

Obstrüktif Akciğer Hastalıklarında Mekanik Ventilasyon

Dr. Kürşat Uzun

Obstrüktif Akciğer Hastalıkları

- KOAH
- Astım
- Bronşektazi
- Kistik Fibrozis
- Diğerleri
 - Küçük ve büyük havayolu obst.

Obstrüktif Akciğer Hastalıklarında Mekanik Ventilasyon

Characteristics and Outcomes in Adult Patients Receiving Mechanical Ventilation

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for the Mechanical Ventilation
International Study Group

JAMA. 2002;287:345-355

Characteristic	No. (%) of Patients Mechanically Ventilated (N = 5183)
Age, mean (SD) [median (IQR)], y	59.2 (17.3) [63 (48-73)]
Sex, females	1985 (38.7)
SAPS II score, mean (SD) [median (IQR)]	44.1 (17.0) [43 (32-54)]
Prior functional status, limited activity	2016 (38.9)
Medical/surgical	3428 (66.1)/1755 (33.9)
Reason for the initiation of mechanical ventilation	
Acute respiratory failure	3564 (68.8)
Coma	864 (16.7)
Acute respiratory failure on chronic pulmonary disease	
COPD	522 (10.1)
Asthma	79 (1.5)
Chronic respiratory disease (non-COPD)	60 (1.2)
Neuromuscular disease	94 (1.8)
Cause of acute respiratory failure†	
Postoperative	1080 (20.8)
Pneumonia	721 (13.9)
Congestive heart failure	539 (10.4)
Sepsis	458 (8.8)
Trauma	407 (7.9)
ARDS	231 (4.5)
Aspiration	129 (2.5)
Cardiac arrest	100 (1.9)
Other	367 (7.1)

5183 hasta

661 hasta obst. Akc.

KOAH %10.1

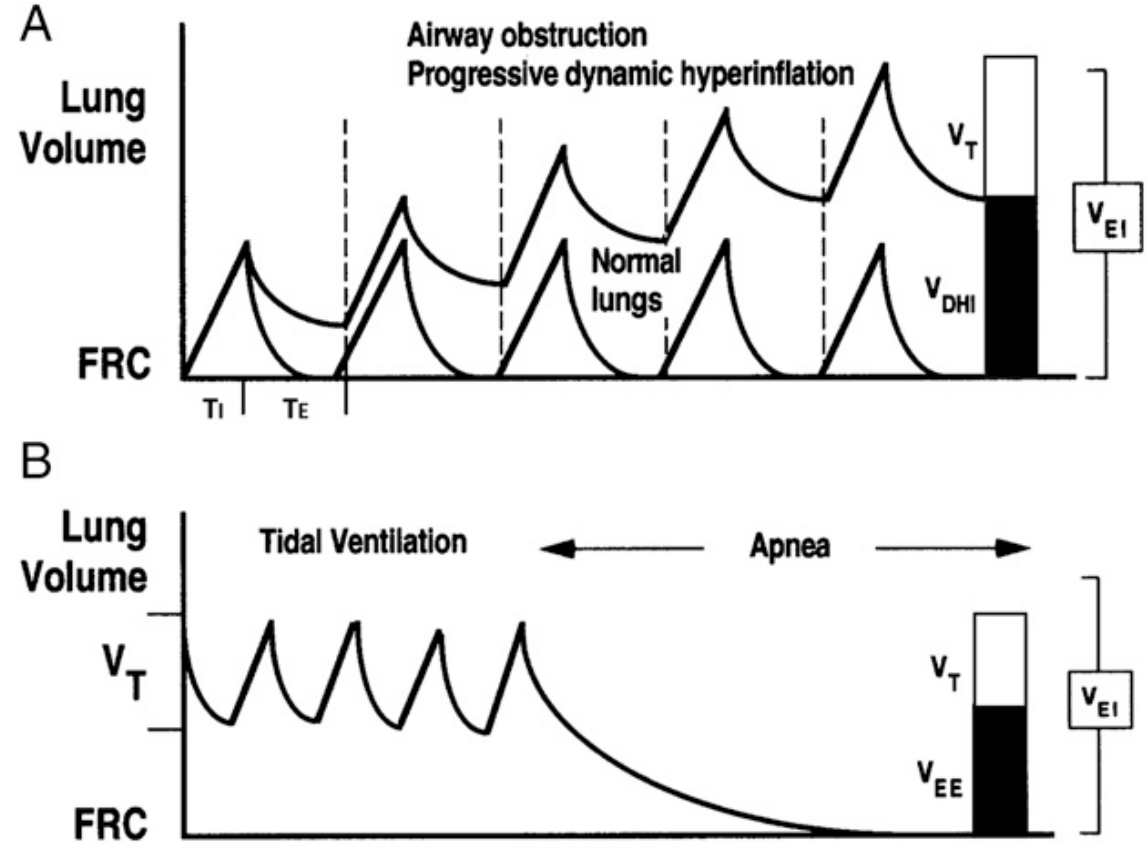
Astım %1.5

Diğerleri %1.2

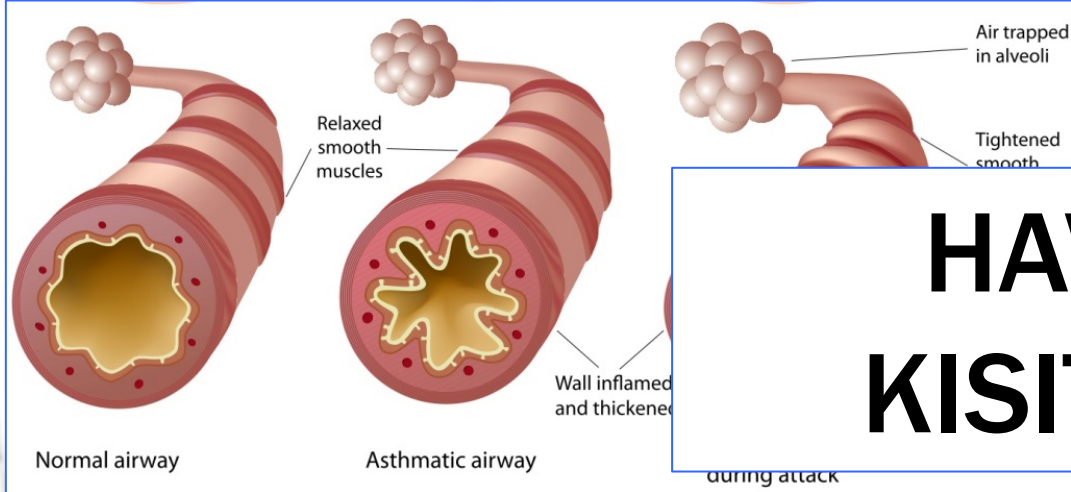
Toplam %12

Obstrüktif Akciğer Hastalıklarında- Patofizyoloji

- Havayolu direncinde artma
- Havayolu sekresyonlarında artma
- Dinamik Hiperinflasyon
- Ventilatuvar talepte artma
- **Gaz alış-verişinde bozukluk**
- **Kardiovasküler disfonksiyon**
- **Hasta-ventilatör uyumsuzluğu**

