YOĞUN BAKIMDA REHABİLİTASYON

PROF.DR. KÜRŞAT UZUN



Amaç





YAŞAM





Bugün

- Yaşam oranı
- Mortalite oranı
- Nöromuskuler zayıflık
  - Fonksiyon kaybında azalma
  - Yoğun bakım sonrası
    - Hayat kalitesinde azalma

- Nöromuskuler zayıflık yapan nedenleri önlemek

Yoğun Bakım

- Hastalık (ARDS, Sepsis, KOAH)
- Hareket kısıtlılığı
- Kasları kullanmama
- İlaçlar
- Beslenme
- Deliryum
- Personel sayısı
- Personel çeşitliliği

Journal of Neurology, Neurosurgery, and Psychiatry 1984;**47**:1223–1231

Polyneuropathy in critically ill patients

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SUMMARY Five patients developed a severe motor and sensory polyneuropathy at the peak of critical illness (sepsis and multiorgan dysfunction complicating a variety of primary illnesses). Difficulties in weaning from the ventilator as the critical illness subsided and the development of flaccid and areflexic limbs were early clinical signs. However, electrophysiological studies, especially needle electrode examination of skeletal muscle, provided the definite evidence of polyneuropathy. The cause is uncertain, but the electrophysiological and morphological features indicate a primary axonal polyneuropathy with sparing of the central nervous system. Nutritional factors may have played a role, since the polyneuropathy improved in all five patients after total parenteral nutrition had been started, including the three patients who later died of unrelated causes. The features allow diagnosis during life, and encourage continued intensive management since recovery from the polyneuropathy may occur.

Nöromuskuler zayıflık

- Yoğun bakım hastaların %57 (9-87)'inden fazlasında
- Çoklu faktörler
  - Bulunan hastalık (malignite, KOAH)
  - Yoğun bakımda meydana gelen kas zayıflığı
    - Sepsis
    - ARDS
    - Sedasyon
    - İlaçlar (steroidler, antibiyotikler (AGA, Colistin), nöromuskuler blokörler)
    - Hiperglisemi
    - Hareketsizlik

Tedavi

- Weaning'de zorluk
- Etkili bir tedavi yok
- Altta yatan hastalığın tedavisi
- Glisemik kontrol
- İlaçların etkin kullanımı ve monitörizasyonu
- Erken rehabilitasyon

Erken Rehabilitasyon

- Sedasyonun erken kesilmesi
- Eğitim
- Takım oluşturma
- Protokol oluşturma

Erken Rehabilitasyon

- Nöromuskuler elektrik stimülasyonu (NMES)
- Ergometri bisikleti

Hareketsizlik

- Kas atrofisi saatler içinde başlar
- Yatak istirahatının her haftasında
- Yoğun bakım ile birlikte hareketsizlik daha fazla kas kaybına neden olur
- Kas protein sentezinde azalma
- Kas katabolizmasında artma
- Kas kitlesinde azalma (alt ekstremitelerde)

