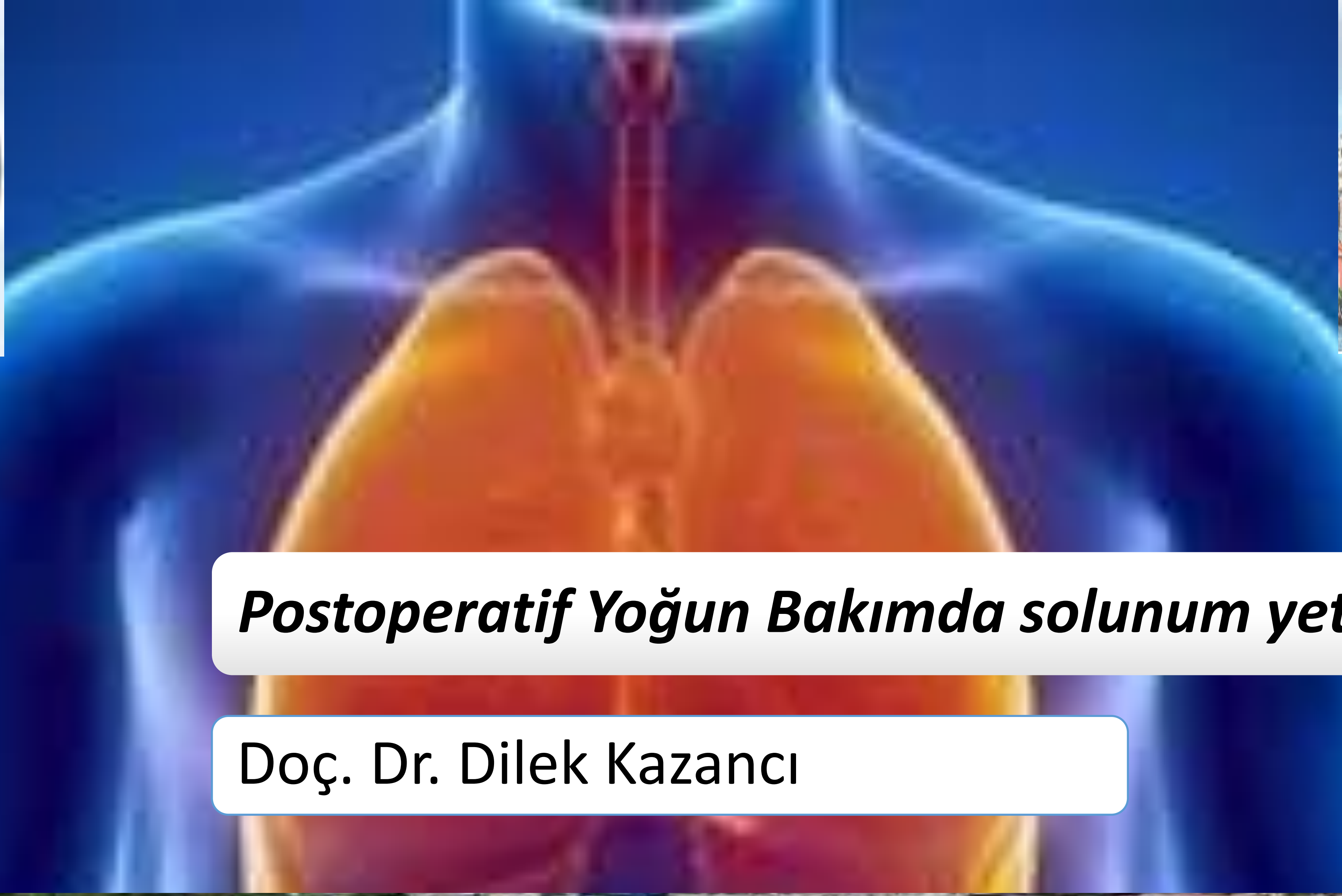
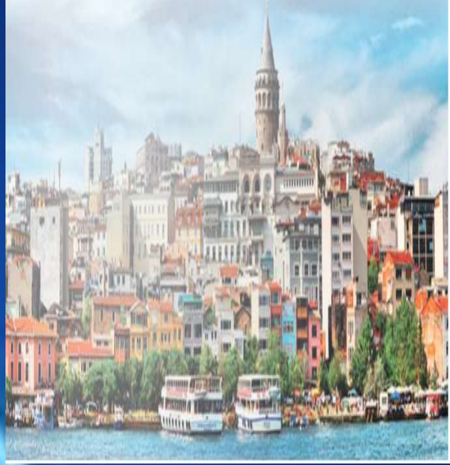




Postoperatif Yoğun Bakımda solunum yetmezliği

Doç. Dr. Dilek Kazancı

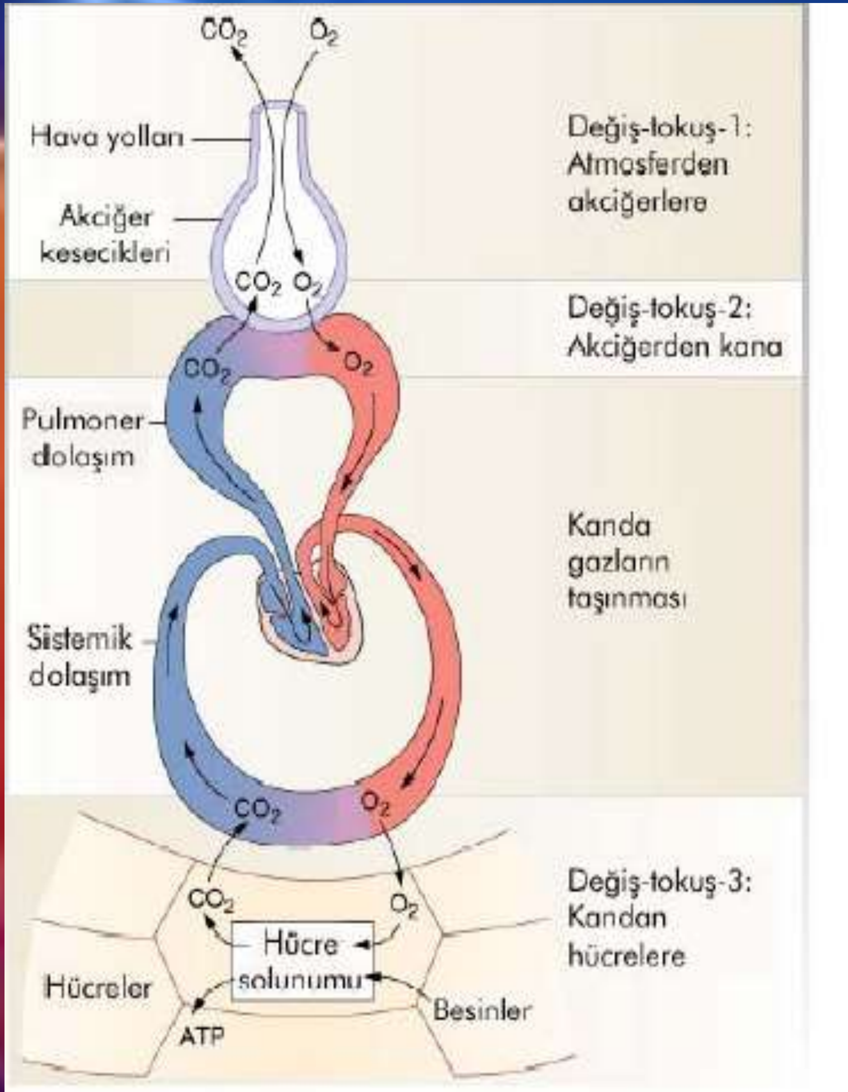
- Normal Akciğer Fizyolojisi
- Solunum Yetmezliği
- Preoperatif Risk Belirleme
- Postoperatif Pulmoner Komplikasyonlar
- Önleme Stratejileri
- Tedavi Stratejileri

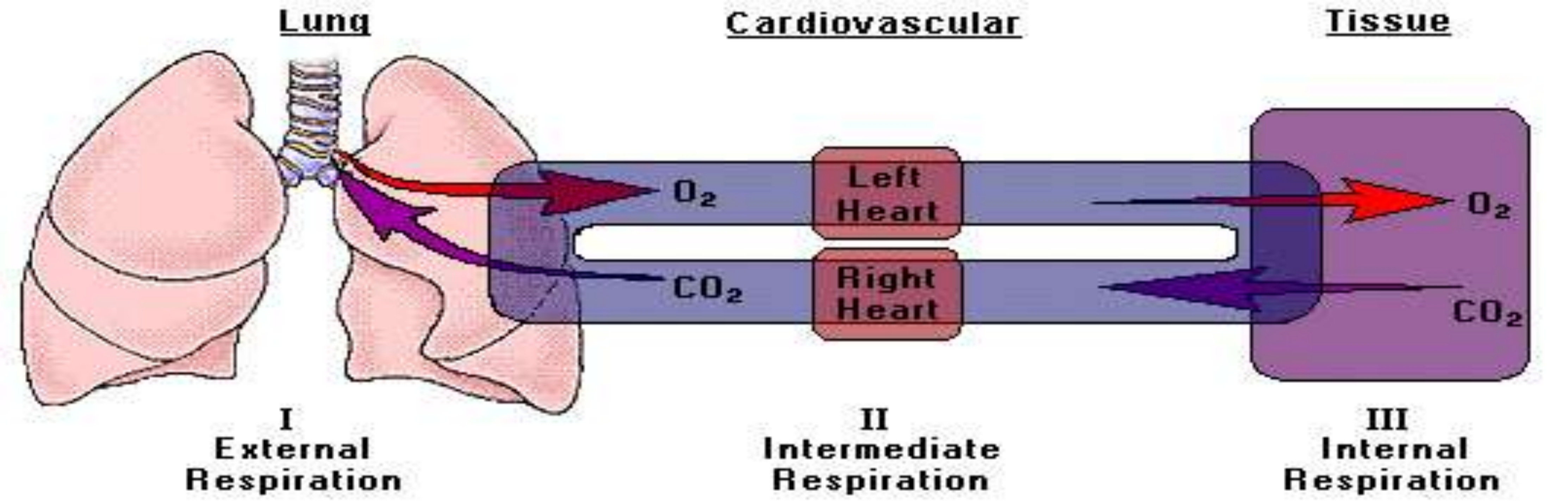
- Beyinden gelen sinir uyarısı
- Solunum kası kasılması
- İntratorasik basınç değişimi ve inspiratuar akım
- Gaz değişimi
- Respiratuar kas gevşemesi ve akciğerde geri dönme
- İntratorasik basınç değişimi ve ekspiratuar akım