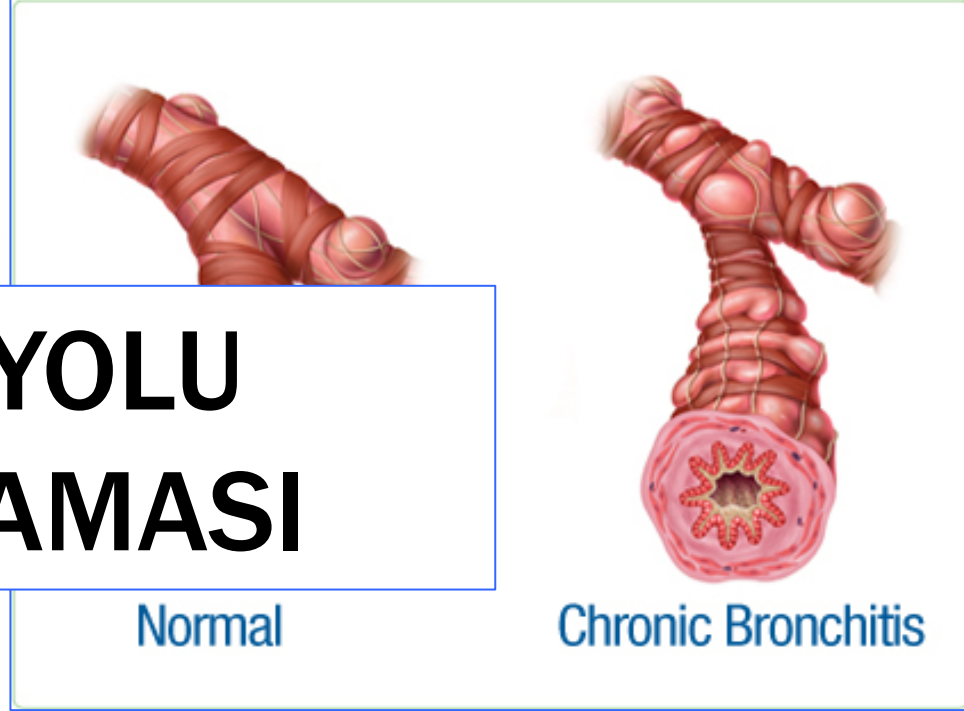


Havayolu direncinde artma



HAVAYOLU KISITLAMASI

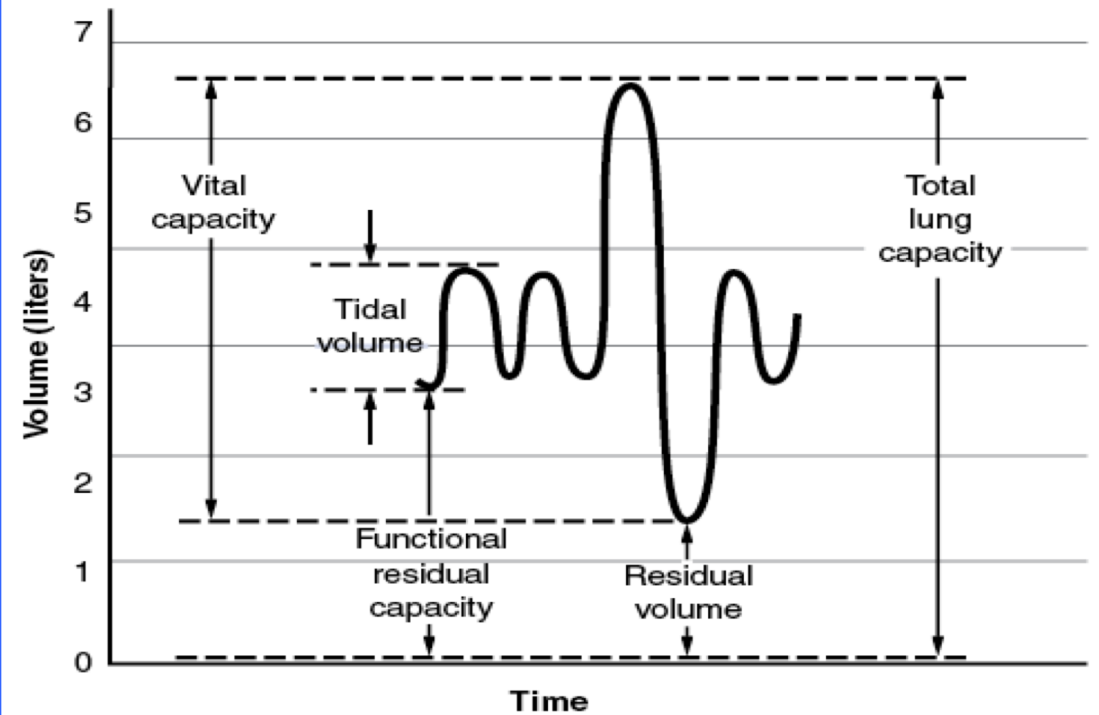
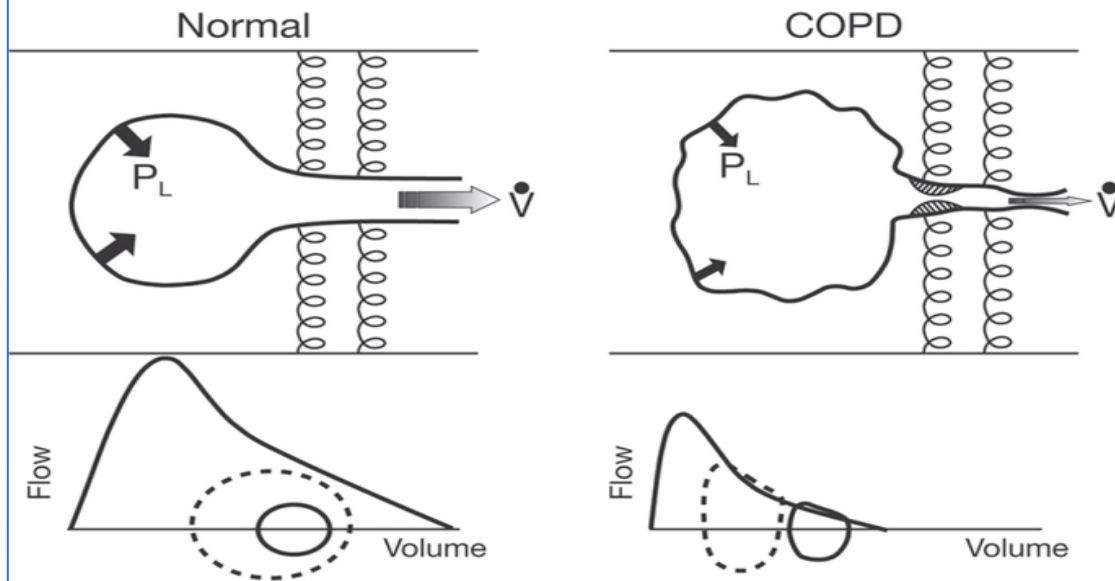
- Bronkokonstriksiyon
- Havayollarında ödem
- Havayolu aşırı duyarlılığı
- Havayolu remodeling



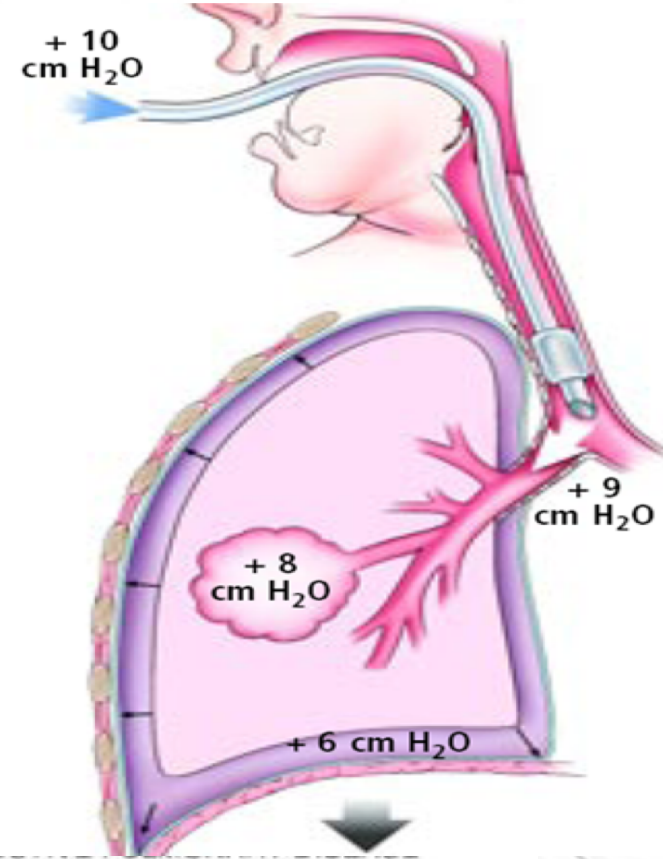
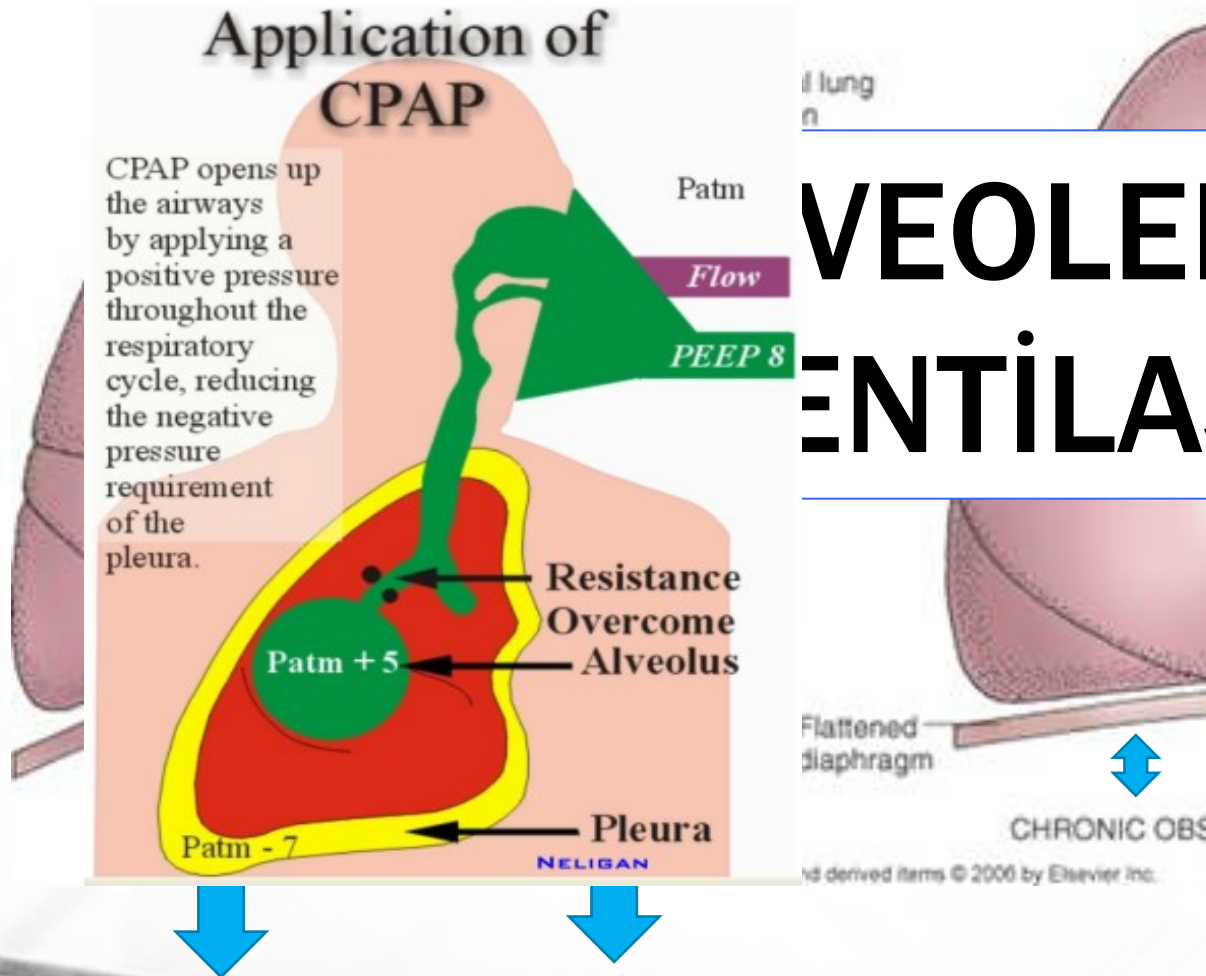
- Küçük hava yolu hast.
- *Havayolu inflamasyonu, fibrozisi, tıkaçlar, artmış havayolu direnci*