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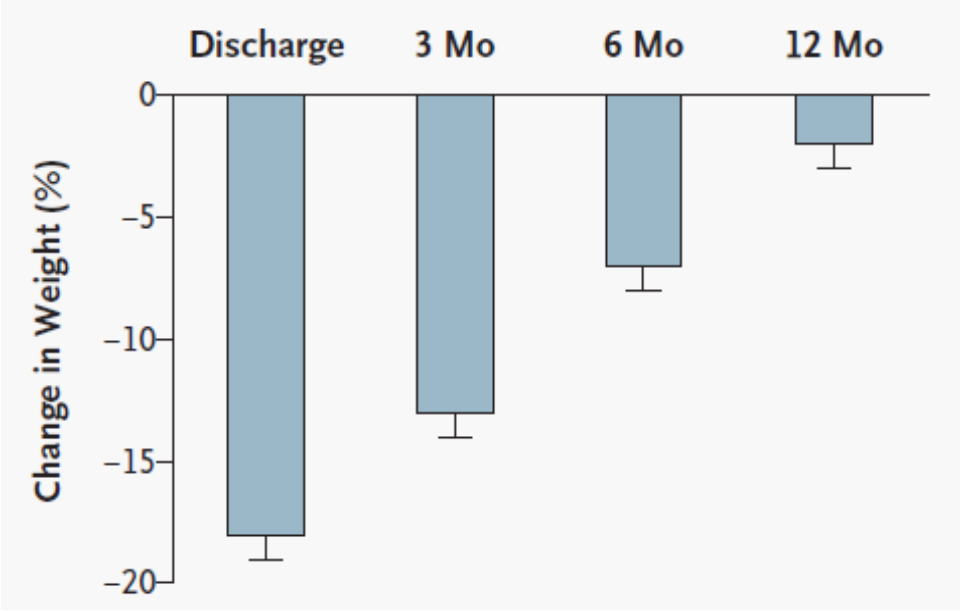
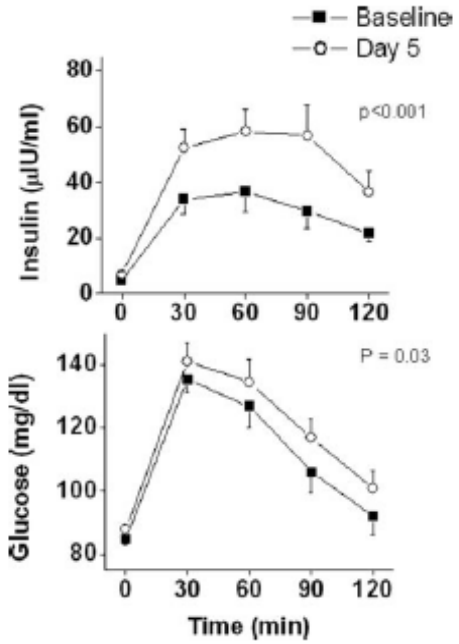
One-Year Outcomes in Survivors of the Acute Respiratory Distress Syndrome

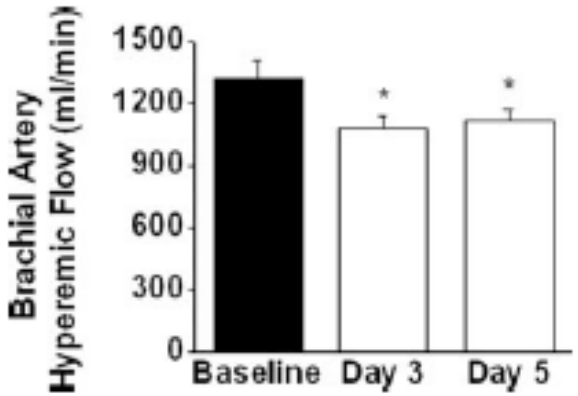


Outcome	3 Months	6 Months	12 Months
Distance walked in 6 min			
No. evaluated	80*	78†	81‡
Median — m	281	396	422
Interquartile range — m	55–454	244–500	277–510
Percentage of predicted value§	49	64	66
Returned to work — no./total no. (%)¶	13/83 (16)	26/82 (32)	40/82 (49)‖
Returned to original work — no./total no. (%)	10/13 (77)	23/26 (88)	31/40 (78)

Physical Inactivity Rapidly Induces Insulin Resistance and Microvascular Dysfunction in Healthy Volunteers

Naomi M. Hamburg, Craig J. McMackin, Alex L. Huang, Sherene M. Shenouda, Michael E. Widlansky, Eberhard Schulz, Noyan Gokce, Neil B. Ruderman, John F. Keaney Jr, Joseph A. Vita





Conclusions—Physical inactivity was associated with the development of insulin resistance, dyslipidemia, increased blood pressure, and impaired microvascular function in healthy volunteers. Our findings may provide insight into the pathogenesis of vascular disease in sedentary individuals and emphasize that even short-term physical inactivity may have adverse metabolic and vascular consequences. (***Arterioscler Thromb Vasc Biol.*** **2007;27:2650-2656.**)

Yoğun Bakım Polinöropati ve Miyopati

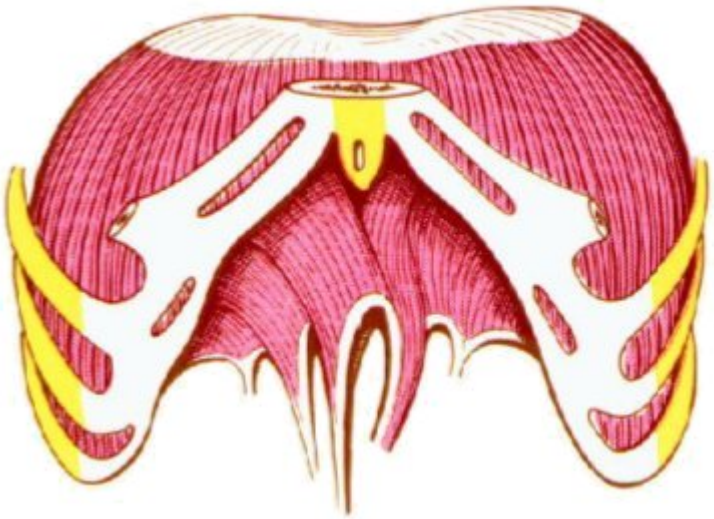
Polinöropati (aksonal yıkım)

