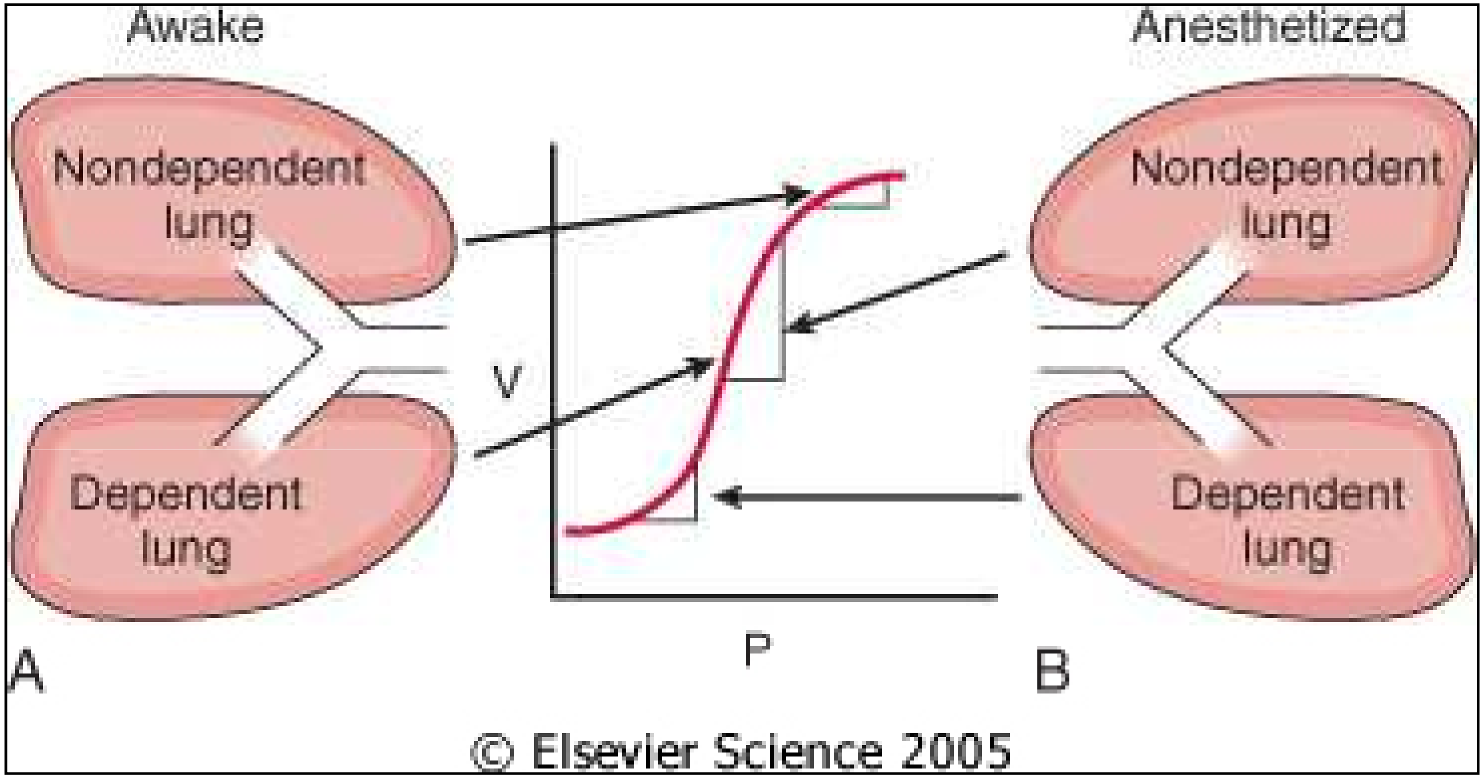
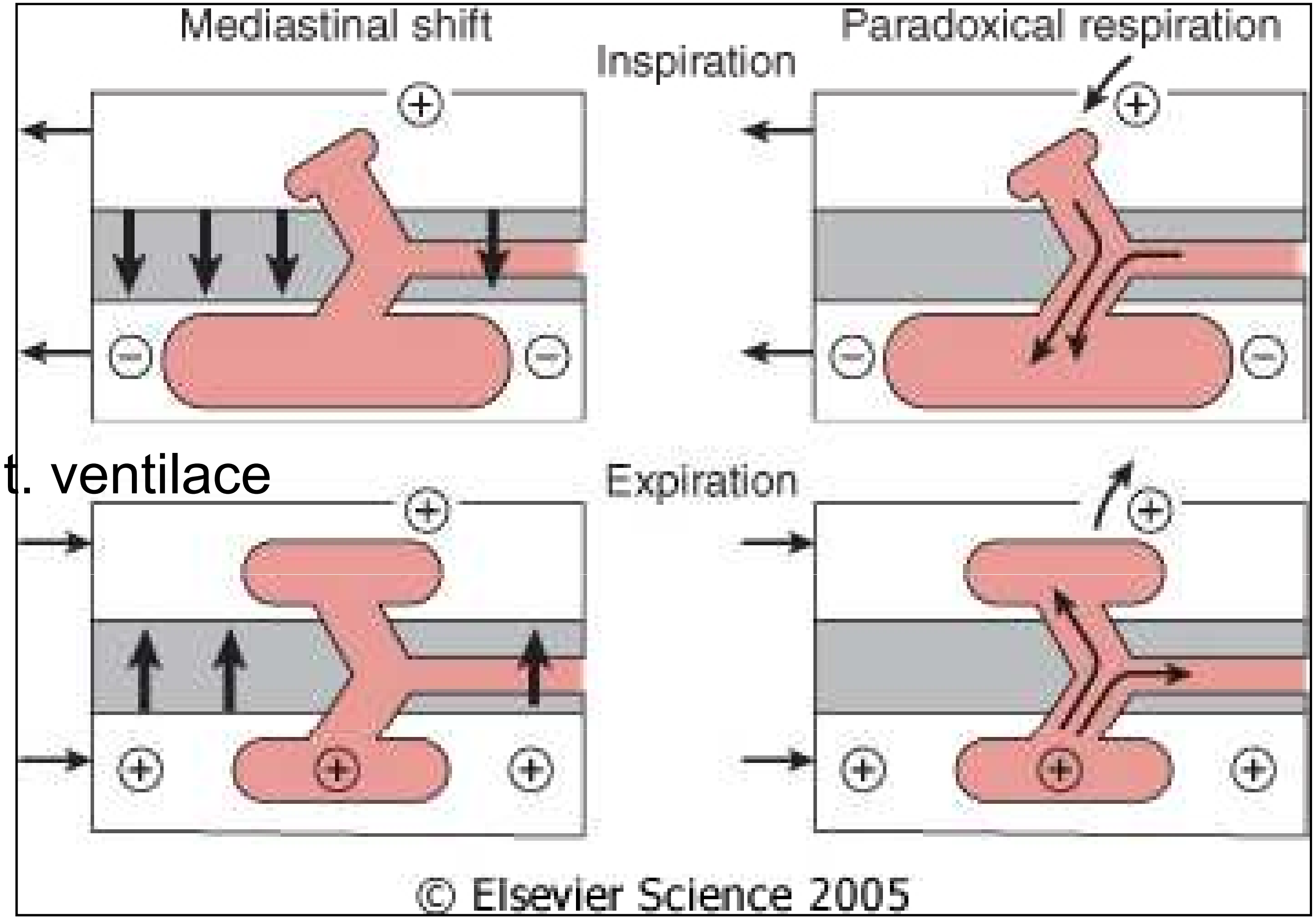