- Parankimde yıkım
- *Alveoler yapının kaybı ve elastik rekoilde azalma*

KOAH



Dinamik hiperinflasyon



Alveoler hipoveantilasyon

NIV

- Nefes darlığında artma
 - Orta-şiddetli
- Takipne
 - >24/dk SS, Obstrüktif
 - >30/dk SS, Restriktif
- Solunum iş yükünde artma
 - Aksesuar kas kullanımı
 - Abdominal paradoks
- AKG
 - $\text{PaCO}_2 > 45 \text{ mmHg}$
 - $\text{pH } 7.10-7.35$
 - Hipoksemi, $\text{PaO}_2/\text{FiO}_2 < 200$

IMV

- Uygun hasta,
- Uyanık hasta,
- Sekresyon kontrolü
- $\text{pH} \leq 7.20$
- 1 saat sonra AKG düzelme yoksa



NIV

KOAH

- IPAP: 8 cmH₂O.....15 cmH₂O
- EPAP: 4cmH₂O..... 5 cmH₂O
- Rise time: 0.05 msn
- Ti: 0.8-12 s
- Ekspiratuar tetikleme
 - %25
 - %40-75

Astım

- IPAP: 7 cmH₂O.....15 cmH₂O
- EPAP: 3 cmH₂O..... 5 cmH₂O
- Rise time: 0.05 msn
- Ti: 0.8-12 s
- Ekspiratuar tetikleme
 - %25
 - %40-75

IMV

KOAH

- $\text{PaO}_2 \geq 60 \text{ mmHg}$, $\text{satO}_2 \geq \%90$
 - Orta düzeyde FiO_2
- Minimal Ventilasyon ile
 - pH'ı normalize (PaCO_2 değil)
- Hiperventilasyondan kaçınılmalı
- A/C mod
- I:E 1:4, 1:6
- $\text{pH} \geq 7.20$ izin verilebilir
- f: 14-16/dk
- V_T : 6-8 mL/kg
- T_i : 0.8-1.2 s
- İnsp akım hızı: 60 L/dk
- PEEP_e: 5 cm H₂O

Astım

- A/C mod
- T_i : 0.8-12 s
- f: 6-8 ML/kg
- İnsp akım hızı: 60 L/dk
- PEEP_e: 0-5 cmH₂O
- Uygun FiO_2

Eksternal PEEP Uygulaması

KOAH

- KOAH'lı hastaların %60'nından fazlasında kullanılmaktadır.
- Gaz alışverişini genelde etkilemez
- Orta düzeyde (5-9 cmH₂O) PEEP PaCO₂ ve PaO₂ benzer düzelme

Astım

- PEEP_e tartışmalı
- Dinamik kompliyans
- Ekspiratuar akıma karşı dirençe neden olur ve hiperinflasyon mg
- PEEP_e uygulamasında dikkatli olunmalı
- PEEP_i ≤ 5cmH₂O
- P_{plato} ≤ 30cmH₂O

PEEPe

- P_i : $PEEP_e + PS$ (IMV)
- PS : IPAP-EPAP (NIMV)
- Nefes darlığını, solunum iş yükünü azaltır
- Tetikleme fonksiyonu artırır
- İnspiratuar kas eforunu azaltır
- Hasta-ventilatör ilişkisini düzeltir

- $PEEP_e \geq PEEP_i$
- Barotaravma
- Solunumu tetikleme de sıkıntı
- Hemodinamide bozulma
- $PEEP_e$ titre edilmeli
 - %80'i

Medikal Tedavi

KOAH

- Kortikosteroid
 - 120 mg
- Bronkodilatör
 - ipratropium+salbutamol nebul
 - 6x2.....4x1
- Teofilin infüzyon
- 5-6 mg/kg 20 dk da yükleme
- 0.5 mg/kg/saat infüzyon
- Antibiyotik
 - Flurokinolon
 - Antipseudomonal

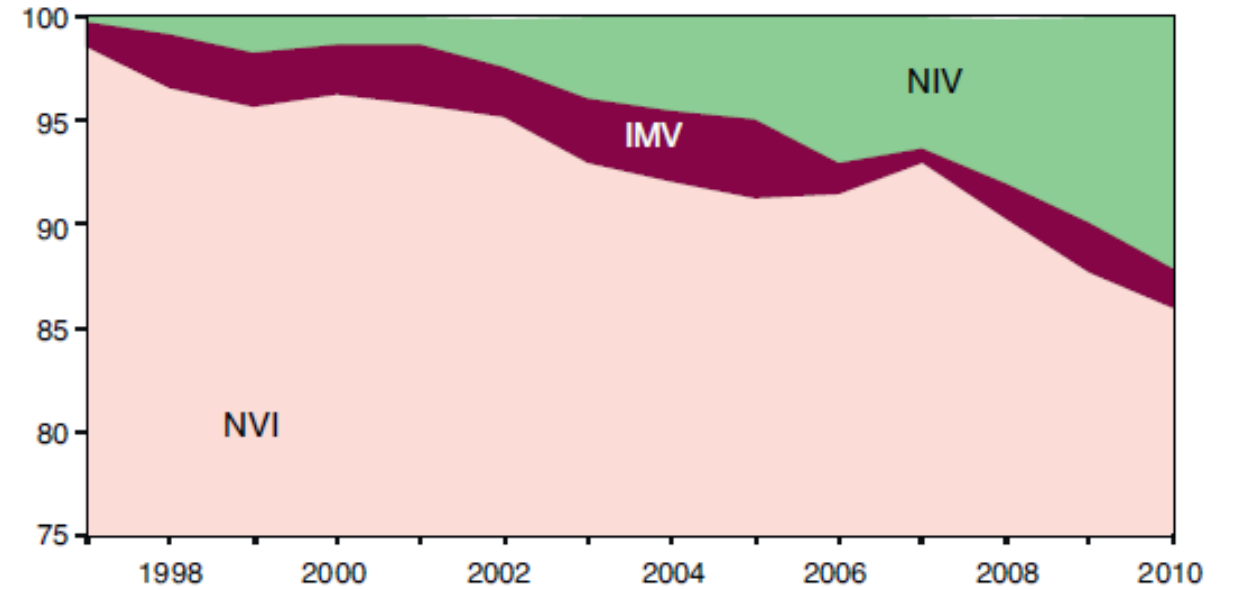
Astım

- Kortikosteroid
 - 1 mg/kg
- Bronkodilatör
 - ipratropium+salbutamol nebul
 - 6x2.....4x1
- Teofilin infüzyon
- 5-6 mg/kg 20 dk da yükleme
- 0.5 mg/kg/saat infüzyon
- Enfeksiyon varsa antibiyotik