- Periferik sinirlerde mikrodolaşım bozukluğu
  - Oksijen
  - Besin
  - Sepsis, hiperglisemi,
- Endonöral ödem
  - Mikrovasküler geçirgenlikte artma (sitokinler)
- Nöronal yetersizlik (mitokondri disfonksiyon)
  - Serbest oksijen radikallleri
  - Artmış glikoz alımı
- Sitokinler periferik sinirlere direkt toksik etkisi

Miyopati

- Metabolik
- İnflamatuar
- Biyoenerjik kas dengesizliği
- Kas
  - Oksijen
  - Besin alımı
- Protein katabolizmasında bozulma (sitokinler)
- Mikrofiber tamir genlerde azalma
- Anabolik/katabolik hormon dengesizliği

Diyafragma



- Atrofi
- Kas gücünde azalma

Sonuç Olarak

- Hızlı kas atrofisi
  - Hareketsizlik
  - Erken subklinik olarak yoğun bakım nöromiyopatisinin gelişimi

Risk faktörleri

Yaş

İlişki yok



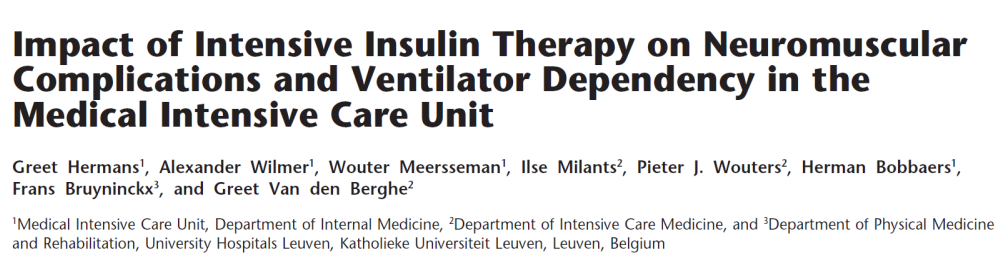
Intensive Care Med (2009) 35:63–68
DOI 10.1007/s00134-008-1304-4

ORIGINAL

Catherine L. Hough
Kenneth P. Steinberg
B. Taylor Thompson
Gordon D. Rubenfeld
Leonard D. Hudson

Intensive care unit-acquired neuromyopathy and corticosteroids in survivors of persistent ARDS

İlişki var



Impact of Intensive Insulin Therapy on Neuromuscular Complications and Ventilator Dependency in the Medical Intensive Care Unit

Greet Hermans[1], Alexander Wilmer[1], Wouter Meersseman[1], Ilse Milants[2], Pieter J. Wouters[2], Herman Bobbaers[1], Frans Bruyninckx[3], and Greet Van den Berghe[2]

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Cinsiyet

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Hastalığın Şiddeti

Var

- APACHE II
- APACHE III
- SOFA

Yok

- APACHE II
- SAPS-2
- SOFA

Glikoz

Impact of Intensive Insulin Therapy on Neuromuscular Complications and Ventilator Dependency in the Medical Intensive Care Unit

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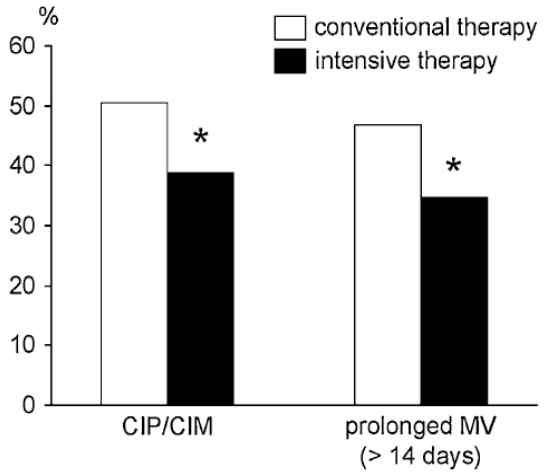