Figure 49-11 Distribution of ventilation in a patient in the lateral decubitus position when awake (A) and when anesthetized (B). Induction of anesthesia has caused loss of lung volume in both lungs, with the nondependent lung moving from a flat, noncompliant portion to a steep, compliant portion of the pressure-volume curve and the dependent lung moving from a steep, compliant part to a flat, noncompliant part of the pressure-volume curve. Thus, an anesthetized patient in a lateral decubitus position has more of the tidal ventilation in the nondependent lung (where perfusion is the least) and less of the tidal ventilation in the dependent lung (where perfusion is the greatest). P, transpulmonary pressure; V, alveolar volume. (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

Paradoxní ventilace – horní plíce



spont. ventilace

Figure 49-8 Schematic representation of mediastinal shift and paradoxical respiration in a spontaneously ventilating patient with an open chest who is placed in the lateral decubitus position. The open chest is always exposed to atmospheric pressure (+). During inspiration, negative pressure (-) in the intact hemithorax causes the mediastinum to move downward (mediastinal shift). In addition, during inspiration, movement of gas from the nondependent lung in the open hemithorax into the dependent lung in the closed hemithorax and movement of air from the environment into the open hemithorax cause the lung in the open hemithorax to collapse (paradoxical respiration). During expiration, relative positive (+) pressure in the closed hemithorax causes the mediastinum to move upward (mediastinal shift). In addition, during expiration, gas moves from the dependent lung to the nondependent lung and from the open hemithorax to the environment; consequently, the nondependent lung expands during expiration (paradoxical respiration). (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

Řízená ventilace na boku

Posun mediastina a paradoxní dýchání se během řízené ventilace odstraní.

Změny V/P poměrů během ŘV však mohou vést ke vzniku

- atelektáz,
- transudaci tekutin
- tvorbě edémů v dolní plíci.

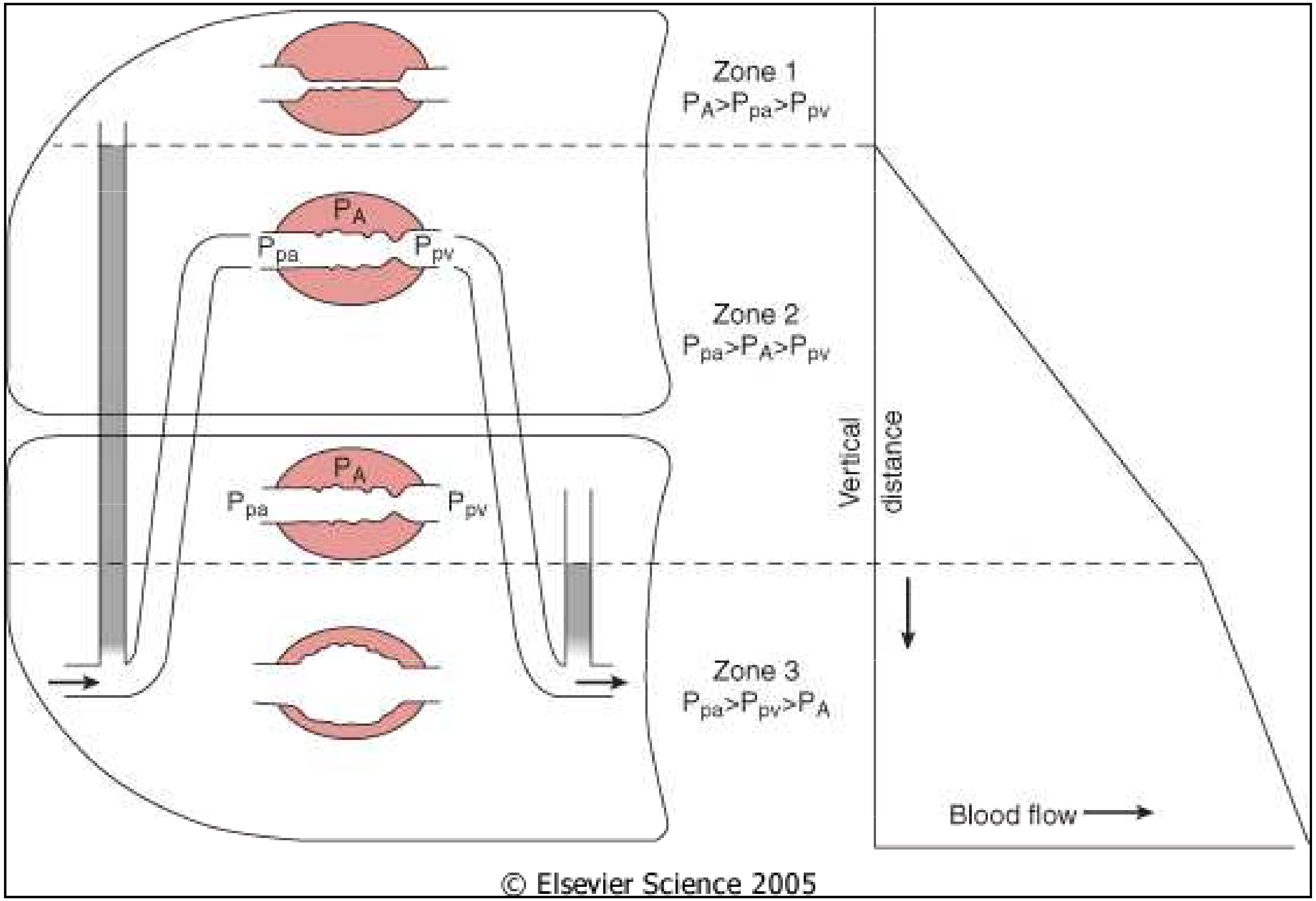


Figure 49-9 Schematic representation of the effects of gravity on the distribution of pulmonary blood flow in the lateral decubitus position. The vertical gradient in the lateral decubitus position is less than in the upright position. Consequently, there is less zone 1 and more zone 2 and 3 blood flow in the lateral decubitus position than in the upright position. Nevertheless, pulmonary blood flow increases with lung dependency and is greater in the dependent lung than in the nondependent lung. PA, alveolar pressure; Ppa, pulmonary artery pressure; Ppv, pulmonary venous pressure. (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