“Solunum”

dış solunum (eksternal solunum)

iç solunum (internal solunum, hücresel solunum)




Lung
Cardiovascular
Tissue
O_2
Left Heart
O_2
CO_2
Right Heart
CO_2
I
External Respiration
II
Intermediate Respiration
III
Internal Respiration

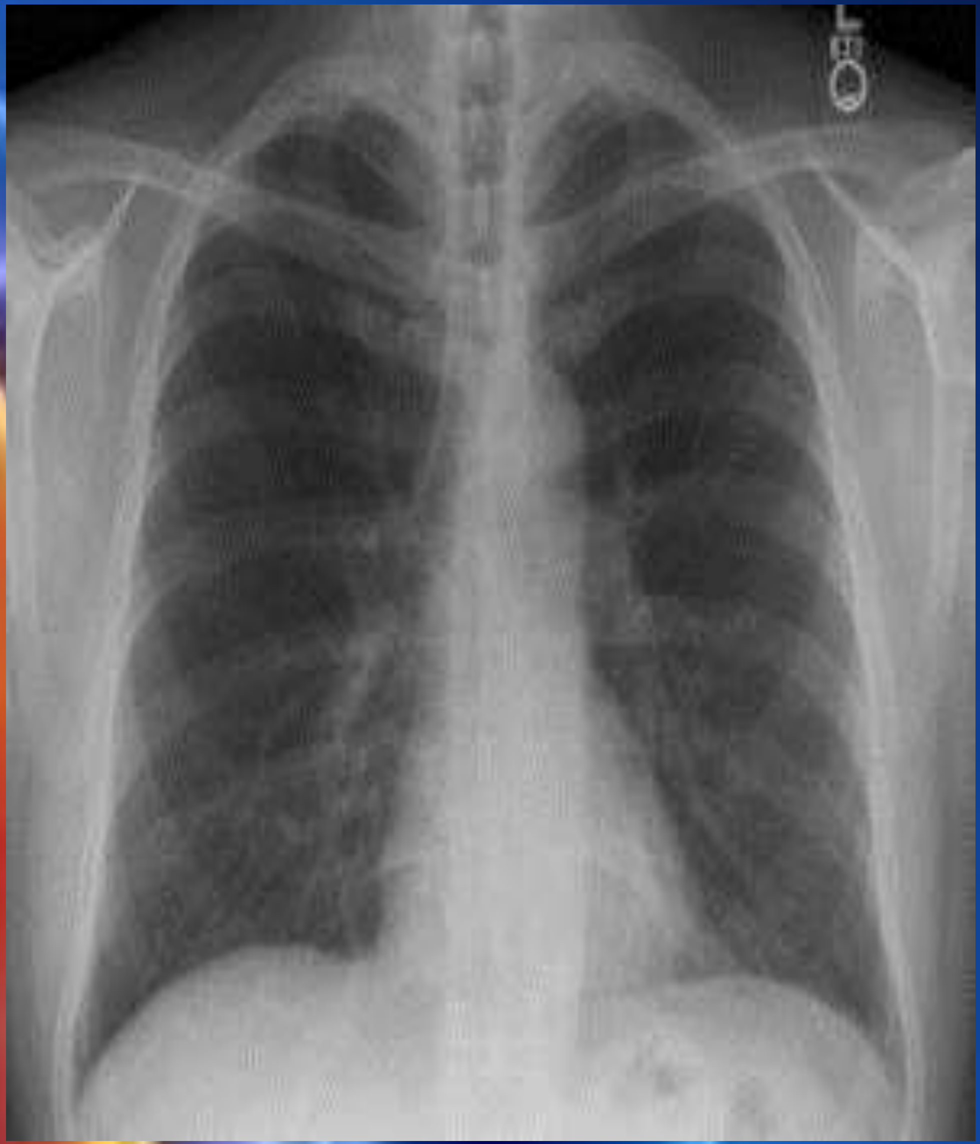
Sağlıklı Akciğer Fizyolojisi

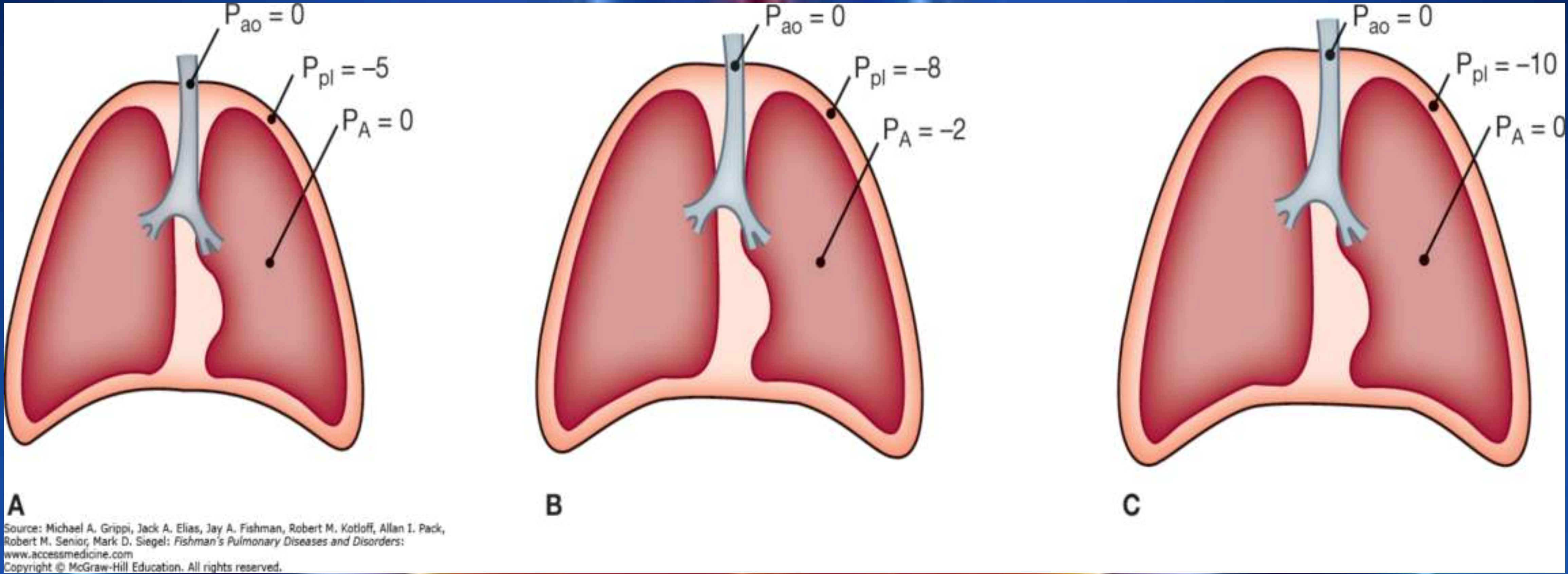
Normal ekspiryum sonunda istirahat halinde iken,plevral basınç -5cmH20, trakeobronşial ağaç ve alveol basıncı 0,   transpulmoner basınç 5 cmH20'dur.

İnspiryum sırasında,plevral basınç -8cmH20 alveoler basınç -2cmH20 değerindedir

İnspiryum sonunda,plevral basınç -10cmH20, alveoler basınç 0 dır.

Ekspirium başında inspiratuar kasların gevşemesi ile plevral basınç negatifliği ve transpulmoner basınç farkı azalır, alveoler basınç atmosfer basınç üstüne çıkar.





Solunum siklusu esnasında basınçlar. A. Expiryum sonu. B. İnspiryum sırasında. C. İnspiryum sonu P_{pl}, pleural basınç P_A, alveol basıncı; P_{ao}, havayolu basıncı

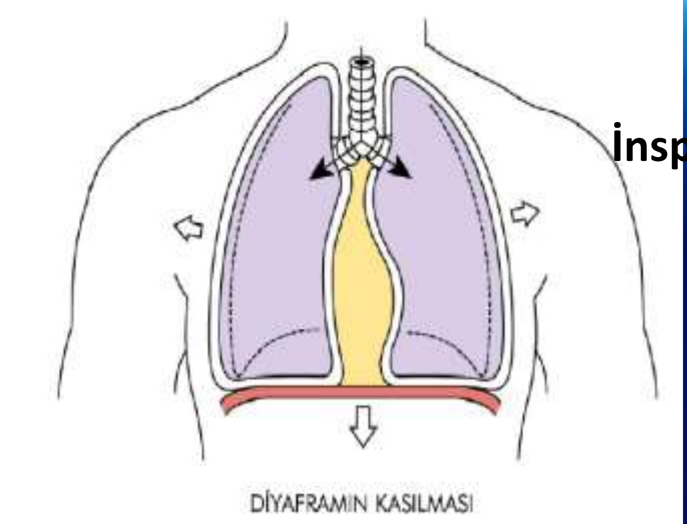
Source: Pulmonary Mechanics, *Fishman's Pulmonary Diseases and Disorders, 5e*

Citation: Grippi MA, Elias JA, Fishman JA, Kotloff RM, Pack AI, Senior RM, Siegel MD. *Fishman's Pulmonary Diseases and Disorders, 5e*; 2015 Available at: https://accessmedicine.mhmedical.com/content.aspx?bookid=1344&sectionid=72261336 Accessed: May 23, 2017

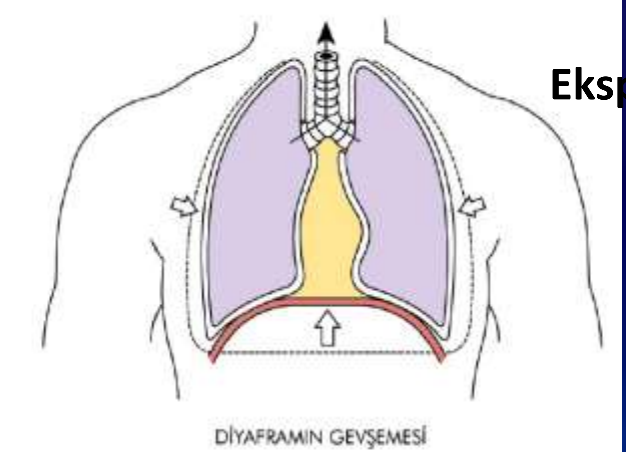
Diyafragma

Normal sakin solunumun % 75’i diyafragma hareketi iledir.