Sedasyon
Nöromuskuler blokaj

KOAH

Mekanik Ventilasyon Uygulamaları



Evolution of the Use of Noninvasive Mechanical Ventilation in Chronic Obstructive Pulmonary Disease in a Spanish Region, 1997–2010[☆]

Bienvenida Carpe-Carpe,^{a,*} Lauro Hernando-Arizaleta,^b M. Carmen Ibáñez-Pérez,^b Joaquín A. Palomar-Rodríguez,^b Antonio M. Esquinas-Rodríguez^c

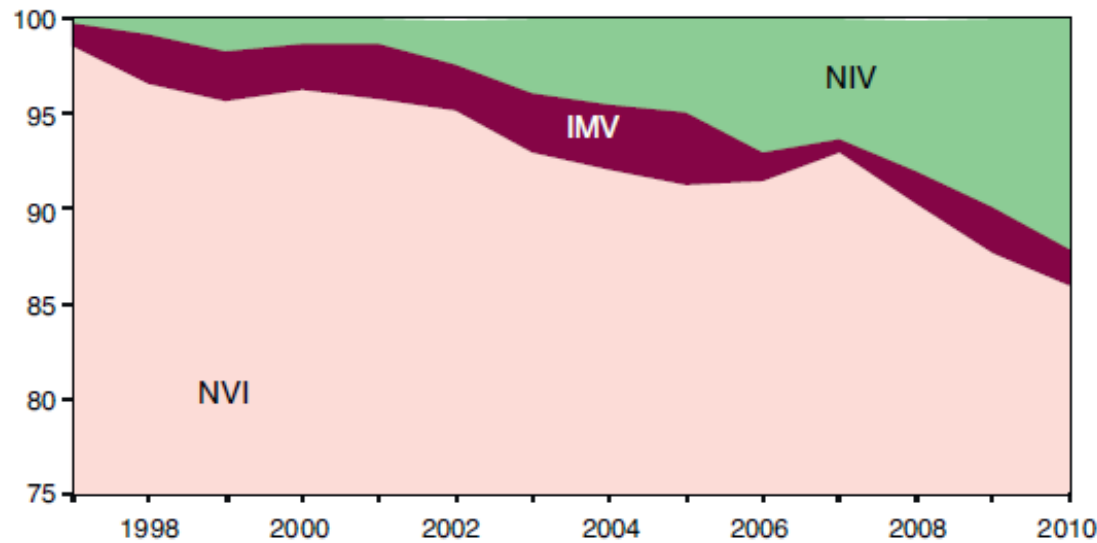
^a Unidad Docente de Medicina Preventiva y Salud Pública de la Región de Murcia, Spain

^b Servicio de Planificación y Financiación Sanitaria, D.G.P.O.S.F.I. Consejería de Sanidad y Política Social de la Región de Murcia, Spain

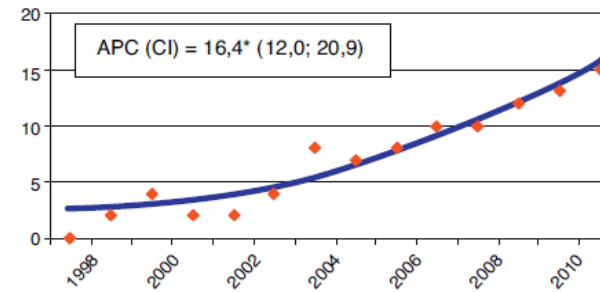
^c Unidad de Cuidados Intensivos, Hospital Morales Meseguer, Murcia, Spain