edition

Anest., relax

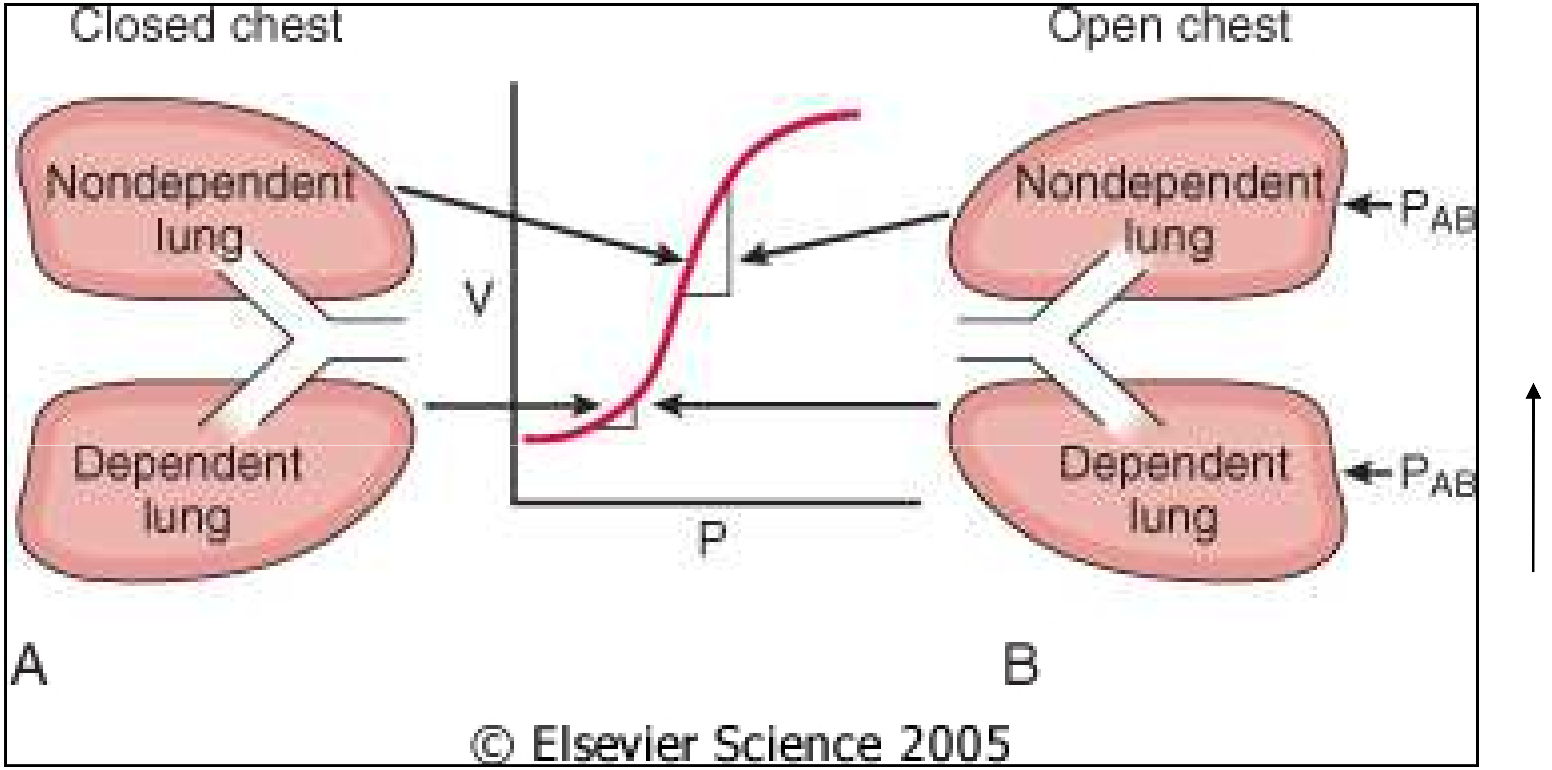


Figure 49-12 Schematic depiction of a patient in the lateral decubitus position in which the closed-chest anesthetized condition is compared with the open-chest anesthetized and paralyzed condition. Opening the chest increases nondependent lung compliance and reinforces or maintains the larger part of tidal ventilation going to the nondependent lung. Paralysis also reinforces or maintains the larger part of tidal ventilation going to the nondependent lung because the pressure of the abdominal contents (PAB) pressing against the upper part of the diaphragm is minimal (smaller arrow), and it is therefore easier for positive-pressure ventilation to displace this lesser resisting dome of the diaphragm. P, transpulmonary pressure; V, alveolar volume. (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

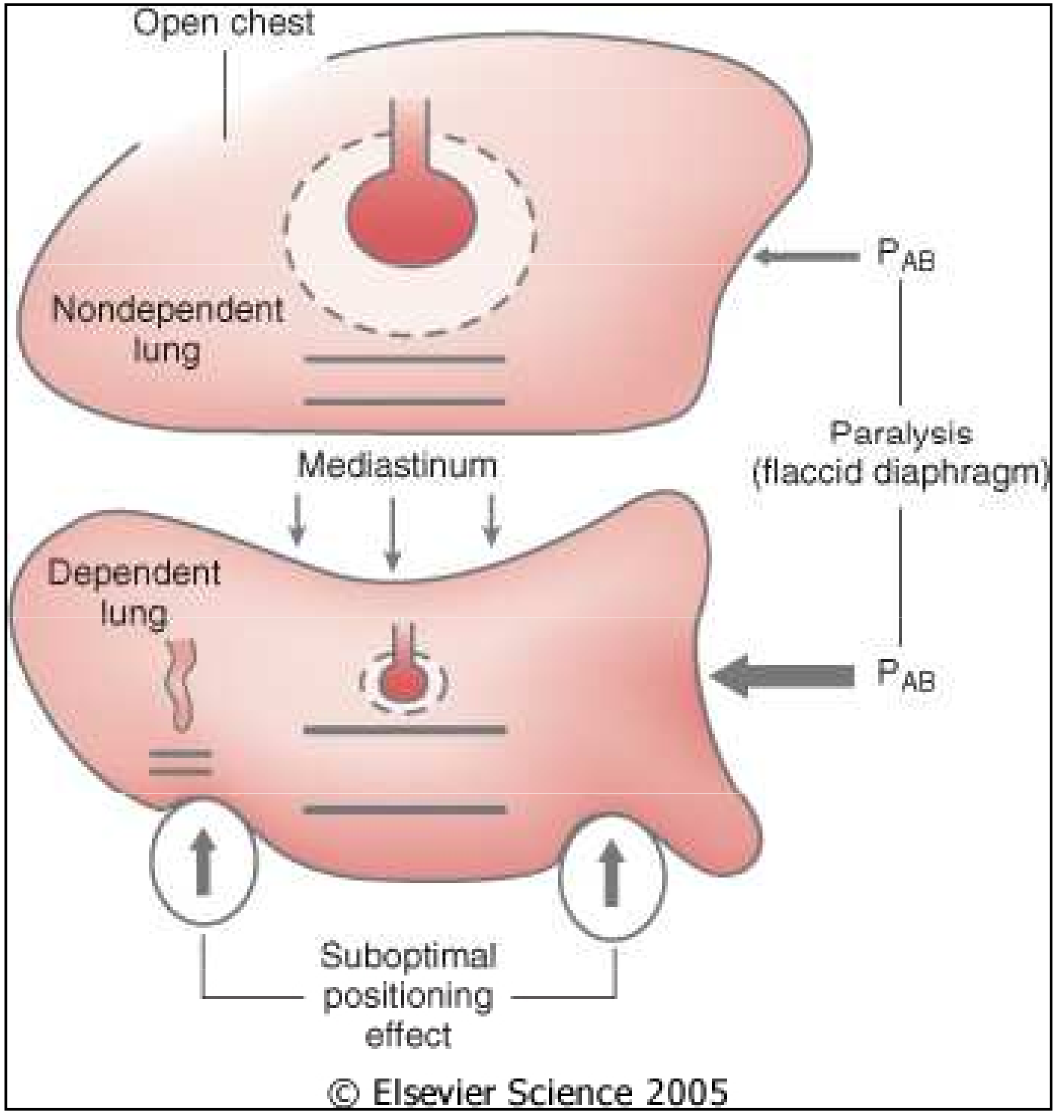


Figure 49-13 Schematic summary of ventilation-perfusion relationships in an anesthetized patient in the lateral decubitus position who has an open chest and is paralyzed and suboptimally positioned. The nondependent lung is well ventilated (as indicated by the large dashed lines) but poorly perfused (small perfusion vessel); the dependent lung is poorly ventilated (small dashed lines) but well perfused (large perfusion vessel). In addition, an atelectatic shunt compartment (indicated on the left side of the lower lung) may also develop in the dependent lung because of the circumferential compression of this lung. (See the text for a detailed explanation.) PAB, pressure of the abdominal contents. (Modified from Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

Selektivní ventilace 1 plíce

- nitroplicní pravo-levý zkrat(20-30%)
  - hypoxii.
  - Vylučování C02 probíhá většinou nerušeně, protože překrvená dolní plíce odevzdá zvýšeně CO_2.
- Velikost prokrvení dolní plíce je ovlivněna:
  - HPV
  - mechanickou manipulací horní plíce - vasokontr.