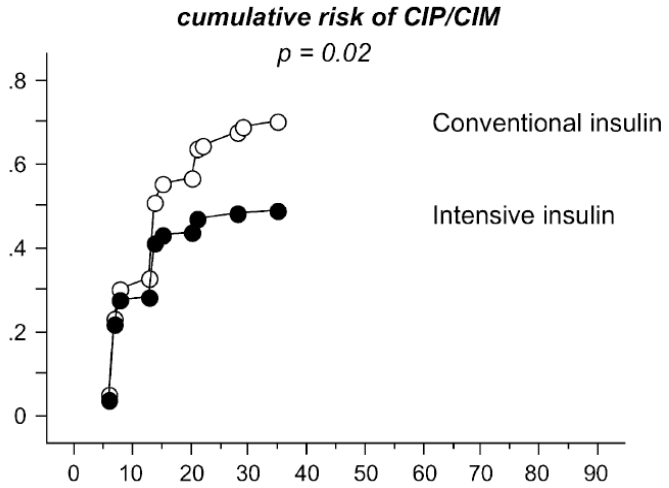

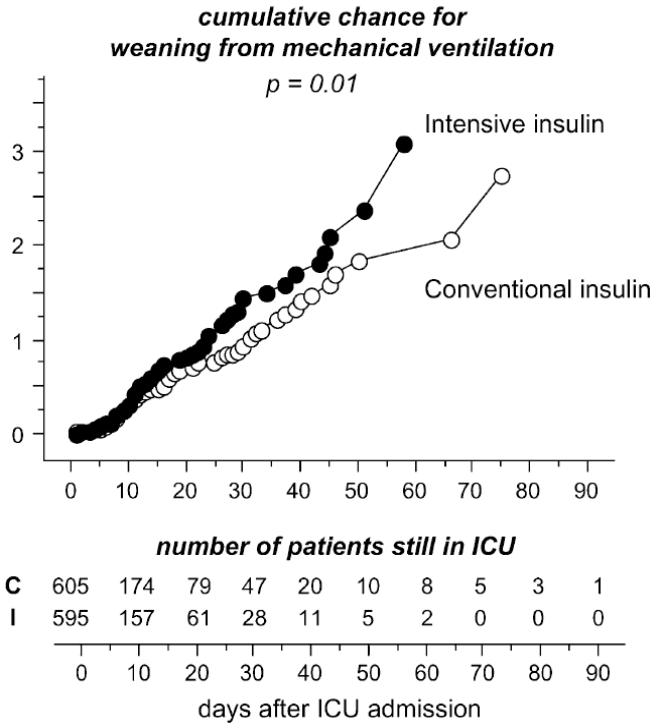

- Hiperglisemi
- Sıkı glikoz kontrolü
- Günlük yüksek glikoz düzeyleri

Am J Respir Crit Care Med Vol 175. pp 480–489, 2007

Kortikosteroidler

Prospective	95	Clinical	Corticosteroids significantly associated (OR 14.9, 95% CI 3.2–69.8) with ICUAW[4]
Secondary analysis	405	Electrophysiological testing	No association between corticosteroids and ICUAW[39]
Secondary analysis	420	Electrophysiological testing	Corticosteroids negatively associated (OR 0.91, 95% CI 0.86–0.97) with ICUAW in patients receiving tight glycemic control[31]
Prospective	61	Clinical, electrophysiological testing	No association between corticosteroids and ICUAW[35]
Prospective	98	Clinical, electrophysiological testing	No association between corticosteroids and ICUAW[36]
Prospective	44	Clinical, electrophysiological testing, muscle biopsy	No association between corticosteroids and ICUAW[38]
Retrospective	50	Clinical	No association between corticosteroids and ICUAW[39]
Prospective	73	Electrophysiological testing	No association between corticosteroids and ICUAW[40]
Secondary analysis	128	Clinical	No association between corticosteroids and ICUAW[41]