İnspirasyonda kasılır, göğüs transvers ve vertikal çapı artar, ekspirasyonda gevşer, göğüs transvers ve vertikal çapı azalır, AC’leri sıkıştırır.



İnspirasyon



Ekspirasyon

İnspirasyon kasları

Eksternal interkostal kaslar: Göğüs kafesini yükseltir (Sakin solunumda aktifdirler).

Sakin solunumda sabit olan *yardımcı inspirasyon kasları:*

M. Sternokleidomasteideus: Sternumu yükseltir.

M. Serrratus anterior: Kostaları yukarı kaldırır.

M. Scaleni: İlk 2 kostayı kaldırır.

Ekspirasyon kasları

- Sakin solunumda inspirasyonda görev alan kaslar ve AC’ler eski şeklini alır.
- İnternal interkostal kaslar: Kostaları aşağı, içe çeker.
- Zorlu solunumda, karın içi organları yukarı iten kaslar görev alır.
- M. rektus abdominalis
- M. internal / eksternal oblikus
- M. Transversus abdominalis

Postoperatif Pulmoner Disfonksiyon&Komplikasyon

PPD, artan nefes alma, sığ solunum, etkisiz öksürük ve hipoksemi gibi solunum fonksiyonlarında **beklenen** değişiklikler anlamına gelir

PPK tanısı semptomatik pulmoner disfonksiyon ve atelektazi gibi belirli bir tanı kriterini karşılayan ilgili klinik bulguları gerektirir.

Kardiyak cerrahi sonrası PPK ler üzerinde çok araştırma yapılmasına rağmen, araştırmacılar risk faktörleri, prediktörler, yönetim müdahaleleri ve bu komplikasyonlara ilerlemeden çok komplikasyonun sonuçlarını incelemişlerdir.

Bu yaklaşım kalp cerrahisi sonrası PPD'nin kaçınılmaz olduğunu veya bir PPK tanısı konmadan önce karşılaşabilecekleri işlev bozukluğu dizisini tanımakta zorluk çeken klinisyen tipini doğuracaktır

Postoperatif yoğun bakımda solunum yetmezliği

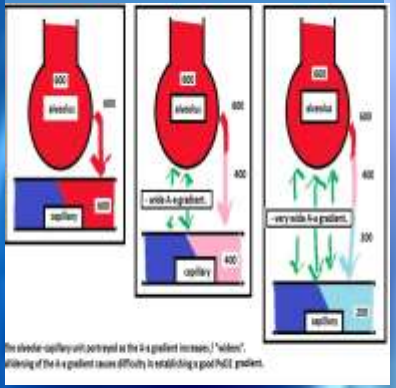
Gaz değişimi anomalileri

Akciğer mekaniklerinde değişimler

Kardiyak cerrahiye bağlı nedenler

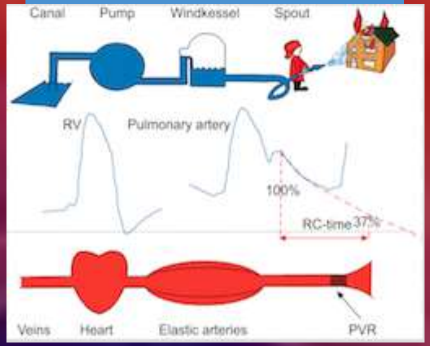
Gaz değişimi anomalileri

Alveoloarteriyel oksijen gradientinde genişleme

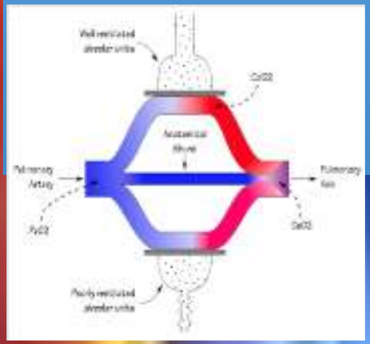


Artmış mikrovasküler permeabilite

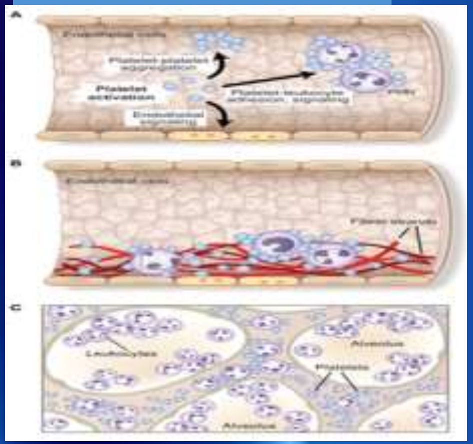
Artmış pulmoner vasküler direnç



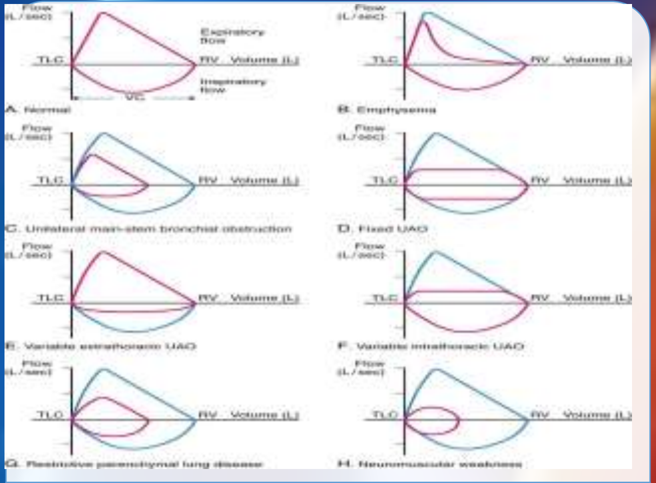
Artmış pulmoner şant fraksiyonu



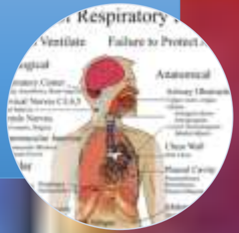
Lökosit ve plateletlerin intrapulmoner agregasyonu

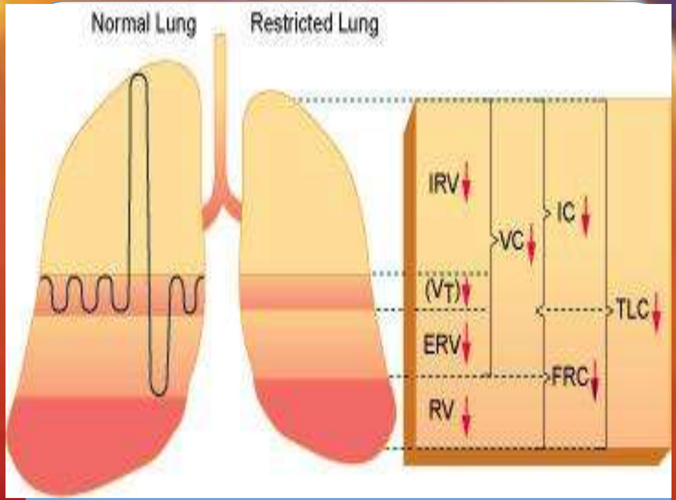


Akciğer mekaniklerinde değişimler

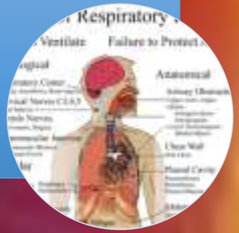


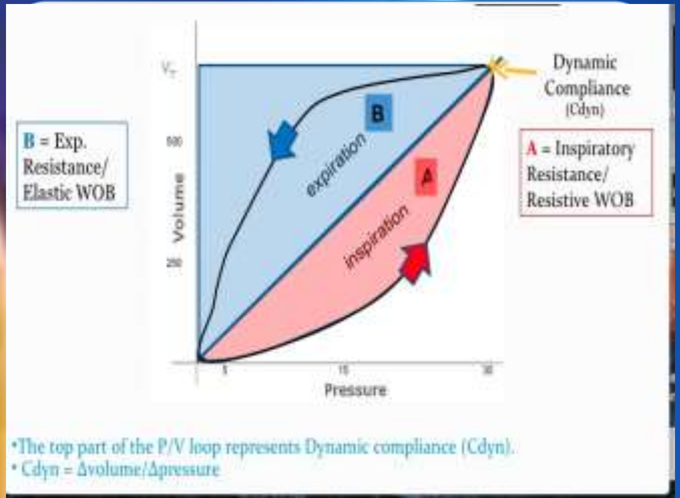
Vital kapasitede azalma



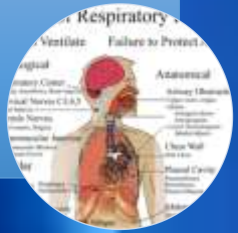


Fonksiyonel rezidüel kapasitede azalma





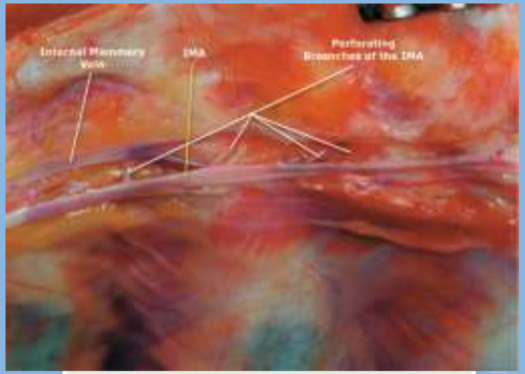
Statik ve dinamik akciğer kompliansında azalma