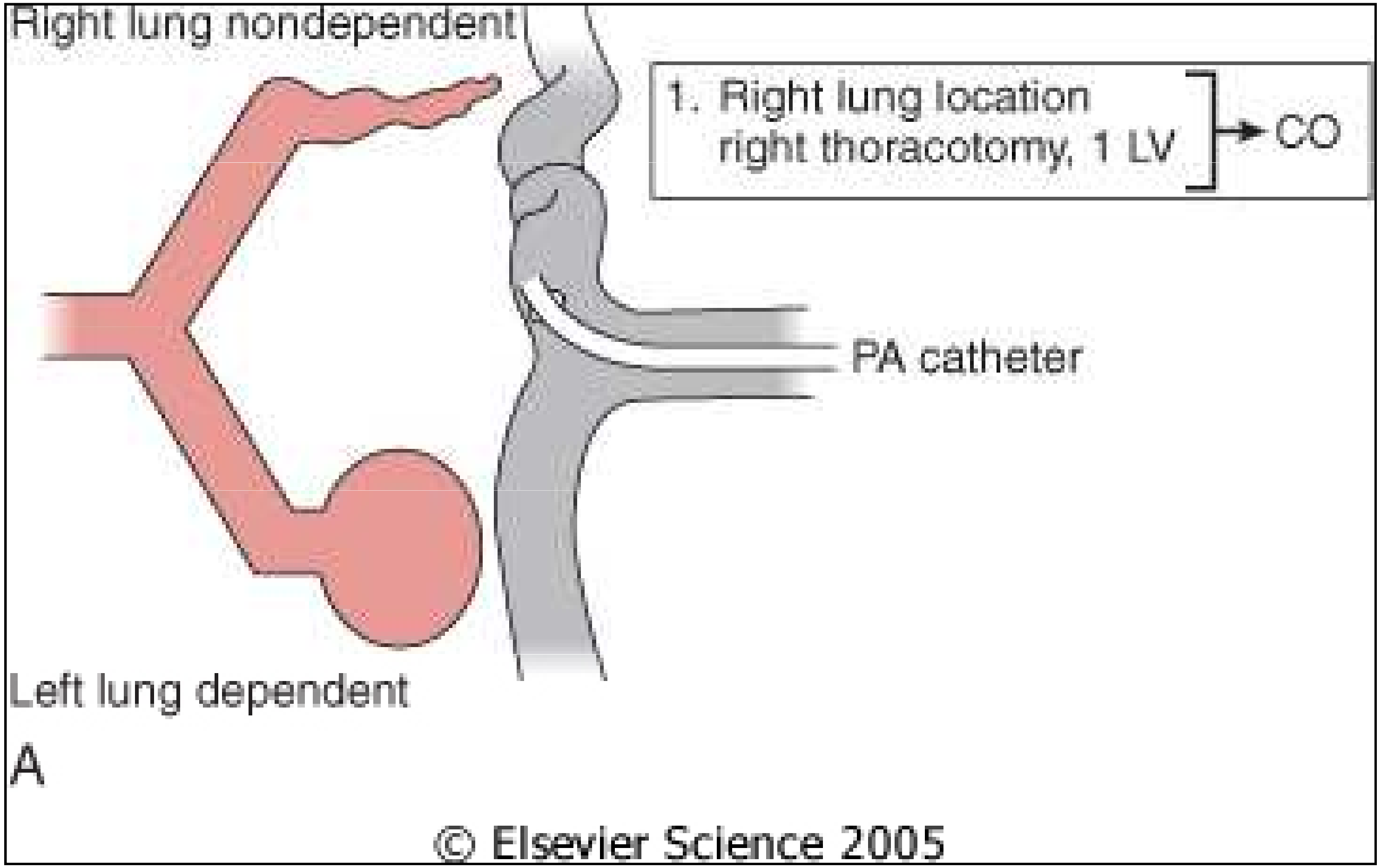


Figure 49-5 Conditions during thoracotomy in the lateral decubitus position when pulmonary artery (PA) catheter data may be inaccurate. A, During right thoracotomy with a PA catheter located in the collapsed right lung (one-lung ventilation [1 LV]), cardiac output (CO) may be lower than when the right lung is ventilated. The thermistor in the collapsed lung may be exposed to abnormal flow patterns or vascular wall interference. B, When the PA catheter is in the nondependent lung and the nondependent lung is exposed to continuous positive airway pressure (CPAP) or positive end-expiratory pressure (PEEP), pulmonary artery wedge pressure (Ppaw) may be inaccurate. Nondependent lung CPAP or PEEP may cause zone 1 conditions in the nondependent lung. Ppaw is probably always reasonably accurate when the PA catheter is in the dependent lung, even if the dependent lung is exposed to PEEP. (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

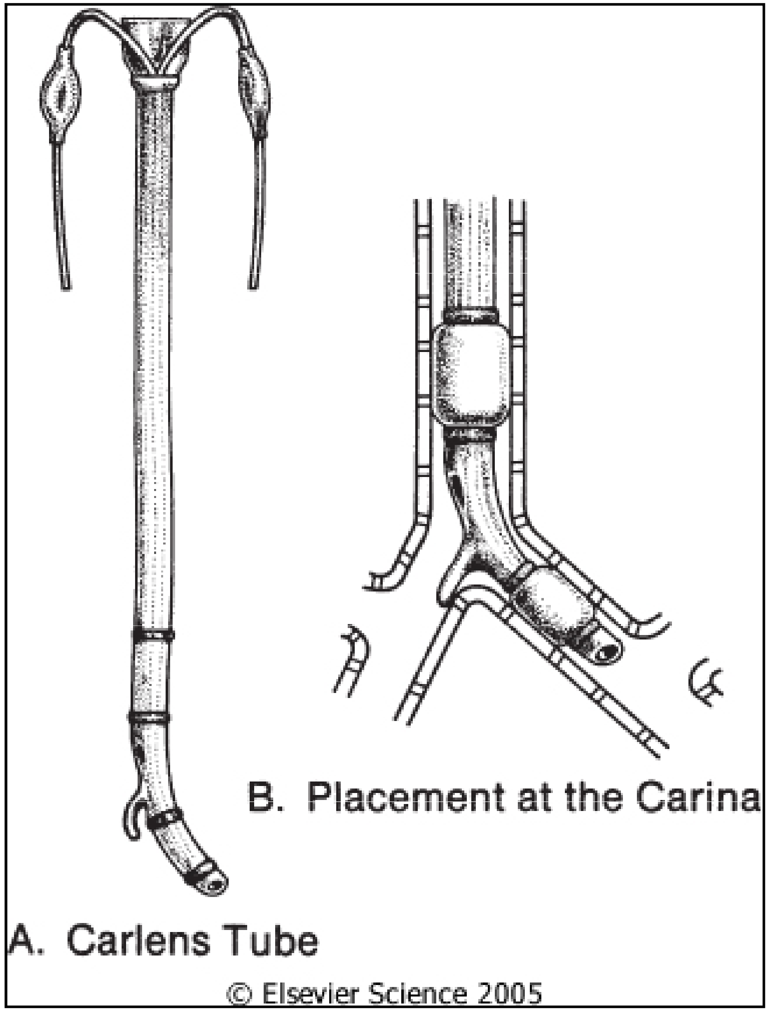


Figure 49-15 A, Sketch of the red rubber (nondisposable) Carlens double-lumen endotracheal tube. B, Close-up of placement of the red rubber Carlens double-lumen endotracheal tube at the carina. Note that the left endobronchial lumen and carinal hook straddle the carina. (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