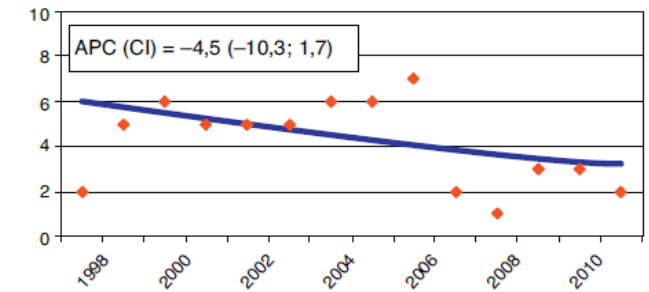
30127 taburcu KOAH hastası



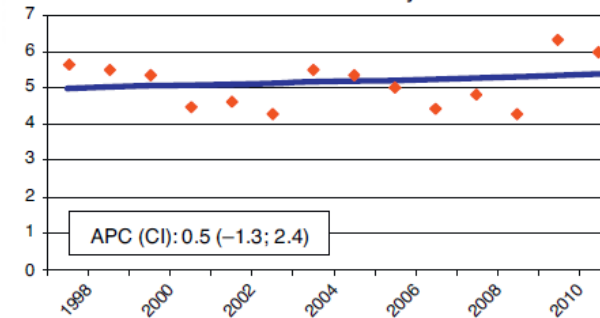
Non-invasive mechanical ventilation



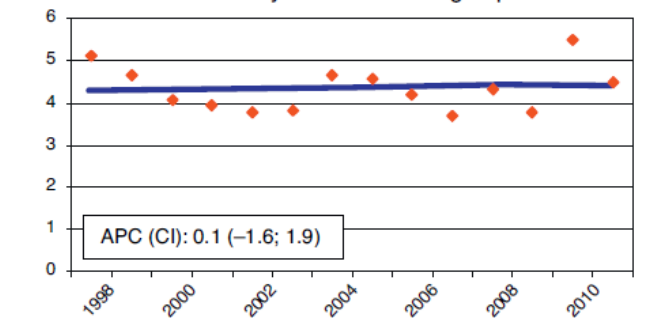
Invasive mechanical ventilation



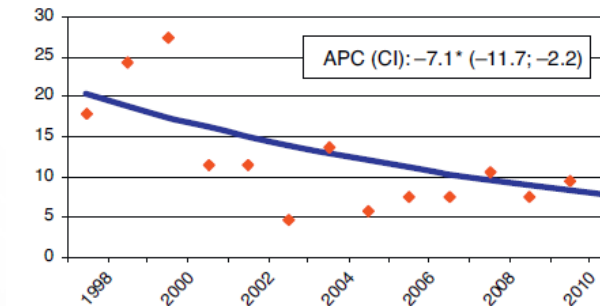
Overall mortality



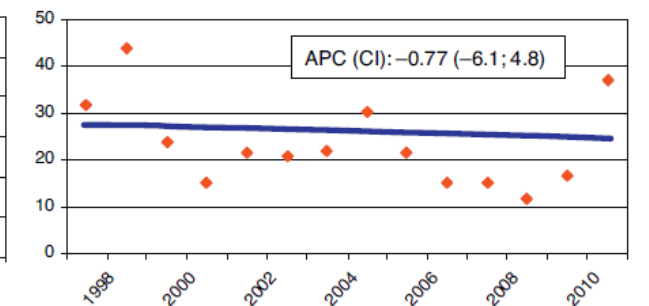
Mortality no-intervention group



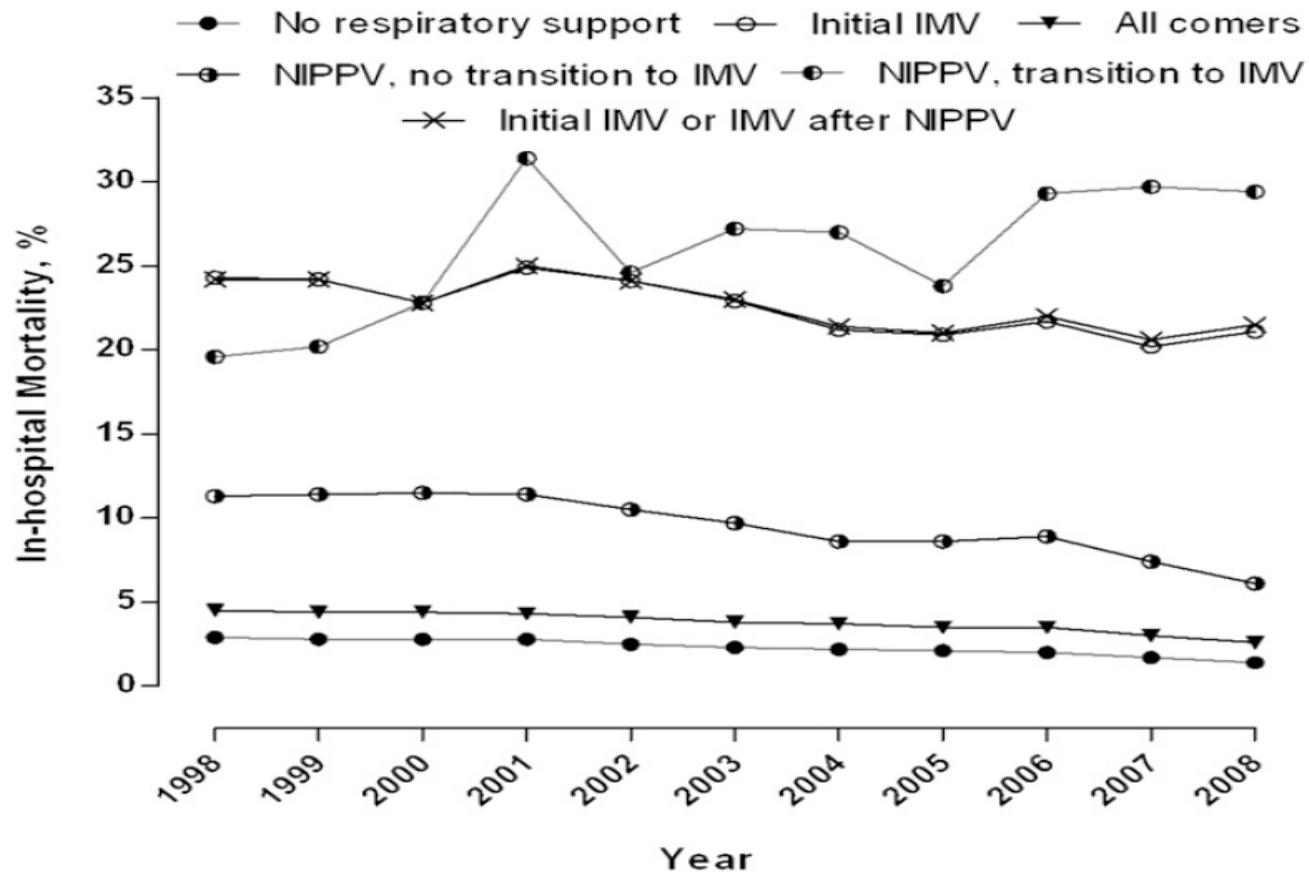
Mortality NIV group



Mortality IMV group



Mortalite-NIMV



NIMV→IMV

IMV veya IMV→NIMV

NIMV

Medikal

Kullanım alanları

Meta Analiz

Sistemik Derlemeler

Randomize Kontrollü Çalışmalar

Kohort Çalışmaları

Vaka Kontrol Çalışmaları

Vaka Serileri/Vaka Sunumları

Hayvan Çalışmaları/Laboratuvar Çalışmaları

•KOAH atak
•KOAH weaning
•Kardiyenik AC ödemi
•İmmüsuprese hastalar

Do-not-ET
Son dönem hastalar
Ekstübasyon yetersizliği (KOAH ve KKY)
KOAH'da TKP
Postop SY
Astımda ASY'nin önlenmesi
Şiddetli TKP*
Ekstübasyon yetersizliği*

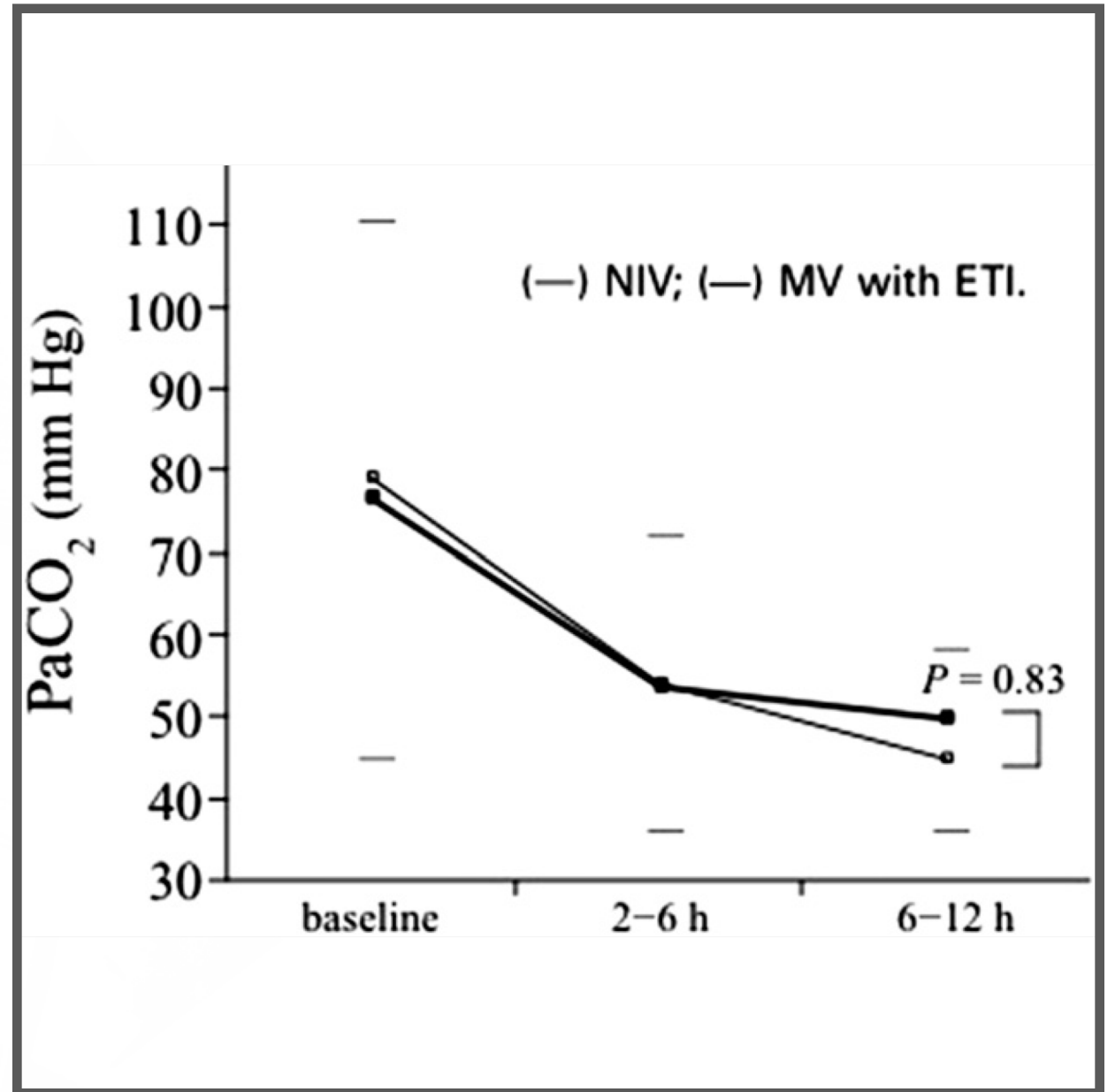
•Nöromuskuler hast/kifoskolyoz
•Üst havayolu obstrüksiyonu
•Toraks travması
•Astımda ASY tedavisi
•SARS*

•Yaşlı hastalar >75y
•Kistik fibrozis
•Obezite hipoventilasyon sendromu
•İdiopatik akciğerfibrozisi*