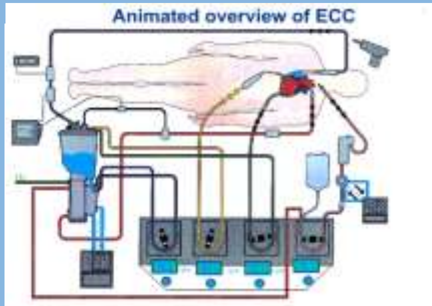
Kardiyak cerrahiye bağlı nedenler

Median sternotomi insizyonu

Kan ürünü transfüzyonu

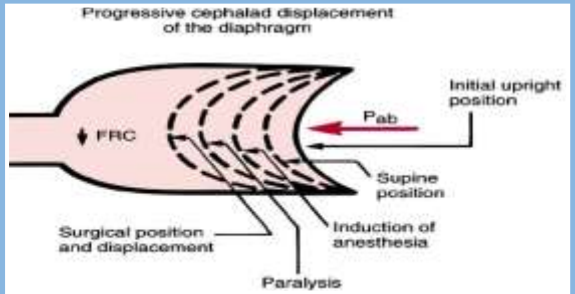


İnternel mammarian arterin diseksiyonu



EKD kullanımı

Miyokard koruması için topikal soğutma



Genel anestezi etkileri

Am J Crit Care September 2004 vol. 13 no. 5 384–393

Postoperative Pulmonary Dysfunction in Adults After Cardiac Surgery With Cardiopulmonary Bypass: Clinical Significance and Implications for Practice

Rochelle Wynne, RN, PGDACN (CTh), MEd, MRCNA and Mari Botti, RN, BA (Melb), GDAP, DipN, PhD, MRCNA

Rewiev

1980-2002

Preoperative

- Chronic obstructive pulmonary disease[17-21]
- Obesity[17,22-24]
- Age: >60 years,[25,26] >70 years,[19,20,23] >80 years[17,22,27,28]
- Diabetes[29]
- History of smoking[18,29,30]
- Chronic heart failure[17,20,22,29,31-33]
- Emergency surgery[22,23,25,34]
- Previous cardiac surgery[20,25]
- Immobility[35]

Intraoperative

- Respiratory depression[36]
- Neurological injury[37]
- Lung deflation[38]
- Cardiopulmonary bypass[36,39]
- Topical cooling[40,41]
- Internal mammary artery dissection[15,36,42-47]
- Sternotomy incision[48,49]
- Increased number of bypass grafts[44,50,51]
- Increased duration of cardiopulmonary bypass[22,23,31,34,44,50,52]
- Lower core temperature[22,34,50,53]

Postoperative

- Respiratory depression associated with nonreversal of anesthesia[36]
- Phrenic nerve dysfunction[54]
- Diaphragmatic dysfunction[55,56]
- Pain[57-60]
- Constant tidal volumes/short shallow respiration[48]
- Reduced compliance[61]
- Reduced vital capacity and functional residual capacity[62]
- Ventilation-perfusion mismatch and physiological shunt[35,63,54]
- Fluid imbalance[27,31,39,65]
- Immobility,[66,67] position[68]
- Chest tubes[69]
- Nasogastric tubes[70]
- Impaired mucocilliary clearance,[71] ineffective cough[14,72]
- Pleural effusion[47,73,74]
- Atelectasis[72,75-77]
- Pulmonary edema[4,7,78,79]
- Aspiration[80]

SPECIAL ARTICLES

Practice Advisory for Preanesthesia Evaluation

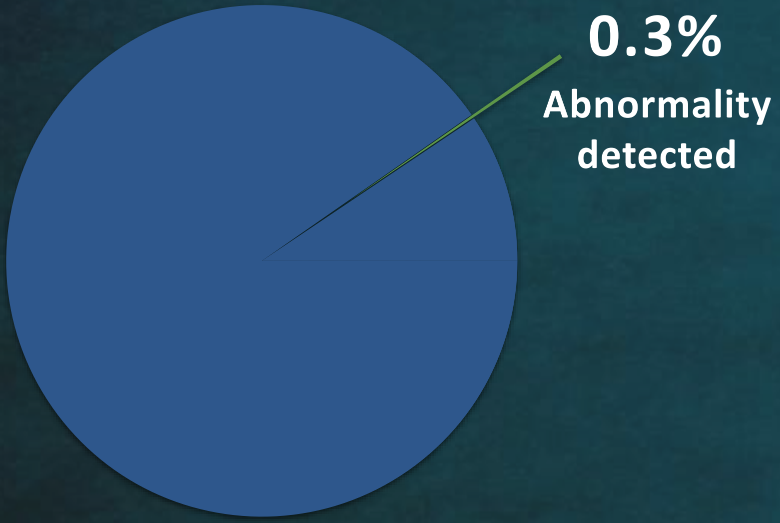
An Updated Report by the American Society of Anesthesiologists Task Force on Preanesthesia Evaluation

Anesthesiology 2012; 116:1–1

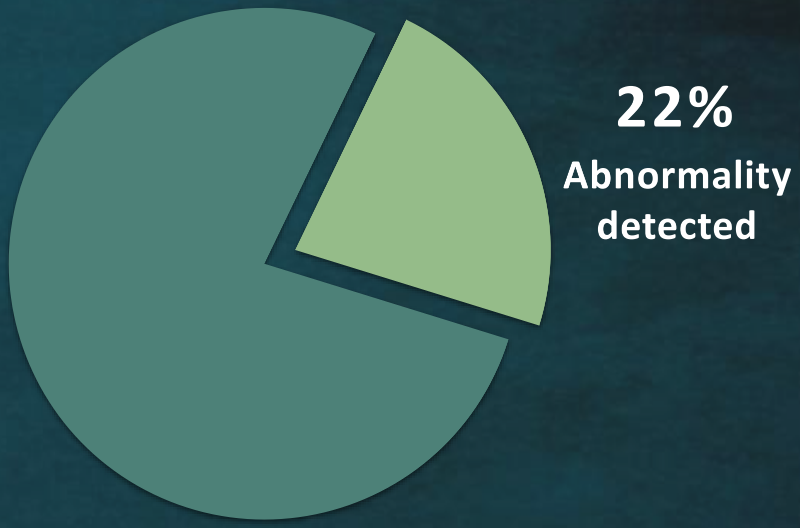
- Preanesthesia Chest Radiographs
  - Clinical characteristics to consider include smoking, recent upper respiratory infection, COPD, and cardiac disease.
    - The Task Force recognizes that chest radiographic abnormalities may be higher in such patients but does not believe that extremes of age, smoking, stable COPD, stable cardiac disease, or resolved recent upper respiratory infection should be considered unequivocal indications for chest radiography.
- Preanesthesia Pulmonary Evaluation Other than Chest X-ray
  - Preanesthesia pulmonary evaluation other than chest x-ray may include consultation with specialists and tests that range from noninvasive passive or provocative screening tests (*e.g.*, pulmonary function tests, spirometry, pulse oximetry) to invasive assessment of pulmonary function (*e.g.*, arterial blood gas).
    - Anesthesiologists should balance the risks and costs of these evaluations against their benefits.
    - Clinical characteristics to consider include type and invasiveness of the surgical procedure, interval from previous evaluation, treated or symptomatic asthma, symptomatic COPD, and scoliosis with restrictive function.

Biz:PA Akciğer
Konsültan:
Pulmoner fonksiyon testleri
Spirometre
Pulse oksimetre
AKG

AKCİĞER GRAFİSİ



Patient without risk factor



Patient with risk factors (cardiac or pulmonary diseases)

Rucker L, Frye EB, Staten MA. *JAMA* 1983; 40: 1022.