Robertshaw

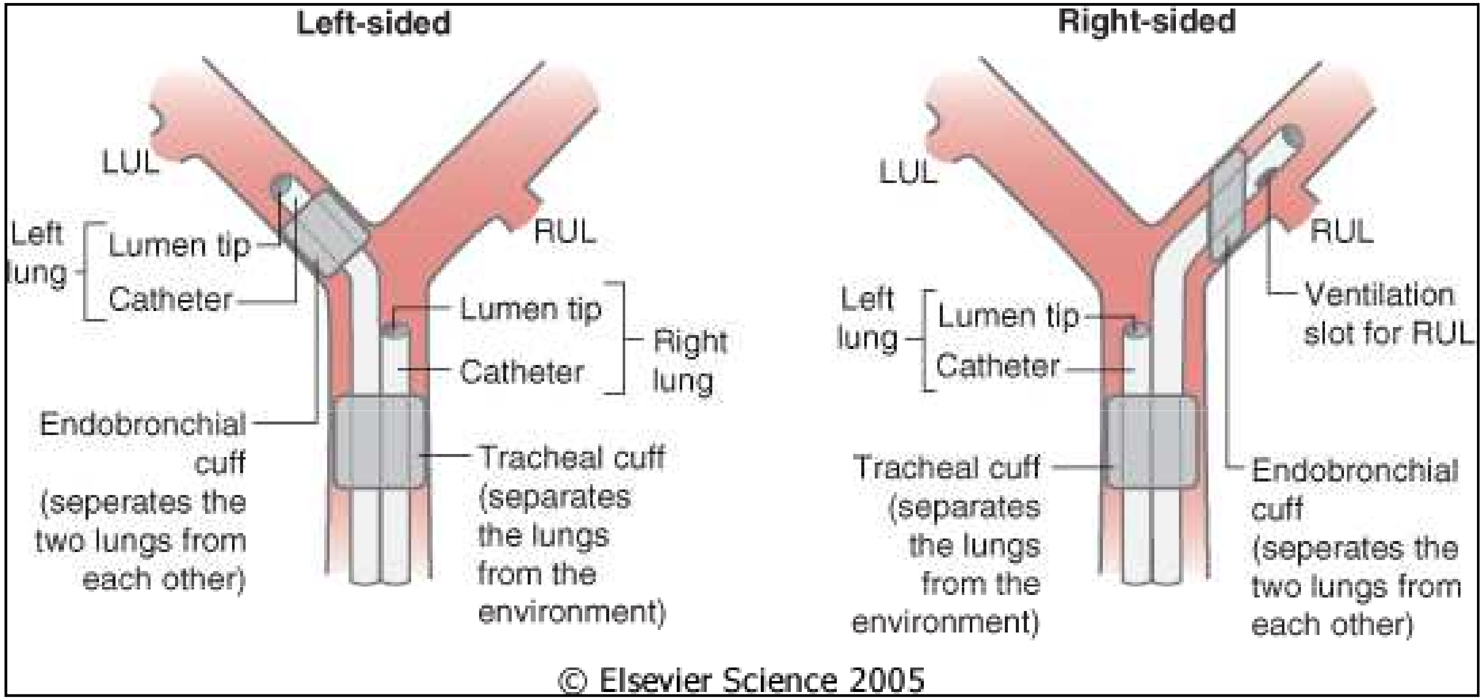
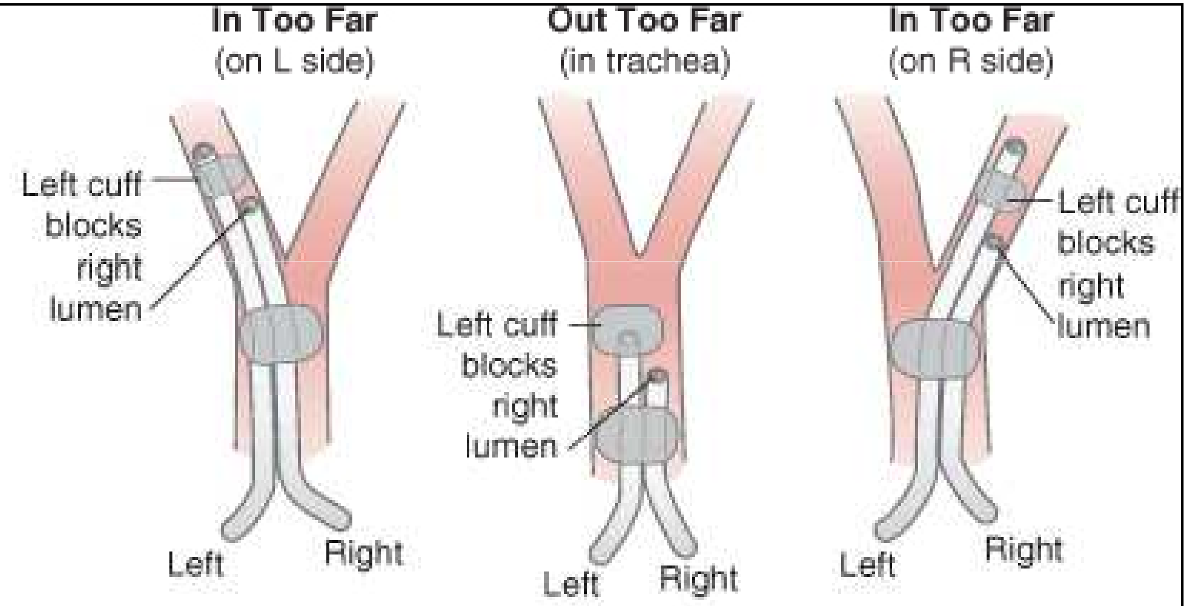


Figure 49-14 Schematic diagram depicting the essential features and parts of left-sided and right-sided double-lumen endotracheal tubes. LUL, left upper lobe; RUL, right upper lobe. (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)



Procedure	Breath sounds heard		
Clamp right lumen Both cuffs inflated	Left	Left and right	Right
Clamp left lumen Both cuffs inflated	None or very ↓↓	None or very ↓↓	None or very ↓↓
Clamp left lumen Deflate left cuff	Left	Left and right	Right