Astım

Mekanik Ventilasyon Uygulamaları



Olgu sunumu

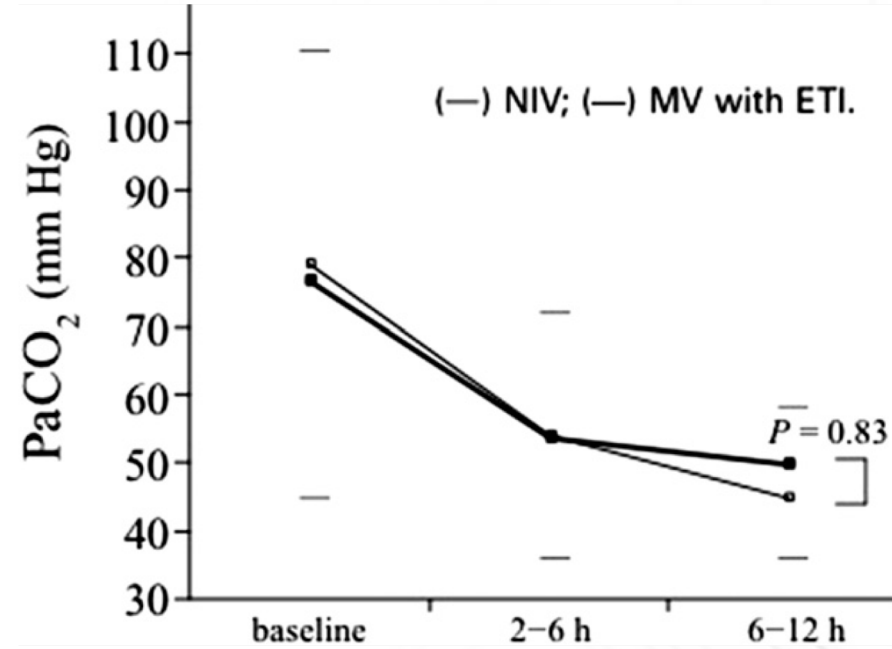
Noninvasive Ventilation in Severe Acute Asthma

Jhaymie L Cappiello MSc RRT-ACCS and Michael B Hocker MD MHS

Noninvasive ventilation (NIV) in severe acute asthma is controversial but may benefit this population by preventing intubation. We report on a 35-year-old male asthma patient who presented to our emergency department via emergency medical services. The patient was responsive, diaphoretic, and breathing at 35 breaths/min on 100% oxygen with bag-mask assistance, with S_{pO_2} 88%, heart rate 110–120 beats/min, blood pressure 220/110 mm Hg, and temperature 35.8°C. NIV at 12/5 cm H_2O and F_{IO_2} 0.40 was applied, and albuterol at 40 mg/h was initiated. Admission arterial blood gas revealed a pH of 6.95, P_{aCO_2} 126 mm Hg, and P_{aO_2} 316 mm Hg. After 90 min of therapy, P_{aCO_2} was 63 mm Hg. Improvement continued, and NIV was stopped 4 h following presentation. NIV tolerance was supported with low doses of lorazepam. The patient was transferred to the ICU, moved to general care the next morning, and discharged 3 days later. We attribute our success to close monitoring in a critical care setting and the titration of lorazepam. *Key words:* noninvasive; ventilation; asthma; ARF; continuous albuterol; capnography; mechanical ventilation; intubation; sedation. [Respir Care 2014;59(10):1–•. © 2014 Daedalus Enterprises]

Astım-MV

- 2.000.000 kiři astım atađı nedeniyle acil servis bařvurusu
 - %25 hastaneye yatıř
 - 500.000 kiři
 - Hastaneye yatanların %10'u yođun bakıma yatıyor
 - 50.000 kiři
 - Yođun bakıma yatanların %2-4'ü MV ihtiyacı
 - 1000-2000 kiři
 - MV ihtiyacı olanların %22'si ölümlle sonuçlanıyor
 - 220-440 kiři (%0.011)



Is non-invasive ventilation safe in acute severe asthma?

MICHAEL PALLIN, MARK HEW AND MATTHEW T. NAUGHTON

Department of Allergy, Immunology and Respiratory Medicine, Alfred Hospital and Monash University,
Melbourne, Victoria, Australia

Respirology (2014)
doi: 10.1111/resp.12428

ABSTRACT

Background and objective: The effect of non-invasive ventilation (NIV) in acute severe asthma is unclear and there are concerns regarding its safety.

Methods: We undertook a 5-year case-control review of mortality and morbidity associated with NIV use in acute severe asthma and compared this with asthma requiring invasive mechanical ventilation (IMV) and a control group with less severe asthma without ventilatory support.

Results: Eight hundred seventy-three patients had acute severe asthma of whom 30 were treated with NIV, 17 with IMV and 90 served as controls. The mean duration of NIV was 9.5 ± 7.3 h with inspiratory positive airway pressure and expiratory positive airway pressure of 11.9 ± 1.4 and 5.8 ± 1.2 cmH₂O respectively. Mortality was zero in the NIV and control groups, compared with 41% in the IMV group. None of the NIV or control groups required escalation to invasive ventilation. There were no instances of haemodynamic compromise in the NIV or control groups. Length of hospital stay was 121 ± 96 h in the NIV group and similar to the severe IMV group (136 ± 99 h, $P > 0.05$) and significantly longer than the control group (42 ± 40 h, $P < 0.05$).

Conclusions: NIV can be safely used in acute severe asthma although further work is needed to delineate the precise patient selection process.

Key words: asthma, mechanical ventilation, morbidity, mortality, non-invasive ventilation.

SUMMARY AT A GLANCE

The role of non-invasive ventilation in acute asthma is not well described and there are concerns about its safety. Over a 5-year period, non-invasive ventilation was used without significant complications in patients with moderate acute severe asthma.



Noninvasive ventilation in acute asthma ☆

Michael Pallin, MB, Matthew T. Naughton, MD *

Department of Allergy, Immunology and Respiratory Medicine, The Alfred Hospital, Melbourne, Australia

A B S T R A C T

Noninvasive ventilation (NIV) has well-recognized benefits in acute exacerbation of chronic obstructive pulmonary disease and pulmonary edema. Its utilization in acute asthma, however, remains controversial. In this review, we describe the physiological basis to justify NIV use in acute asthma and contribute a critical appraisal of the available literature relating to this practice. A discussion of some of the more pertinent, clinically relevant practicalities is also provided. Original research articles were identified using the electronic PubMed database.

Randomized controlled trials of NIV in the setting of acute asthma were selected. Retrospective observational studies were also included if they were considered to contribute to the literature review. The use of NIV in the acute asthma setting has been shown to be associated with improvements in important physiological variables including measures of airflow and respiratory rate, and lends support to further study in this field. Improvements in airflow may be a direct effect of applied positive airway pressure or an indirect effect secondary to better dispersal of aerosolized medication. Reductions observed in respiratory rate and dyspnea are likely influenced by the amount of pressure support provided. Evidence suggestive of any improvement in mortality, intubation rate, or hospital/intensive care unit length of stay, however, is lacking. Studies to date have been hampered by small numbers and a lack of demonstrable meaningful clinical outcomes. Data relating to mortality, endotracheal intubation rates, and hospital length of stay/admission should be sought in future large clinical trials.

Trends in Prevalence and Prognosis in Subjects With Acute Chronic Respiratory Failure Treated With Noninvasive and/or Invasive Ventilation

[Respir Care 2015;0(0):1]

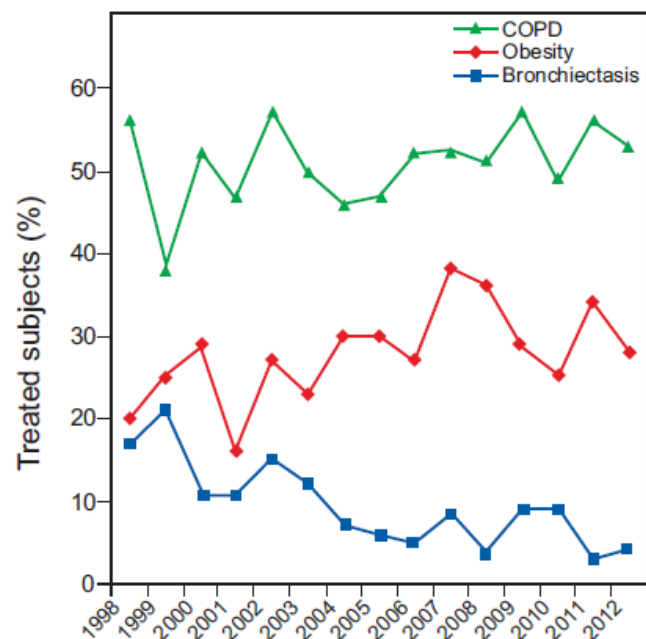


Fig. 1. Trends in COPD subjects, subjects with bilateral bronchiectasis, and subjects with respiratory failure due to obesity over the study period.