Ancak artık bu testler risk belirlemede yetersiz

Çok SKOR

Preop rutin
- Düz Grafi
- SFT
- AKG

Altta yatan hastalık
- KOAH CAT SKORU
- OBEZ OSA BMI Mallampati
- Astım

Cerrahi risk
- STS
- EUROSCORE
- GOLDMAN

Postop Pulmoner Komp
- ASA
- GUPTA
- AROUZULLAH
- CANET

Postoperatif Pulmonary Risk Tahmini

- 2 recently developed prediction tools
- National Surgery Quality Improvement Program Risk Calculator (NSQIP) AKA Gupta Criteria
- VASQUIP Arouzullah criteria
- Respiratory failure
- Pneumonia

Calculate by QxMD

iPad iPhone BlackBerry Android

Gupta Perioperative Risk Calculators

- Prospective, multicenter data set
- 183 academic and community hospitals
- American College of Surgeons National Surgical Quality Improvement Program (NSQIP)
- 211,410 patients undergoing major surgery

Surgicalriskcalculator.com

Gupta et al. CHEST 2011; 140(5):1207–1215
Gupta et al. May Clin Proc 2013; 88(11):1241–1249

Prediktif Risk Faktörleri

POSTOP RESPIRATORY FAILURE

- **ASA class**
- **Dependent functional status**
- **Emergency procedure**
- **Preoperative sepsis**
- **Type of surgery**

Mayo Clin Proc 2013;88:1241

CHEST 2011;140:1207

POSTOP PNEUMONIA

- **Age**
- **ASA class**
- **COPD**
- **Dependent functional status**
- **Preoperative sepsis**
- **Smoking in past year**
- **Type of surgery**

VASQIP (Arozullah) Indices

Ann Intern Med 2001;135:847

Table 4. **Postoperative Pneumonia Risk Index**

Preoperative Risk Factor	Point Value
Type of surgery	
Abdominal aortic aneurysm repair	15
Thoracic	14
Upper abdominal	10
Neck	8
Neurosurgery	8
Vascular	3
Age	
≥80 y	17
70–79 y	13
60–69 y	9
50–59 y	4
Functional status	
Totally dependent	10
Partially dependent	6
Weight loss > 10% in past 6 months	7
History of chronic obstructive pulmonary disease	5
General anesthesia	4
Impaired sensorium	4
History of cerebrovascular accident	4
Blood urea nitrogen level	
<2.86 mmol/L (<8 mg/dL)	4
7.85–10.7 mmol/L (22–30 mg/dL)	2
≥10.7 mmol/L (≥30 mg/dL)	3
Transfusion > 4 units	3
Emergency surgery	3
Steroid use for chronic condition	3
Current smoker within 1 year	3
Alcohol intake > 2 drinks/d in past 2 weeks	2

Ann Surgery 2000;232:242

Table 6. RESPIRATORY FAILURE RISK INDEX

Preoperative Predictor	Point Value
Type of surgery	
Abdominal aortic aneurysm	27
Thoracic	21
Neurosurgery, upper abdominal, or peripheral vascular	14
Neck	11
Emergency surgery	11
Albumin (<30 g/L)	9
Blood urea nitrogen (>30 mg/dL)	8
Partially or fully dependent functional status	7
History of chronic obstructive pulmonary disease	6
Age (years)	
≥70	6
60–69	4

	Gupta	Arozullah
Methodology	NSQIP databases, Prospective cohorts	VASQIP database, Prospective cohorts
Patient Population	468,795 patients in 183-211 community & academic hospitals	316,071 patients in 100 VA hospitals
Date of development	2007/2008	1995-1999
Outcomes	Respiratory Failure Pneumonia	Respiratory Failure Pneumonia
C-statistic	Resp Failure: 0.897 Pneumonia: 0.855	Resp Failure: 0.834 Pneumonia: 0.817
Notable limitations	No OSA, asthma, h/o VTE, PFTs	Veterans, almost no females, Surgeries classified on incision site and not organ involved

Canet Risk Index

Factor score	Adjusted odds ratio	Risk
Age ≤50 years	1	0
51-80	1.4 (0.6-3.3)	3
>80	5.1 (1.9-13.3)	16
Preoperative O	1	0
91-95%	2.2 (1.2-4.2)	8
≤90%	10.7 (4.1-28.1	24
Respiratory infection in the last month	5.5 (2.6-11.5)	17
Preoperative anemia (Hb ≤10 g/dL)	3.0 (1.4-6.5)	11

Canet J, Gallart L, Gomar C, et al. *Anesthesiology* 2010; 113:1338.

Factor	Adjusted odds ratio	Risk score
Surgical incision in upper abdomen	1	0
>80	5.1 (1.9-13.3)	16
Duration of surgery ≤2 hours	1	0
2-3 hours	2.2 (1.2-4.2)	8
>3 hours	10.7 (4.1-28.1	24
Emergency surgery	5.5 (2.6-11.5)	17

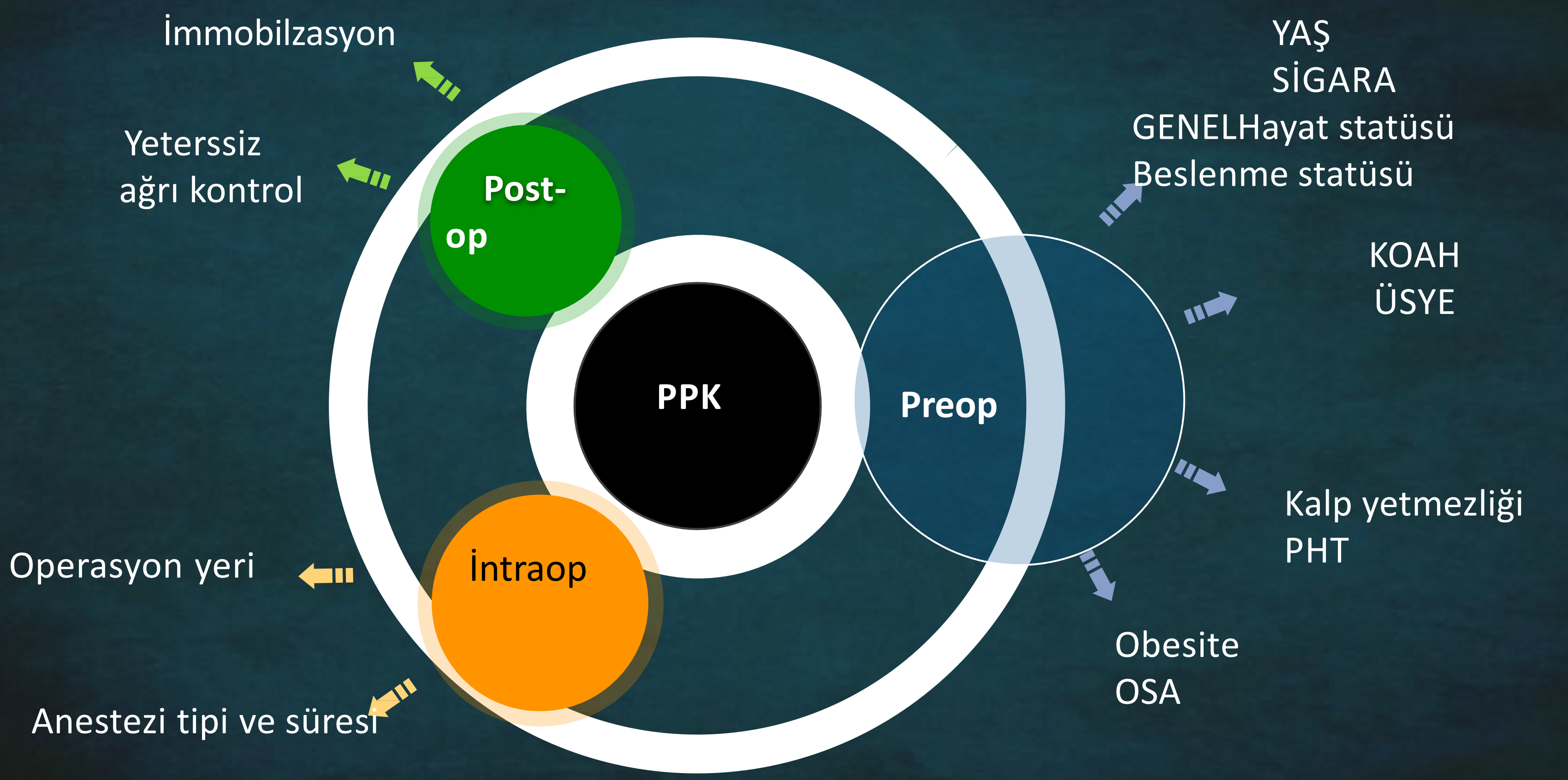
Pulmonary complication rate:

Low risk (1.6%)
<26 points

Moderate risk (13.3)%)
26-44 points

High risk (42.1%)
≥45 points

PPK ile ilişkili Patolojiler



Klinik Manifestasyonlar

Plevral effüzyon

Atelektazi

Altta yata hastalığın alevlenmesi

Pnömoni

Post op hipoksemi

- Uzamış ventilasyon desteği
- ARDS

SURGİCAL CRİTİCAL CARE 2012

Hypoxemic respiratory failure (type I), defined as arterial partial pressure of oxygen (PaO2) <60 mm Hg on room air, is the most common form of respiratory failure, and hypoxemia is a major immediate threat to organ function.

Hypercapnic respiratory failure (type II) is defined as arterial partial pressure of carbon dioxide (PaCO2) of >50 mm Hg on room air.

Acute lung injury (ALI) and ARDS

TABLE 2: Specific interventions to reduce the risk for postoperative pulmonary complications (PPCs)

Risk reduction strategy	Strength of evidence*	Type of complication
Postoperative lung expansion modalities	A	Atelectasis, pneumonia, bronchitis, severe hypoxemia
Selective postoperative nasogastric decompression	B	Atelectasis, pneumonia, aspiration
Short-acting neuromuscular blockade	B	Atelectasis, pneumonia
Laparoscopic (vs open) operation	C	Spirometry, atelectasis, pneumonia, overall respiratory complications
Smoking cessation	I	Postoperative ventilator support
Intraoperative neuraxial blockade	I	Pneumonia, postoperative hypoxia, respiratory failure
Postoperative epidural analgesia	I	Atelectasis, pneumonia, respiratory failure
Immunonutrition	I	Overall infectious complications, pneumonia, respiratory failure
Routine total parenteral or enteral nutrition†	D	Atelectasis, pneumonia, empyema, respiratory failure
Right heart catheterization	D	Pneumonia

*A, good evidence that the strategy reduces the risk for PPCs and benefit outweighs harm; B, at least fair evidence that the strategy reduces the risk for PPCs and benefit outweighs harm; C, at least fair evidence that the strategy may reduce the risk for PPCs, but the balance between benefit and harm is too close to justify a general recommendation; D, at least fair evidence that the strategy does not reduce the risk for PPCs or harm outweighs benefit; I, evidence of effectiveness of the strategy to reduce the risk for PPCs is conflicting, of poor quality, lacking, or insufficient or the balance between benefit and harm cannot be determined.