Figure 49-19 Three major malpositions (involving a whole lung) of a left-sided double-lumen endotracheal tube can occur. The tube can be in too far on the left (both lumens are in the left main stem bronchus), out too far (both lumens are in the trachea), or down the right main stem bronchus (at least the left lumen is in the right main stem bronchus). In each of these three malpositions, the left cuff, when fully inflated, can completely block the right lumen. Inflation and deflation of the left cuff while the left lumen is clamped create a breath sound differential diagnosis of tube malposition. (See the text for a full explanation.) L, left; R, right; ↓, decreased. (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

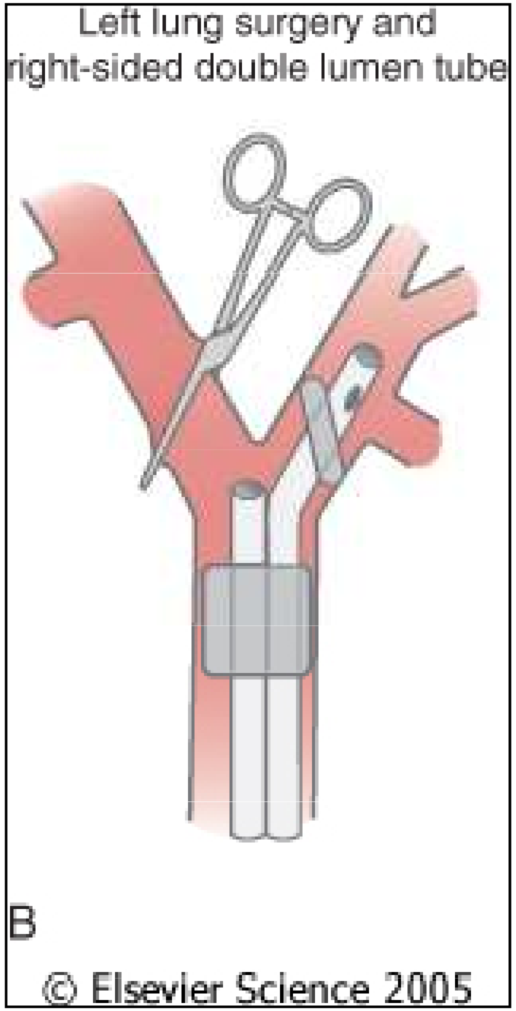


Figure 49-17 Use of left-sided and right-sided double-lumen endotracheal tubes for left and right lung surgery (as indicated by the clamp). A, When surgery is performed on the right lung, a left-sided double-lumen endotracheal tube should be used. B, When surgery is performed on the left lung, a right-sided double-lumen endotracheal tube can be used. However, because of uncertainty about alignment of the right upper lobe ventilation slot with the right upper lobe orifice, a left-sided double-lumen endotracheal tube can also be used for left lung surgery. C, If the left lung surgery requires a clamp to be placed high on the left main stem bronchus, the left endobronchial cuff should be deflated, the left-sided double-lumen endotracheal tube pulled back into the trachea, and the right lung ventilated through both lumens (use the double-lumen endotracheal tube as a single-lumen tube). (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

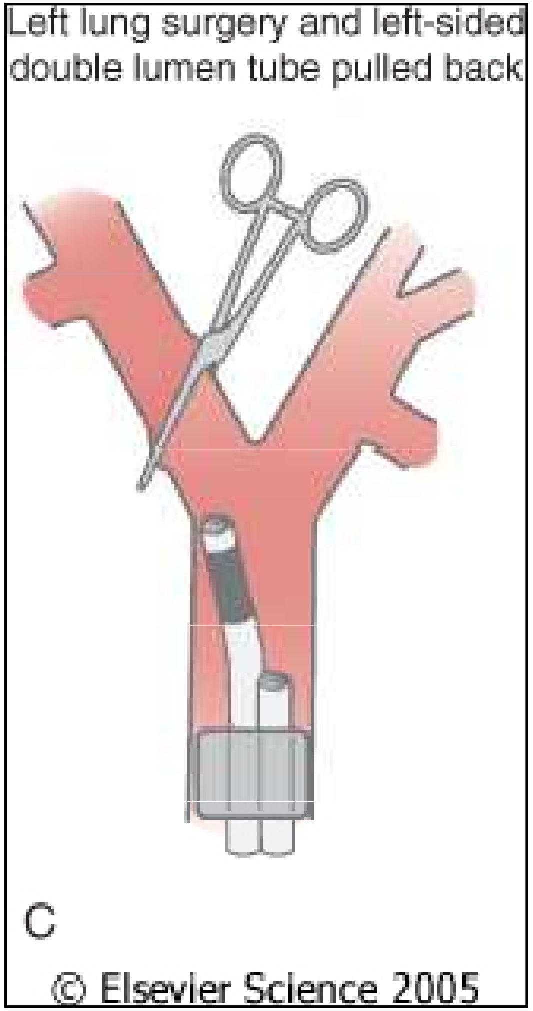


Figure 49-17 Use of left-sided and right-sided double-lumen endotracheal tubes for left and right lung surgery (as indicated by the clamp). A, When surgery is performed on the right lung, a left-sided double-lumen endotracheal tube should be used. B, When surgery is performed on the left lung, a right-sided double-lumen endotracheal tube can be used. However, because of uncertainty about alignment of the right upper lobe ventilation slot with the right upper lobe orifice, a left-sided double-lumen endotracheal tube can also be used for left lung surgery. C, If the left lung surgery requires a clamp to be placed high on the left main stem bronchus, the left endobronchial cuff should be deflated, the left-sided double-lumen endotracheal tube pulled back into the trachea, and the right lung ventilated through both lumens (use the double-lumen endotracheal tube as a single-lumen tube). (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

edition

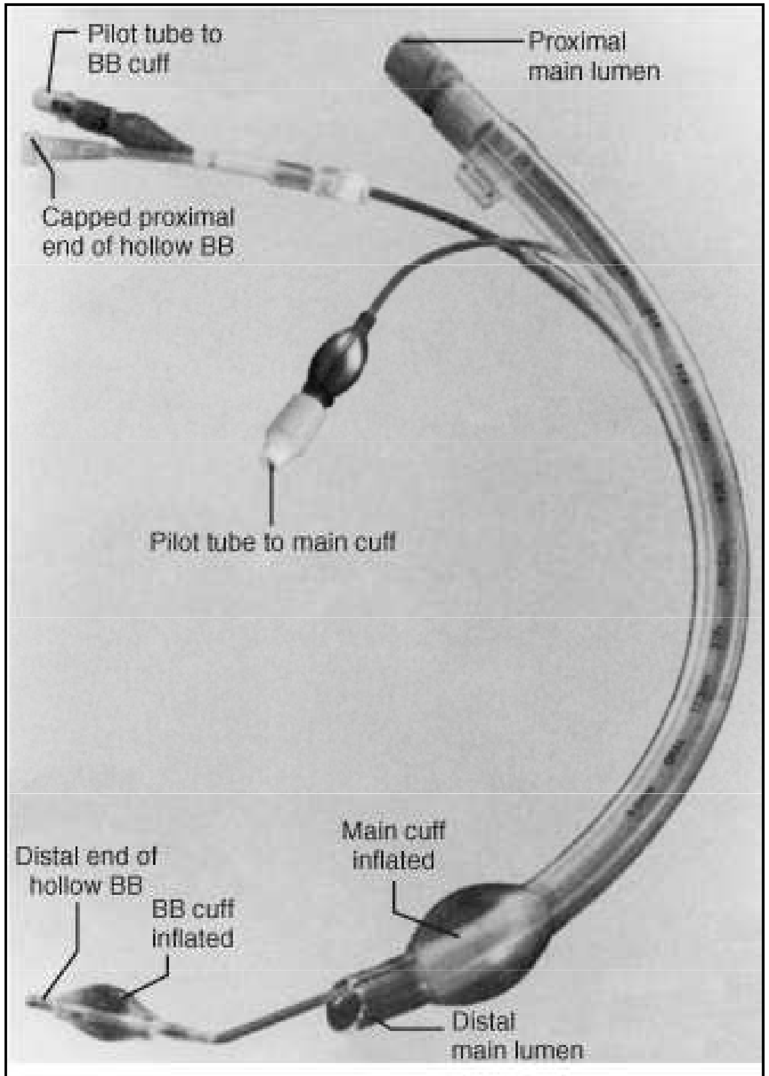


Figure 49-23 Single-lumen tube of the Univent bronchial blocker (BB) system.