Nöromuskuler blokürler

Prospective	95	Clinical	No association between NMBA and ICUAW[4]
Secondary analysis	405	Electrophysiological testing	No association between NMBA and ICUAW[33]
Secondary analysis	420	Electrophysiological testing	Prolonged NMBA significantly associated (OR 2.01, 95% CI 1.10–3.99) with ICUAW[34]
Prospective	61	Clinical, electrophysiological testing	No association between NMBA and ICUAW[35]
Prospective	98	Clinical, electrophysiological testing	No association between NMBA and ICUAW[36]
Prospective	474	Clinical	No association between NMBA and ICUAW[34]
Prospective	44	Clinical, electrophysiological testing, muscle biopsy	No association between NMBA and ICUAW[37]
Prospective	73	Electrophysiological testing	NMBA use significantly associated (OR 16.32, 95% CI 1.34–199) with ICUAW[38]

Aminoglikozidler

Prospective	95	Clinical	No association between aminoglycosides and ICUAW[4]
Prospective	474	Clinical	Aminoglycosides significantly associated (OR 4.06, 95% CI 1.83–9.00) with ICUAW[34]

Sepsis/SIRS

Prospective	61	Clinical, electrophysiological testing	Duration of SIRS during the first week of ICU admission significantly (OR 1.05, 95% CI 1.01–1.15) associated with ICUAW[35]
Prospective	98	Clinical, electrophysiological testing	Presence of SIRS significantly associated ($P < .05$) with ICUAW in multivariate analysis[36]
Prospective	44	Clinical, electrophysiological testing, muscle biopsy	No association between presence of sepsis and ICUAW[37]

TPN

Prospective	474	Clinical	Total parenteral nutrition not associated with ICUAW[34]
Prospective	73	Electrophysiological testing	Total parenteral nutrition significantly associated (OR 5.11, 95% CI 1.14–22.88) with ICUAW[38]

Önlemek ve Tedavi

- Kortikosteroidler
- Nöromuskuler blokürler
- Sıkı glikoz kontrolü
- Elektrolit dengesini sağlamak (fosfat, magnezyum)
- Yeterli beslenme
- Yeni bir tedavi seçeneği
  - Erken rehabilitasyon

Erken Rahabilitasyon ve Mobilizasyon

Erken rehabilitasyon ve Mobilizasyon

- Pasif hareket
- Aktif hareket
- Yatak egzersizi
- Yatak kenarında oturmak
- Dolaşım

Resource-efficient mobilization programs in the intensive care unit: who stands to win?

John W. Mah, M.D.[a,*], Ilene Staff, Ph.D.[b], David Fichandler, M.S.P.T., C.L.T.[c], Karyn L. Butler, M.D.[a]

Abstract

BACKGROUND: Functional outcomes can improve with early intensive care unit (ICU) mobilization programs but require additional resources. Details regarding resource allotment and methods to deliver therapy are lacking. We describe an effective team-based, resource-efficient mobility program (REMP).

METHODS: Consecutive admissions (November 2009 to March 2010) underwent an evaluation by a physical therapist and participation in the REMP. Sitting balance (SB), transfer from bed to chair, and ambulation were assessed on the initial evaluation and compared with ICU and hospital discharge using the Functional Independence Measure scale.

RESULTS: Twenty-eight patients entered the REMP, and 31 patients served as controls. There were no differences in baseline characteristics or initial Functional Independence Measure scores for ambulation or SB. Bed-to-chair evaluation was higher in the controls ($P < .024$). Both groups improved across the 3 time periods on all measures; however, more REMP patients had a significantly improved SB at ICU and hospital discharge.

CONCLUSIONS: A team-based, resource-efficient approach to early mobilization is feasible and effective in the ICU.

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Yoğun Bakım Egzersiz

- Düzey 1
  - Şuur yok
  - Aile eğitimi
  - 3x1/gün 5 kez pasif egzersiz
- Düzey 2
  - Şuur var
  - Sözel uyarı yanıt var
  - Aktif egzersiz 5kez 1-2x1/gün
  - Sandalyeye oturma 2x1/gün (20 dk)
- Düzey 3
  - Üst ekstermite gücü
  - Yatak kenarında oturma
  - Sandalyeye oturma 2x1/gün (20 dk
- Düzey 4
  - Alt ekstremite gücü
  - Sandalyeye oturma 2-3x1/gün (20-30 dk
- Düzey 5
  - Gezen hasta





Early Mobilization of Mechanically Ventilated Patients: A 1-Day Point-Prevalence Study in Germany