†Evidence remains uncertain (strength of evidence I) for severely malnourished patients or when a protracted time of inadequate nutritional intake is anticipated.

From Lawrence VA, Cornell JE, Smetana GW: Strategies to reduce postoperative pulmonary complications after noncardiothoracic surgery: systematic review for the American College of Physicians. Ann Intern Med *144:596–608, 2006.*

ARDS BERLİN KRİTERLERİ

TABLE 6: New acute respiratory distress syndrome "Berlin" definition 2012

Acute respiratory distress	Syndrome (ARDS)
Timing	Within 1 week of a known clinical insult or new or worsening respiratory symptoms *(New addition, AECC stated "acute onset" with no definition)*
Chest imaging	Bilateral opacities on chest radiograph or chest computed tomographic scan *(No change from AECC definition)*
Origin of edema	Respiratory failure not fully explained by cardiac failure or fluid overload *(No change from AECC definition, but removed pulmonary artery wedge pressure criterion from definition given declining use of PA catheters)*
Oxygenation	
Mild	PaO_2/FiO_2 ratio 201-300 mm Hg with PEEP or CPAP $\geq$ 5 cm H_2O *(The term "acute lung injury, ALI" in AECC definition was removed, and added a minimum level of PEEP)*
Moderate	PaO_2/FiO_2 ratio 101-200 mm Hg with PEEP $\geq$ 5 cm H_2O
Severe	PaO_2/FiO_2 ratio $\leq$ 100 mm Hg with PEEP $\geq$ 5 cm H_2O

AECC, American-European Consensus Conference; *CPAP*, continuous positive airway pressure; *FiO_2*, fraction of inspired oxygen; *PA*, pulmonary artery catheter; *PaO_2*, partial pressure of arterial oxygen; *PEEP*, positive end-expiratory pressure.

Adapted from: The ARDS Definition Task Force, Ranieri VM, Rubenfeld GD, et al: Acute respiratory distress syndrome: the Berlin definition. JAMA

Önleyici stratejiler

PREOP

- Sigara yı bıraktır
- AC hastalığını optimize et
- Enf varsa ertele
- Antibiotik eğer üsye varsa
- Akciğer kompliansını arttırıcı egzersizler

INTRAOP

- Minimal ve kısa prosedür
- Rejyonel kullanımı
- Uzun etkilş NMB den kaçın

POSTOP

- Akciğer FZT
- Epidural Ağrı Önlemi
- Mümkünse NG yi çıkar

LUNG SAFE NIV KULLANIMI 2016 JAMA

Noninvasive Ventilation of Patients with Acute Respiratory Distress Syndrome. Insights from the LUNG SAFE Study

Giacomo Bellani NIV, C. Guerin IMV

PLUG GROUP ECMO GROUP of ESICM

PaO2/FiO2 over 150 group higher mortality with NIV

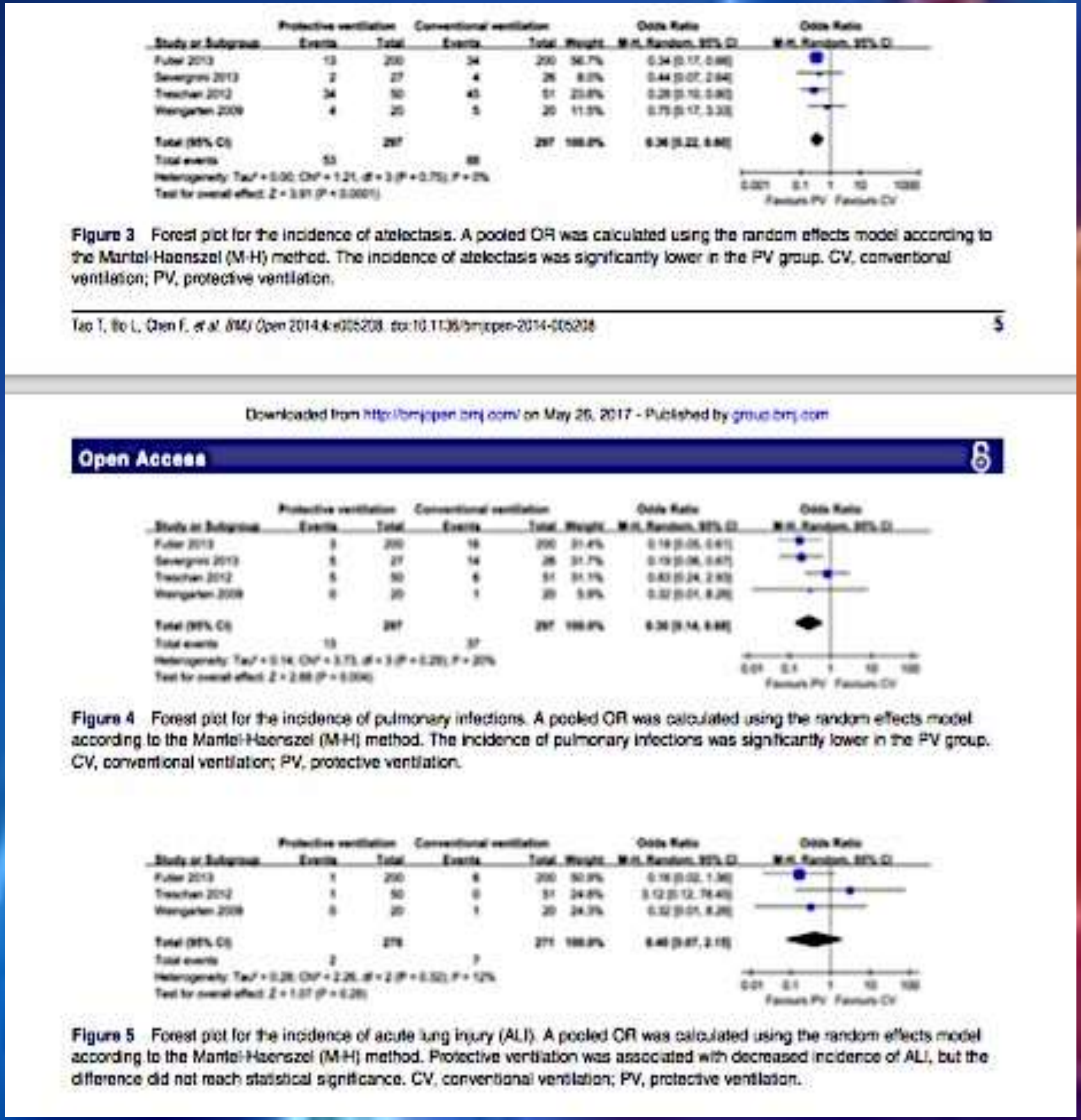


Figure 3 Forest plot for the incidence of atelectasis. A pooled OR was calculated using the random effects model according to the Mantel-Haenszel (M-H) method. The incidence of atelectasis was significantly lower in the PV group. CV, conventional ventilation; PV, protective ventilation.

Tao T, Bo L, Chen F, *et al*. *BMJ Open* 2014;4:e005208. doi:10.1136/bmjopen-2014-005208 5

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Figure 4 Forest plot for the incidence of pulmonary infections. A pooled OR was calculated using the random effects model according to the Mantel-Haenszel (M-H) method. The incidence of pulmonary infections was significantly lower in the PV group. CV, conventional ventilation; PV, protective ventilation.

Figure 5 Forest plot for the incidence of acute lung injury (ALI). A pooled OR was calculated using the random effects model according to the Mantel-Haenszel (M-H) method. Protective ventilation was associated with decreased incidence of ALI, but the difference did not reach statistical significance. CV, conventional ventilation; PV, protective ventilation.

- Derleme
- Knvansiyonel&Protektif ventilasyon grubu
- Pulmoner İnf ve atelektazi riskinde azalma anlamlı
- ALI gelişimi azalıyor ama istatistiki anlamlı değil

Tao T, Bo L, Chen F, et al. BMJ Open 2014;4:e005208. doi:10.1136/bmjopen-2014-005208

AMERICAN THORACIC SOCIETY DOCUMENTS

An Official American Thoracic Society/European Society of Intensive Care Medicine/Society of Critical Care Medicine Clinical Practice Guideline: Mechanical Ventilation in Adult Patients with Acute Respiratory Distress Syndrome

Eddy Fan, Lorenzo Del Sorbo, Ewan C. Goligher, Carol L. Hodgson, Laveena Munshi, Allan J. Walkey, Neill K. J. Adhikari, Marcelo B. P. Amato, Richard Branson, Roy G. Brower, Niall D. Ferguson, Ognjen Gajic, Luciano Gattinoni, Dean Hess, Jordi Mancebo, Maureen O. Meade, Daniel F. McAuley, Antonio Pesenti, V. Marco Ranieri, Gordon D. Rubenfeld, Eileen Rubin, Maureen Seckel, Arthur S. Slutsky, Daniel Talmor, B. Taylor Thompson, Hannah Wunsch, Elizabeth Uleryk, Jan Brozek, and Laurent J. Brochard; on behalf of the American Thoracic Society, European Society of Intensive Care Medicine, and Society of Critical Care Medicine

THIS OFFICIAL CLINICAL PRACTICE GUIDELINE OF THE AMERICAN THORACIC SOCIETY (ATS), EUROPEAN SOCIETY OF INTENSIVE CARE MEDICINE (ESICM), AND SOCIETY OF CRITICAL CARE MEDICINE (SCCM) WAS APPROVED BY THE ATS, ESICM, AND SCCM, MARCH 2017

Background: This document provides evidence-based clinical practice guidelines on the use of mechanical ventilation in adult patients with acute respiratory distress syndrome (ARDS).