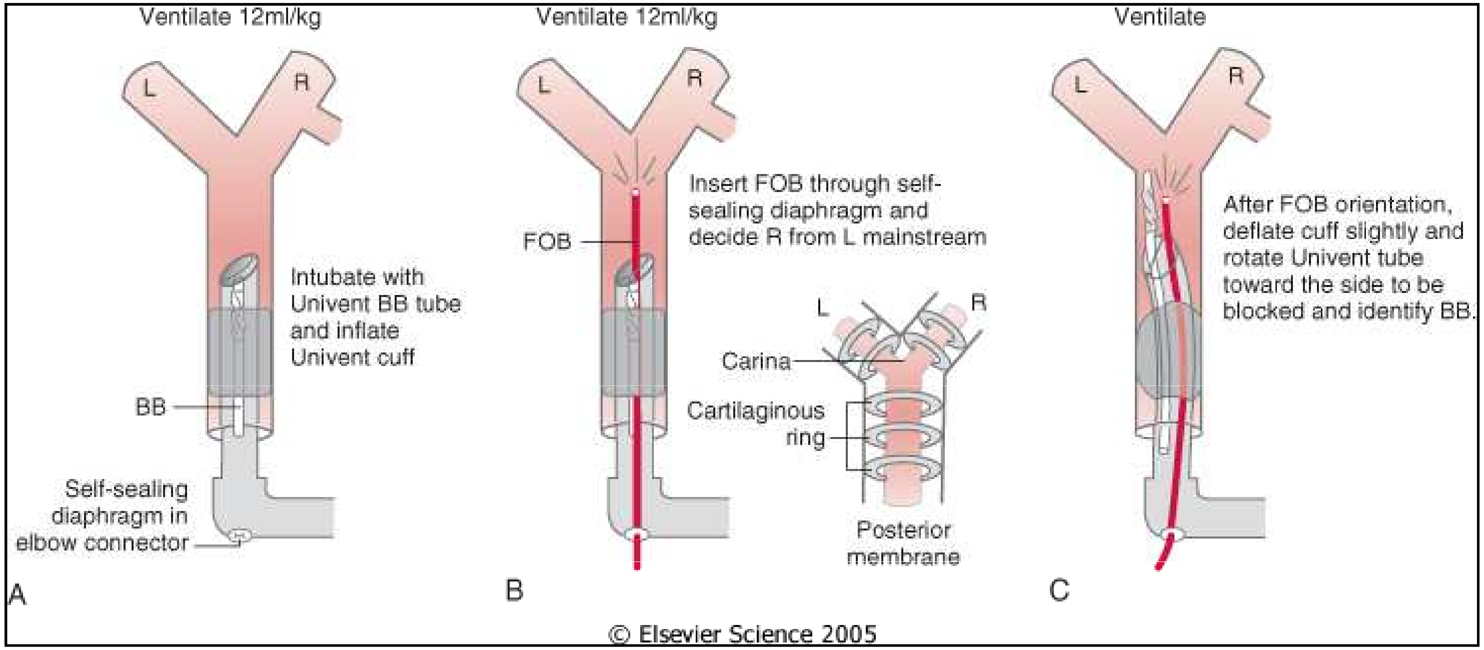


Figure 49-24 The sequential steps of the fiberoptic-aided method of inserting and positioning the Univent bronchial blocker (BB) in the left main stem bronchus are illustrated. One- or two-lung ventilation is achieved simply by inflating or deflating, respectively, the bronchial blocker balloon. FOB, fiberoptic bronchoscope.

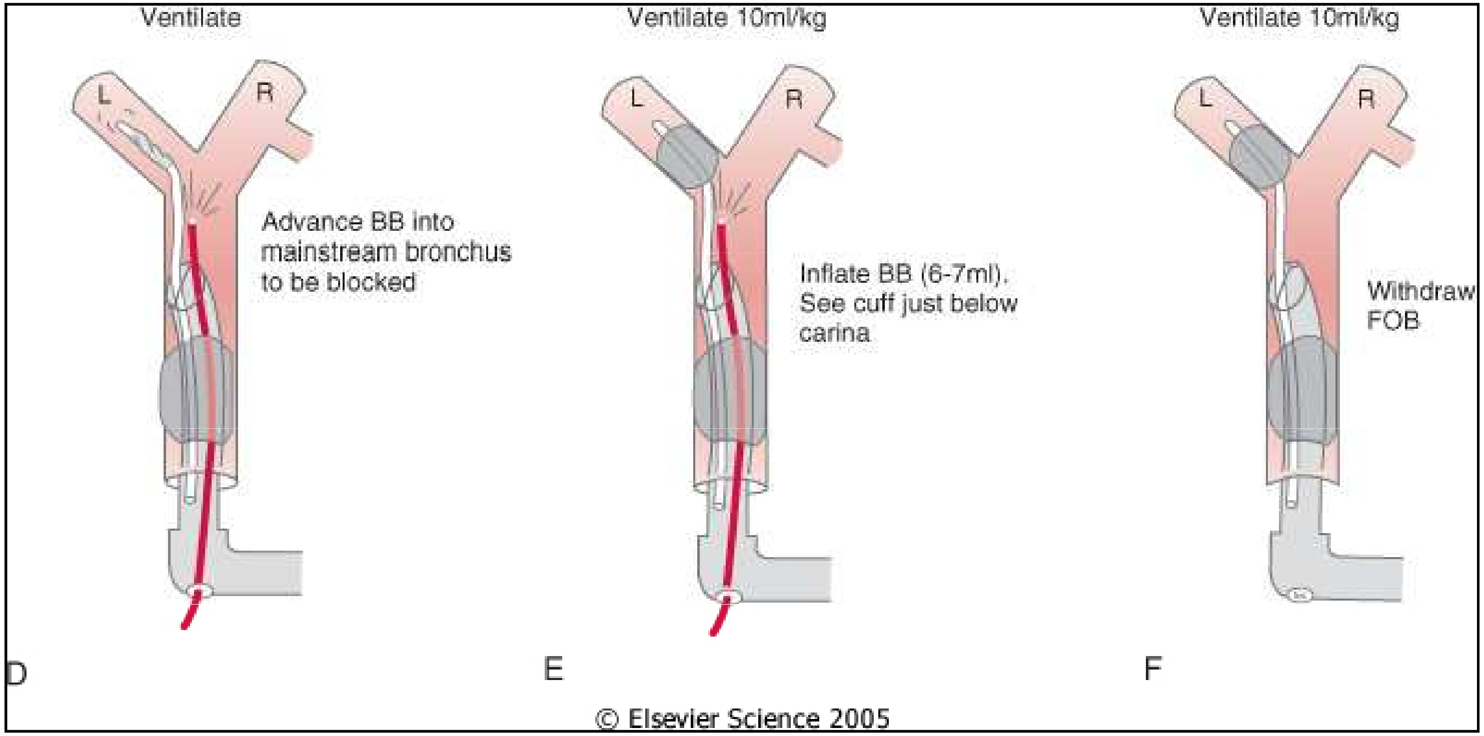


Figure 49-24 The sequential steps of the fiberoptic-aided method of inserting and positioning the Univent bronchial blocker (BB) in the left main stem bronchus are illustrated. One- or two-lung ventilation is achieved simply by inflating or deflating, respectively, the bronchial blocker balloon. FOB, fiberoptic bronchoscope.