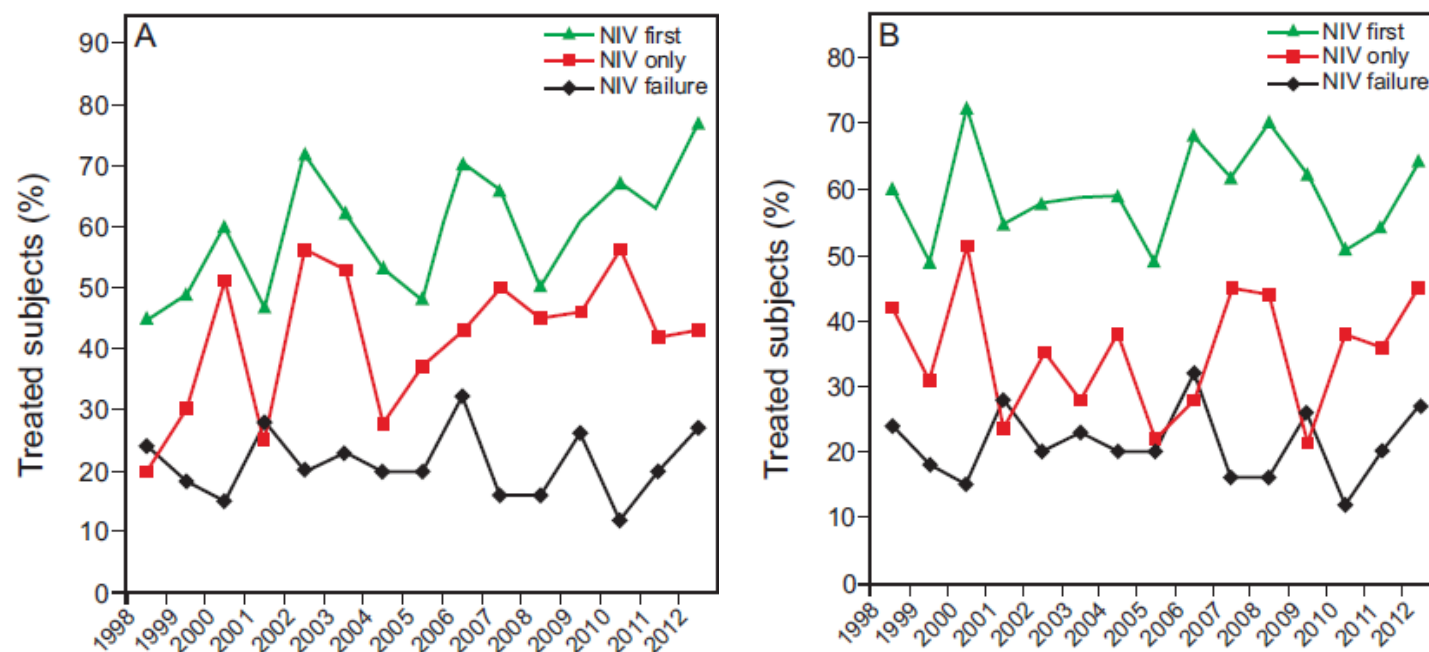
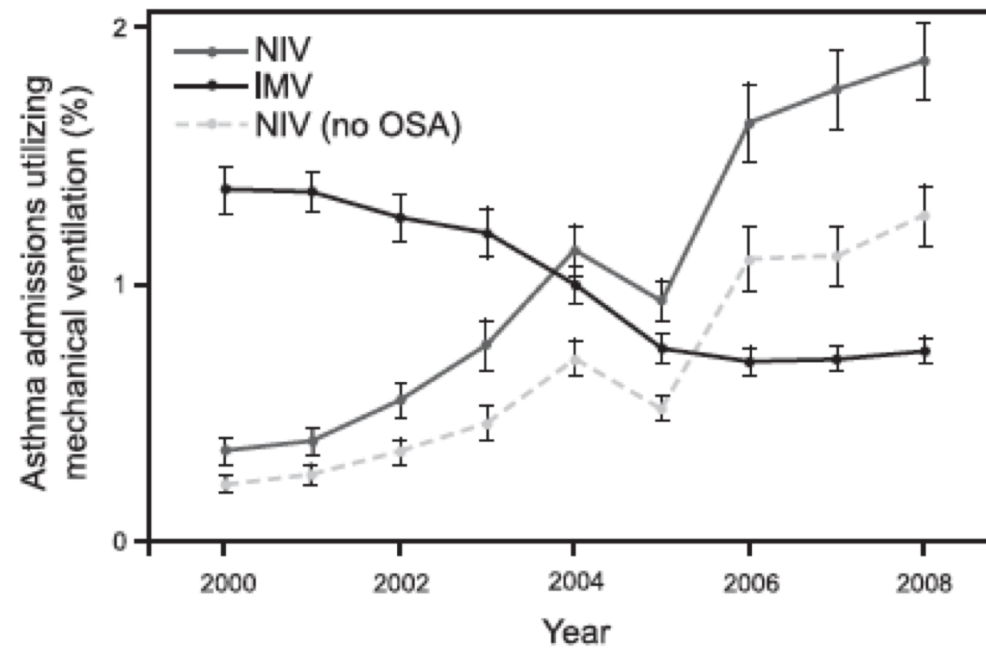


Fig. 2. Trends in subjects treated with noninvasive ventilation (NIV) only, in subjects who received NIV as first-line respiratory support, and in subjects transitioned from NIV to invasive mechanical ventilation in COPD (A) and non-COPD (B) subjects over the study period.

Astim-MV



Patient Characteristics	2000	2008	P
Mechanical ventilation, n (%)			
Total NIV*	796 (0.35)	4908 (1.9)	< .001
NIV in patients without OSA*	486 (0.21)	2987 (1.1)	< .001
Total invasive mechanical ventilation*	3095 (1.4)	1931 (0.73)	< .001
Any mechanical ventilation (invasive mechanical ventilation + NIV)	3891 (1.8)	6839 (2.6)	< .001