Methods: A multidisciplinary panel conducted systematic reviews and metaanalyses of the relevant research and applied Grading of Recommendations, Assessment, Development, and Evaluation methodology for clinical recommendations.

Results: For all patients with ARDS, the recommendation is strong for mechanical ventilation using lower tidal volumes (4–8 ml/kg predicted body weight) and lower inspiratory pressures (plateau pressure < 30 cm H_2O) (moderate confidence in effect estimates). For patients with severe ARDS, the recommendation is strong for prone positioning for more than 12 h/d (moderate confidence in effect estimates). For patients with moderate or severe ARDS, the recommendation is strong against routine use of high-frequency oscillatory ventilation (high confidence in effect estimates) and conditional for higher positive end-expiratory pressure (moderate confidence in effect estimates) and recruitment maneuvers (low confidence in effect estimates). Additional evidence is necessary to make a definitive recommendation for or against the use of extracorporeal membrane oxygenation in patients with severe ARDS.

Conclusions: The panel formulated and provided the rationale for recommendations on selected ventilatory interventions for adult patients with ARDS. Clinicians managing patients with ARDS should personalize decisions for their patients, particularly regarding the conditional recommendations in this guideline.

Kuvvetli öneriler

4-8 ml/kg PBW

PIP 30 mmHg

Prone 12h/günb

No High freq oss ventilation

Yüksek PEEP Orta Öneri

Recruitment MNV Düşük Öneri

ECMO ek kanıt gerekli

ARDSNET → ART

ClinicalTrials.gov

Try our beta test site

IMPORTANT: Listing of a study on this site does not reflect endorsement by the National Institutes of Health. Talk with a trusted healthcare professional before volunteering for a study. Read more...

ART - Alveolar Recruitment for Acute Respiratory Distress Syndrome Trial (ART)

This study is ongoing, but not recruiting participants.

Sponsor:
Hospital do Coracao

Information provided by (Responsible Party):
Hospital do Coracao

ClinicalTrials.gov Identifier:
NCT01374022

First received: June 13, 2011
Last updated: May 8, 2017
Last verified: May 2017
History of Changes

Full Text View | Tabular View | No Study Results Posted | Disclaimer | How to Read a Study Record

Table 2

Summary of mechanical ventilation procedures in the ART strategy groupvs.ARDSNet strategy group

Procedure	ART strategy: maximum alveolar recruitment maneuver associated with PEEP titration	ARDSNet strategy
Alveolar recruitment maneuver	Yes (see Figure 1)	No
Ventilation mode	Volume-controlled	Volume-controlled
Target plateau pressure and driving pressure	Plateau ≤30 cmH_2O	Plateau ≤30 cmH_2O
Target tidal volume	4 to 6 mL/kg of predicted body weight	4 to 6 mL/kg of predicted body weight
Respiratory rate and pH goal	6 to 35/min, adjusted for pH ≥ 7.30 if possible	6 to 35/min, adjusted for pH ≥ 7.30 if possible

I:E ratio	1:1 to 1:2; flow 60 L/min; inspiratory pause 0.5 s	1:1 to 1:2; flow 60 L/min; inspiratory pause 0.5 s
Oxygenation goals		
PaO_2	60 to 80 mmHg	55 to 80 mmHg
SpO_2	90 to 95%	88 to 95%
PEEP and FiO_2 adjustment	PEEP titration 2 cmH_2O above PEEP value associated with maximum compliance. FiO_2 titration adjusted according to oxygenation goals	According to PEEP/FiO_2 combination table
Weaning	After 24 h with $PaO_2/FiO_2 \geq 300$ (or stable/ascending) start weaning from PEEP 2 cmH_2O every 8 h. Consider pressure support ventilation after PEEP $\leq$ 14 cmH_2O. Spontaneous ventilation test in PS = 5 cmH_2O and PEEP = 5 cmH_2O. Routine use of NIV immediately after extubation is encouraged	Weaning from PEEP according to table of PEEP and FiO_2 combinations. Consider pressure support ventilation after PEEP $\leq$ 14 cmH_2O. Spontaneous ventilation test in PS = 5 cmH_2O and PEEP = 5 cmH_2O. Routine use of NIV immediately after extubation is encouraged

Nasıl Recruitment yapacak???

Recruitment starts with PEEP of 25 cmH2O and driving pressure of 15 cmH2O. These parameters will be maintained for 1 min;

Following this, PEEP will be increased to 35 cmH2O with other parameters maintained for 1 min;

Lastly, PEEP will be increased to 45 cmH2O with other parameters maintained for 2 min.

EOLİA 2018

ClinicalTrials.gov

Try our beta test site

IMPORTANT: Listing of a study on this site does not reflect endorsement by the National Institutes of Health. Talk with a trusted healthcare professional before volunteering for a study. Read more...

Extracorporeal Membrane Oxygenation for Severe Acute Respiratory Distress Syndrome (EOLIA)

This study is currently recruiting participants. (see Contacts and Locations)

Verified December 2016 by Assistance Publique - Hôpitaux de Paris

Sponsor:
Assistance Publique - Hôpitaux de Paris

Collaborator:
Maquet Cardiopulmonary AG

Information provided by (Responsible Party):
Assistance Publique - Hôpitaux de Paris

ClinicalTrials.gov Identifier:
NCT01470703

First received: November 9, 2011
Last updated: March 21, 2017
Last verified: December 2016
History of Changes

Randomization

Experimental Treatment Arm

– Venovenous ECMO will be started as rapidly as possible
– Mechanical ventilation settings: volume-assist control mode, FiO_2 30–60%, PEEP ≥10 cm H_2O, V_T lowered to obtain a plateau pressure ≤20 cm H_2O, RR 10–30/minute or APRV mode with high pressure level ≤20 cm H_2O an low pressure level ≥10 cm H_2O
– ECMO weaning according to protocol

Control Conventional Treatment Arm

– Conventional management of ARDS
– Ventilatory settings: volume-assist control mode, V_T 6 ml/kg of ideal body weight and PEEP adapted so as not to exceed plateau pressure of 28–30 cm H_2O
– In the case of refractory hypoxemia, the usual adjunctive therapeutics can be used: NO, prone position, HFO ventilation, almitrine infusion
– Cross-over option to ECMO possible if refractory hypoxemia defined as SaO2 <80% for >6 hours, despite mandatory use of recruitment maneuvers, and inhaled NO/prostacyclin and if technically possible a test of prone position.

SOLVE bekliyoruz

Strategies for Optimal Lung Ventilation in ECMO for ARDS: The SOLVE ARDS Study (SOLVE ARDS)

The recruitment status of this study is unknown. The completion date has passed and the status has not been verified in more than two years.

Verified November 2014 by Eddy Fan, University of Toronto.
Recruitment status was: Recruiting

Sponsor:
University of Toronto

Collaborators:
University Health Network, Toronto
The Physicians' Services Incorporated Foundation

Information provided by (Responsible Party):
Eddy Fan, University of Toronto

ClinicalTrials.gov Identifier:
NCT01990456

First received: November 6, 2013
Last updated: November 5, 2014
Last verified: November 2014
History of Changes

Full Text View | **Tabular View** | **No Study Results Posted** | Disclaimer | How to Read a Study Record

Purpose

Due to lack of studies on mechanical ventilation strategies in patients with severe Acute Respiratory Distress Syndrome (ARDS) supported with Veno-Venous Extra-Corporeal Membrane Oxygenation (VV ECMO), ventilator settings in this patient population are set arbitrarily.

In this two-phases prospective, interventional, pilot study we hope to gain physiologically relevant data on two aspects of mechanical ventilation in patients with severe ARDS supported with VV ECMO: (1) the use of tidal ventilation and (2) the level of Positive End-Expiratory Pressure (PEEP).

1. PHASE 1: impact of tidal ventilation on VILI (10 patients) We hypothesized that a CPAP strategy that minimizes end-tidal pulmonary stress and strain mitigates VILI compared to the current mechanical ventilation practice that employs tidal ventilation in patients with severe ARDS on ECMO. In this first phase we will test whether administering a distending inspiratory pressure to produce tidal ventilation is superior to a strategy where only continuous positive airway pressure (CPAP) is applied for ventilation induced lung injury (VILI) mitigation, as assessed by its impact on biotrauma (serum cytokines) and physiologic measurements.
2. PHASE 2: impact of PEEP on VILI (10 patients) We also hypothesized that adjusting PEEP to maximize respiratory system compliance reduces VILI in patients with severe ARDS on ECMO.

Chiu et al. Ann. Intensive Care (2017) 7:12
DOI 10.1186/s13613-017-0236-y

Annals of Intensive Care

RESEARCH

Open Access

Dynamic driving pressure associated mortality in acute respiratory distress syndrome with extracorporeal membrane oxygenation

Li-Chung Chiu[1*], Han-Chung Hu[1,2,3], Chen-Yiu Hung[1], Chih-Hao Chang[1], Feng-Chun Tsai[4], Cheng-Ta Yang[1,2], Chung-Chi Huang[1,2,3], Huang-Pin Wu[5] and Kuo-Chin Kao[1,2,3]

Abstract

Background: The survival predictors and optimal mechanical ventilator settings in patients with severe acute respiratory distress syndrome (ARDS) undergoing extracorporeal membrane oxygenation (ECMO) are uncertain. This study was designed to investigate the influences of clinical variables and mechanical ventilation settings on the outcomes for severe ARDS patients receiving ECMO.

Methods: We reviewed severe ARDS patients who received ECMO due to refractory hypoxemia from May 2006 to October 2015. Serial mechanical ventilator settings before and after ECMO and factors associated with survival were analyzed.