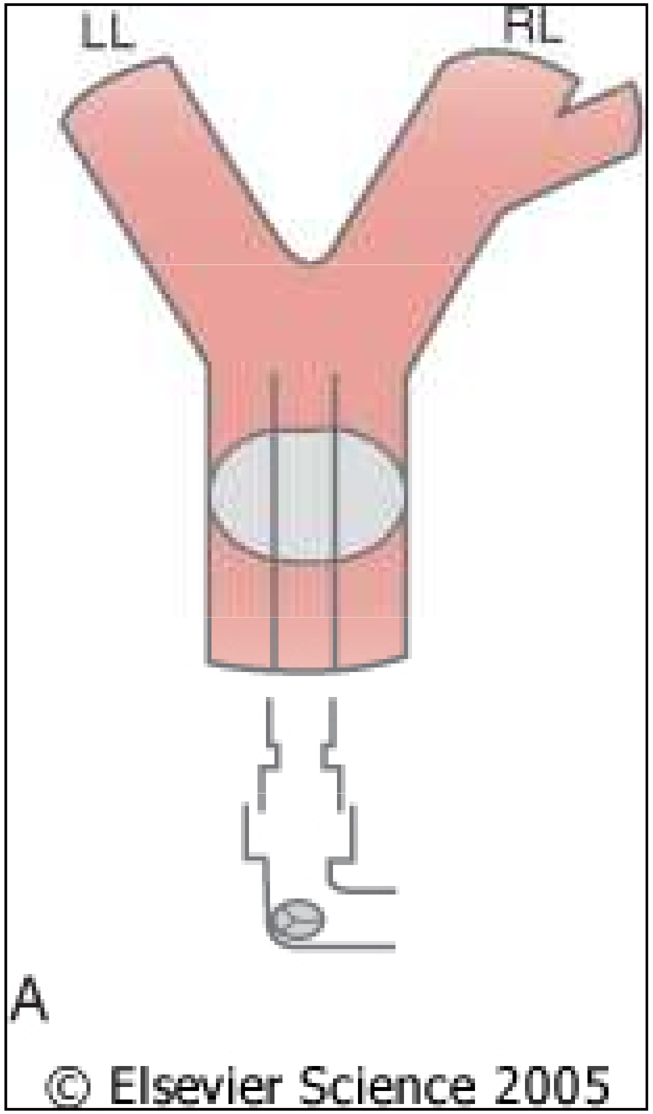


Figure 49-25 Lung separation with a single-lumen tube, fiberoptic bronchoscope, and right lung bronchial blocker. The sequence of events is as follows. A, A single-lumen tube is inserted and the patient is ventilated. B, A bronchial blocker is passed alongside the indwelling endotracheal tube. C, A fiberoptic bronchoscope is passed through a self-sealing diaphragm in the elbow connecter to the endotracheal tube and is used to place the bronchial blocker into the right main stem bronchus under direct vision. D, The balloon on the bronchial blocker is also inflated under direct vision and is positioned just below the tracheal carina. E, The fiberoptic bronchoscope is then removed. During the lower-panel sequence (insertion and use of the fiberoptic bronchoscope ([C to E]), the self-sealing diaphragm allows the patient to continue to be ventilated with positive-pressure ventilation (around the fiberoptic bronchoscope, but within the lumens of the endotracheal tube). LL, left lung; RL, right lung. (From Benumof JL: Anesthesia for Thoracic Surgery. Philadelphia, WB Saunders, 1987.)

indikace selektivní ventilace

absolutní

- infekce jedné plíce
- masivní krvácení
- bronchopleurální fistula
- jednostranná cysta
- alveolární proteinoza plíce
- tracheobronchiální disrupce
- těžká hypoxémie způsobená unilaterálním plicním onemocněním

relativní

- aneurysma hrudní aorty
- pneumonektomie,lobektomie horního laloku
- resekce jícnu
- lobektomie
- torakoskopie
- přední přístup k hrudní páteři
- bronchoalveolární laváž
- transplantace jedné plíce

Bronchospasmus

- chirurgickou manipulací,
- endobronchiální intubací přímým drážděním bronchů.
- Podíl anestetik:
  - halotan-bronchodilatační, sklon k arytmiím (zejména u pac. s Aminophyllinem a léčbou beta sympatomimetiky)
  - Izofluran, enfluran-bronchodilatační, nepatrný arytmogenní.
  - Inhalační anestetika snižují bronch. tonus,tlumí reflexy z DC vyvolané přímou chir.,minimální efekt HPV v dávkách do 1 MAC Manipulací, umožňují vyšší koncentrace kyslíku, aniž by se hloubka anestezie snížila , jsou rychle eliminována, což vede k rychlejší extubaci
  - Thiopental, Propanidin-uvolňuje histamin
  - Ketamin-bronchodilatační
  - Midazolam- zanedbatelný histaminogenní úč.
  - N2O-inhibuje HPV, může vyvolat plicní hypertenzi u některých pacientů.

Overall One-Lung Ventilation Plan

1. Maintain two-lung ventilation until pleura is opened

2. Dependent lung
   - $F_IO_2 = 1.0$
   - TV = 10ml/kg
   - RR = so that P_aCO_2 = 40mmHg
   - PEEP = 0-5 mmHg

3. If severe hypoxemia occurs
   - (a) Check position of double-lumen tube with fiberoptic bronchoscopy
   - (b) Check hemodynamic status
   - (c) Nondependent lung CPAP
   - (d) Dependent lung PEEP
   - (e) Intermittent two-lung ventilation
   - (f) Clamp pulmonary artery ASAP (for pneumonectomy)

Figure 49-33 An overall one-lung ventilation plan. ASAP, as soon as possible; CPAP, continuous positive airway pressure; Fio2, inspired oxygen concentration; PEEP, positive end-expiratory pressure; RR, respiratory rate; TV, tidal volume.

Pooperační respirační péče

Příčiny RI:

- narůstající kolaps alveolů
- pokles celk. plicního objemu, FRC a RV
- poruchy V/P
- nitroplicní pravolevý zkrat
- pokles compliabnce a zvýšení dechové práce

Pooperační respirační péče

Profylaxe

- dostatečná analgézie, kyslík
- fyzioterapie hrudníku
- dechová cvičení
- broncholýza sekretolýza

Pooperační analgézie:

- PCA-morphin; i.v. kont. Opioidy
- nejlépe epidurál
- paravertebrální, interpleurální- možné odsátí anestetika hrudními dreny, či naředení výpotkem, krví..
- mezižeberní nervové blokády?