Obstrüktif Akc Hast ve MV Komplikasyonları

Oto-PEEP

Dinamik hiperinflasyon

Hipotansiyon

Pnömotoraks

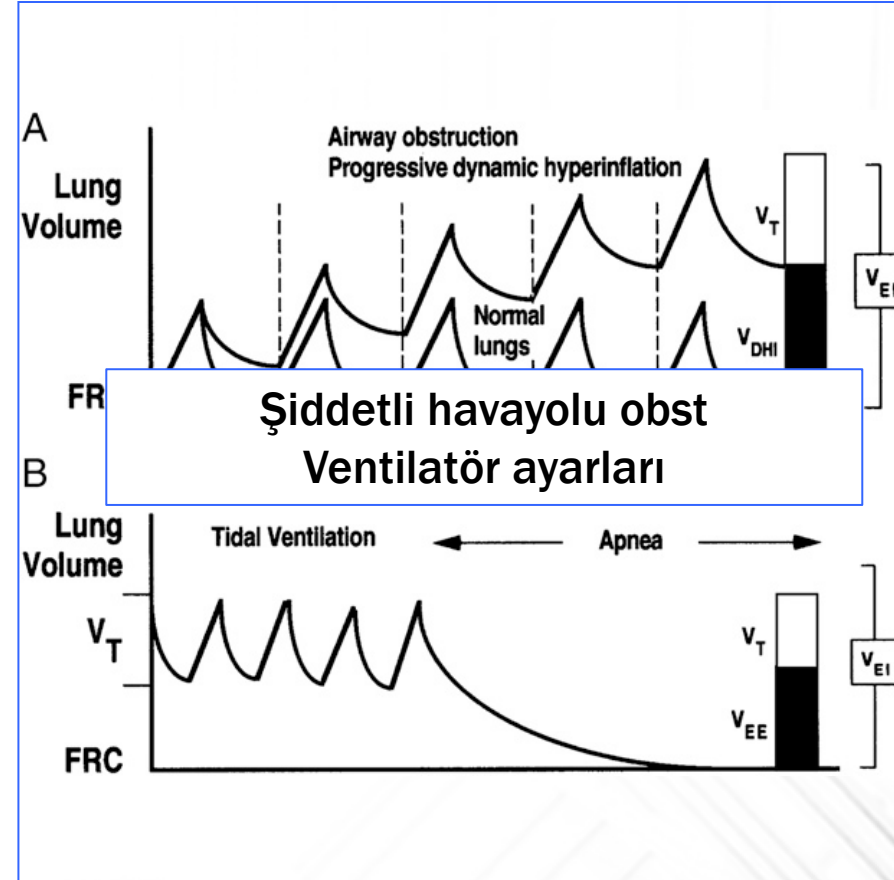
Pnömomediastinum, subkütan
amfizem

Kardiyak aritmiler

MV ayarları

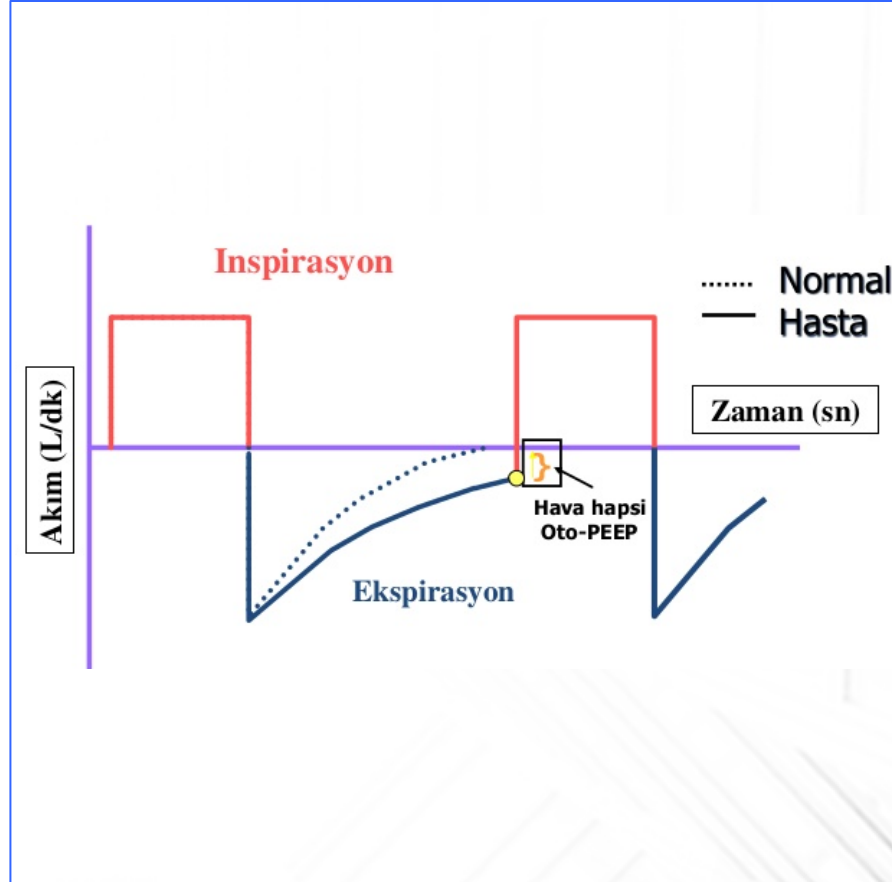
Dinamik hiperinflasyon tespiti

- Dinamik hiperinflasyon
 - $V_{EI} \geq 20\text{ml/kg}$
 $= V_T \times P_{plto} / P_{plto} - PEEP_i$



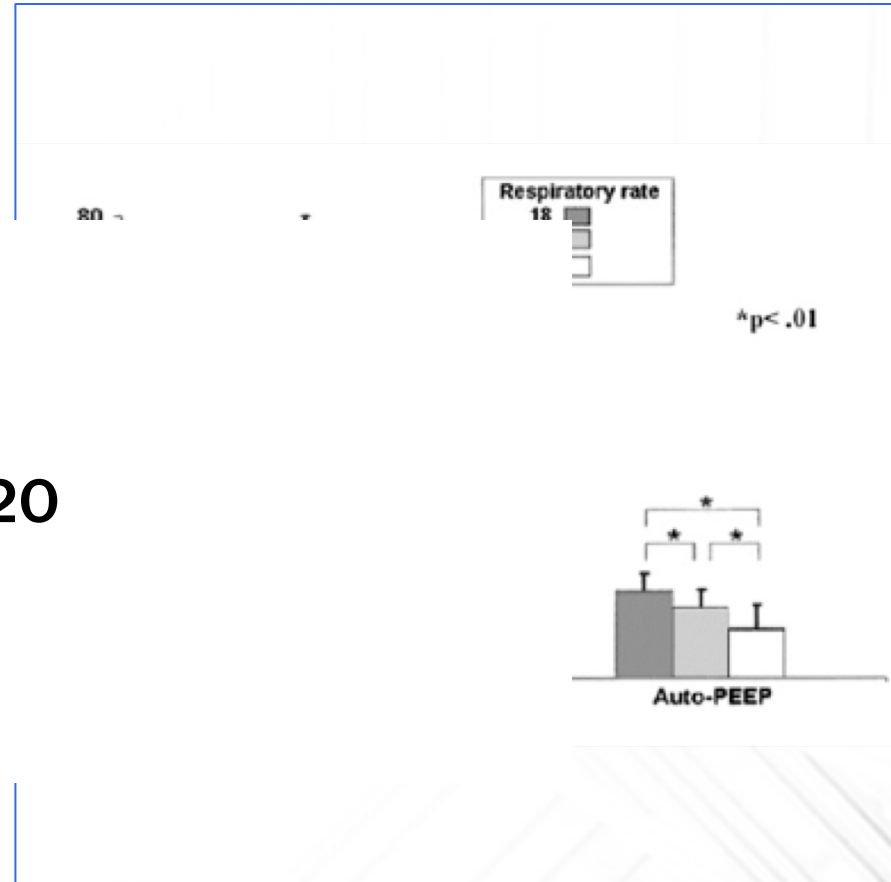
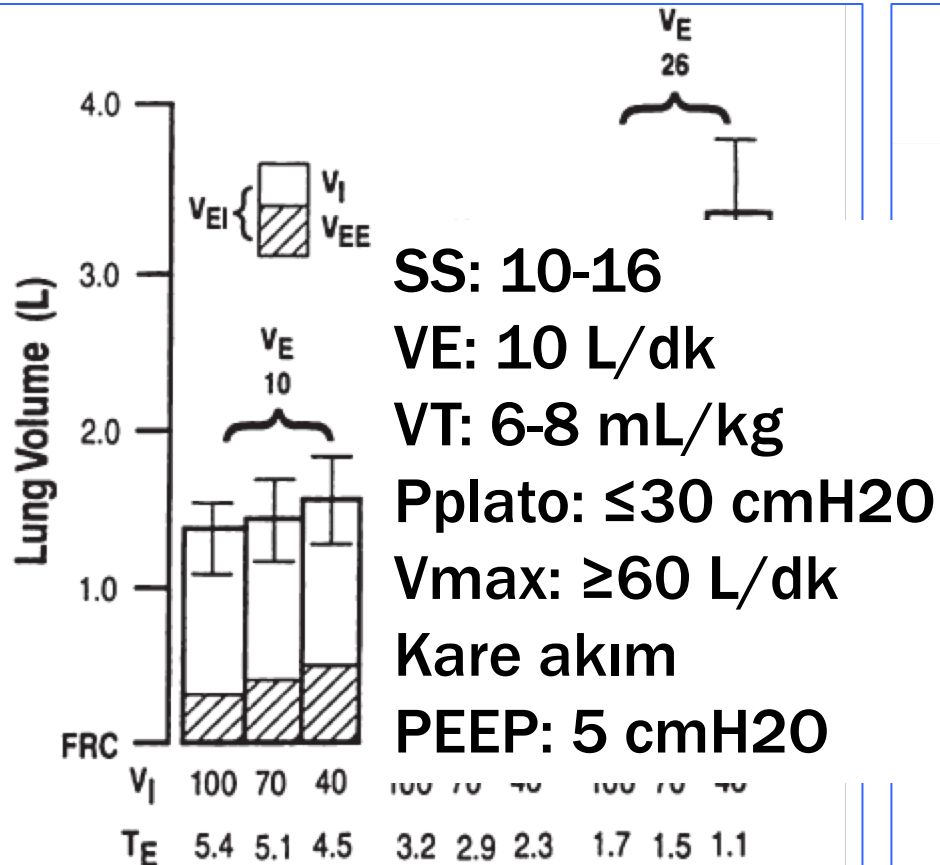
Dinamik hiperinflasyon

- PEEPi ölçümü
 - $PEEP_{tot} - PEEP_e$
- Pplato ölçümü
 - $\leq 24-26 \text{ cm H}_2\text{O}$
 - $\leq 30 \text{ cm H}_2\text{O}$
- Ppeak
 - $\leq 50 \text{ cmH}_2\text{O}$



Ventilatör ayarları

Dinamik hiperinflasyon- VT, SS, VE, VI



Ve
 10 L/dk
 16 L/dk
 26 L/dk

Hiperkapni

- Korunma
 - Yüksek VT (Volütravma)
 - İntartorasik basınçta artma
 - Hemodinamik etkileri
- Permisif hiperkapni
- pH: 7.20
- PaCO₂: 60-70 mmHg
- PaCO₂ ≥ 100-120 mmHg
- Astımda 12 saatte düzelme pH düzelme
- Beyin ödemi
- Beyin kanaması
- Kafa içi basınçta artma

Sonuç

- KOAH
- KOAH-NIMV, altın standart
- Astımda NIMV kullanımı artıyor
- Yeterli VE
- Permisiv hiperkapni
- Etkili altta yatan hastalığın medikal tedavisi

TEŞEKKÜRLER