Results: A total of 158 severe ARDS patients received ECMO were finally analyzed. Overall intensive care unit (ICU) mortality was 55.1%. After ECMO initiation, tidal volume, peak inspiratory pressure and dynamic driving pressure were decreased, while positive end-expiratory pressure levels were relative maintained. After ECMO initiation, nonsurvivors had significantly higher dynamic driving pressure until day 7 than survivors. Cox proportional hazards regression model revealed that immunocompromised [hazard ratio 1.957; 95% confidence interval (CI) 1.216–3.147; $p = 0.006$], Acute Physiology and Chronic Health Evaluation (APACHE) II score (hazard ratio 1.039; 95% CI 1.005–1.073; $p = 0.023$), ARDS duration before ECMO (hazard ratio 1.002; 95% CI 1.000–1.003; $p = 0.029$) and mean dynamic driving pressure from day 1 to 3 on ECMO (hazard ratio 1.070; 95% CI 1.026–1.116; $p = 0.002$) were independently associated with ICU mortality.

Conclusions: For severe ARDS patients receiving ECMO, immunocompromised status, APACHE II score and the duration of ARDS before ECMO initiation were significantly associated with ICU survival. Higher dynamic driving pressure during first 3 days of ECMO support was also independently associated with increased ICU mortality.

Keywords: Driving pressure, Mechanical ventilation, Acute respiratory distress syndrome, Extracorporeal membrane oxygenation, Outcome

PMC full text: Ann Intensive Care. 2017; 7: 12.
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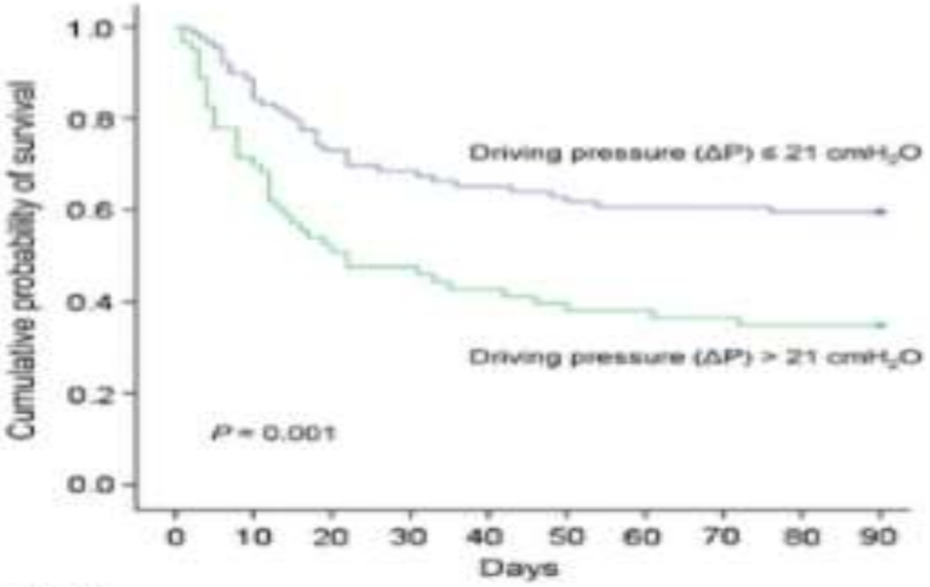
Fig. 4



Number at risk

$\Delta P \le 21$ cmH_2O	98	69	59	56	55
$\Delta P > 21$ cmH_2O	60	29	25	21	20

Kaplan–Meier survival curves in patients with severe acute respiratory distress syndrome (ARDS) on extracorporeal membrane oxygenation (ECMO). *Blue line* denotes patients with mean dynamic driving pressure ≤21 cm H_2O, and *green line* denotes patients with mean dynamic driving pressure >21 cm H_2O from day 1 to 3 on ECMO. The overall survival rate of patients with dynamic driving pressure ≤21 cm H_2O was significantly higher than those with dynamic driving pressure >21 cm H_2O (56.1 vs. 33.3%, $p = 0.001$)

Driving Pressure Yeni çalışma modalitesi

Sürüş basıncı, aerodinamik akciğerin büyüklüğüne uyarlanmış akciğer koruyucu havalandırma stratejisi sağlayarak ARDS'li hastalarda mekanik ventilasyonun optimizasyonunu basitleştirecek zarif bir konsepttir.

Driving pressure (ΔP) is the ratio of tidal volume to (static) respiratory system compliance ; i.e. $\Delta P = VT/CRS$

Driving pressure (ΔP) can be calculated at the bedside as plateau pressure minus positive end-expiratory pressure (Pplat – PEEP)

Önceden???

SCIENTIFIC REPORTS

OPEN

Metabotyping Patients' Journeys Reveals Early Predisposition to Lung Injury after Cardiac Surgery

Received: 31 August 2016
Accepted: 05 December 2016
Published: 11 January 2017

Raluca Georgiana Maltesen[1,2,3,*], Bodil Steen Rasmussen[1,3,*], Shona Pedersen[3,4], Munsoor Ali Hanifa[3], Sergey Kucheryavskiy[2], Søren Risom Kristensen[3,4] & Reinhard Wimmer[2]

Cardiovascular disease is the leading cause of death worldwide and patients with severe symptoms undergo cardiac surgery. Even after uncomplicated surgeries, some patients experience postoperative complications such as lung injury. We hypothesized that the procedure elicits metabolic activity that can be related to the disease progression, which is commonly observed two-three days postoperatively. More than 700 blood samples were collected from 50 patients at nine time points pre-, intra-, and postoperatively. Dramatic metabolite shifts were observed during and immediately after the intervention. Prolonged surgical stress was linked to an augmented anaerobic environment. Time series analysis showed shifts in purine-, nicotinic acid-, tyrosine-, hyaluronic acid-, ketone-, fatty acid, and lipid metabolism. A characteristic 'metabolic biosignature' was identified correlating with the risk of developing postoperative complications two days before the first clinical signs of lung injury. Hence, this study demonstrates the link between intra- and postoperative time-dependent metabolite changes and later postoperative outcome. In addition, the results indicate that metabotyping patients' journeys early, during or just after the end of surgery, may have potential impact in hospitals for the early diagnosis of postoperative lung injury, and for the monitoring of therapeutics targeting disease progression.

METABOLİK BİYOİMZA

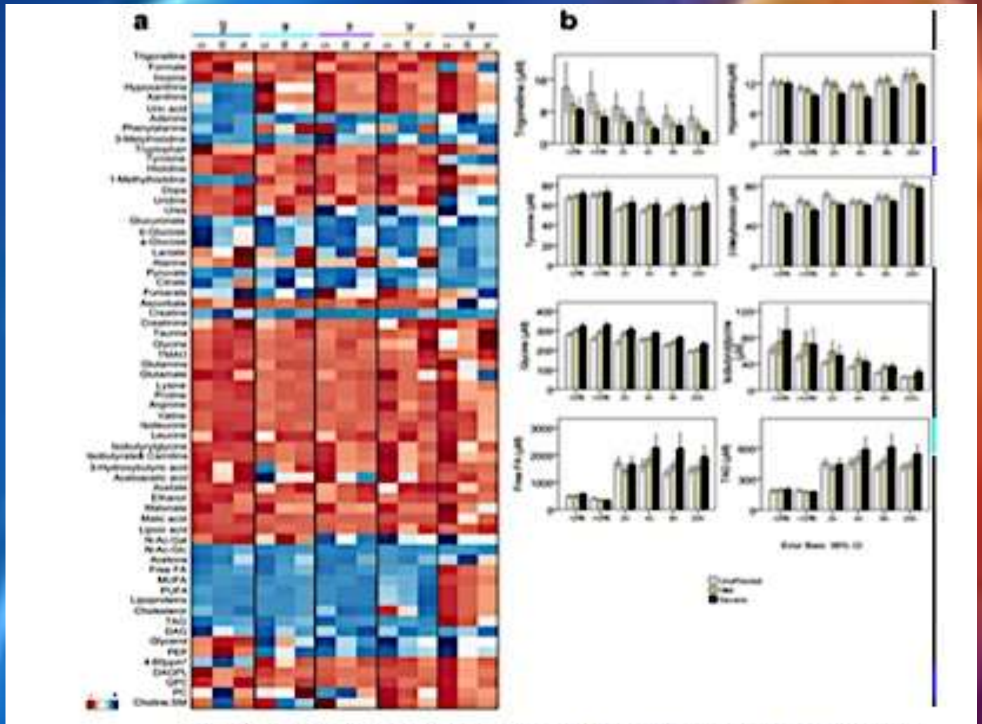


Figure 6. Metabolic signature of lung injury. (**a**) Heat map representation of the mean percent changes in the unaffected ('N'), mildly affected ('M'), and severely affected ('S') by hypoxaemia patients. Means percent changes were calculated as (post-CPB − pre-CPB)/pre-CPB*100. (**b**) Selected metabolites showing time- and phenotype dependent changes Means and standard deviations (error bars represent 95% confidence intervals) are provided. Abbreviations: '−', decreased levels; '+', increased levels; TMAO, trimethylamine-N-oxide; N-Ac-Gal, N-acetyl-galactosamine; N-Ac-Glc, N-acetyl-glucosamine; FA, fatty acids; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids; DAG, diacylglycerol; PEP, phosphoenolpyruvate; 4.60 ppm*, unassigned metabolite; DAGPL, diacylglycerophosphocholine; PC, phosphatidylcholine; GPC, glycerophosphocholine; SM, sphingomyelin.

- Tirozin
- FFA
- Keton
- Hiyaluronik asid
- Nikotinik asid
- Pürin
- Lipid

TEŞEKKÜR EDERİM