Peter Nydahl, RN, BScN[1]; A. Parker Ruhl, MD[2,3]; Gabriele Bartoszek, MSc[4]; Rolf Dubb, BSc, CCRN[5]; Silke Filipovic, BSc[6]; Hans-Jürgen Flohr, RN, CCRN[7]; Arnold Kaltwasser, BSc, CCRN[8]; Hendrik Mende, MD[9]; Oliver Rothaug, BSc, CCRN[10]; Danny Schuchhardt, RN[11]; Norbert Schwabbauer[12]; Dale M. Needham, FCA, MD, PhD[2,13]

TABLE 5. Most Important Perceived Complication During Mobilization

Complication	Total ($n = 654$) (%)[a]	Mobilized in Bed[b] ($n = 473$) (%)[c]	Mobilization Out of Bed[d] ($n = 181$) (%)[e]	p[f]
Any complication	135 (21)	94 (20)	41 (23)	0.450
Specific complications				
Ventilator dyssynchrony	23 (4)	15 (3)	8 (4)	0.478
Anxiety or confusion	22 (3)	1		
Oxygen saturation < 85%	19 (3)	1		
Mean arterial pressure < 55 mm Hg	15 (2)	1		
Arrhythmia (any type)	12 (2)	1		
Cardiac arrest	4 (1)			
Disconnection from ventilator	7 (1)			
Bleeding	2 (0)			
Mean arterial pressure > 140 mm Hg	5 (1)			
Removal of endotracheal tube	1 (0)			
Removal of bladder catheter	1 (0)	1 (0)	0 (0)	> 0.999
Removal of feeding tube	1 (0)	0 (0)	1 (1)	0.277
Removal of intravascular catheter[g]	0 (0)	0 (0)	0 (0)	> 0.999
Fall	0 (0)	0 (0)	0 (0)	> 0.999
Other	23 (4)	16 (3)	7 (4)	0.813

Conclusions: In this 1-day point-prevalence study conducted across Germany, only 24% of all mechanically ventilated patients and only 8% of patients with an endotracheal tube were mobilized out of bed as part of routine care. Addressing modifiable barriers for mobilization, such as deep sedation, will be important to increase mobilization in German ICUs. (*Crit Care Med* 2013; XX:00–00)

TABLE 4. Perceived Barriers to Achieve a Higher Level of Mobilization

Perceived Barrier	Total[a] ($n = 762$) (%)[b]	Remaining in Bed[c] ($n = 587$) (%)[d]	Mobilized Out of Bed[e] ($n = 175$) (%)[f]	p[g]
Any perceived barrier	575 (75)	496 (84)	79 (45)	< 0.001
Specific perceived barriers				
Cardiovascular instability	105 (14)	100 (17)	5 (3)	< 0.001
Deep sedation	87 (11)	86 (15)	1 (1)	< 0.001
	1)	81 (14)	3 (2)	< 0.001
	)	63 (11)	4 (2)	< 0.001
	)	27 (4)	22 (13)	< 0.001
	)	9 (2)	8 (5)	0.035
	)	14 (2)	0 (0)	0.048
	)	8 (1)	7 (4)	0.055
	)	23 (4)	2 (1)	0.089
	)	17 (3)	7 (4)	0.463
	)	19 (3)	4 (2)	0.623
Patient refusal	16 (2)	11 (2)	5 (3)	0.383
No physician order	15 (2)	13 (2)	2 (1)	0.540
Immobile prior to ICU	12 (2)	8 (1)	4 (2)	0.486
No nursing staff available	9 (1)	9 (1)	0 (0)	0.128
Intravascular catheter	11 (1)	7 (1)	4 (2)	0.287
No physiotherapist available	2 (0)	1 (0.2)	1 (1)	0.407

Crit Care Med 2013

Very Early Passive Cycling Exercise in Mechanically Ventilated Critically Ill Patients: Physiological and Safety Aspects - A Case Series

Ruy Camargo Pires-Neto[1,2*], Yurika Maria Fogaça Kawaguchi[1], Adriana Sayuri Hirota[1], Carolina Fu[1,3], Clarice Tanaka[1,3], Pedro Caruso[4], Marcelo Park[5], Carlos Roberto Ribeiro Carvalho[4]

September 9, 2013 PLOS | ONE

Abstract

Introduction: Early mobilization can be performed in critically ill patients and improves outcomes. A daily cycling exercise started from day 5 after ICU admission is feasible and can enhance functional capacity after hospital discharge. In the present study we verified the physiological changes and safety of an earlier cycling intervention (< 72 hrs of mechanical ventilation) in critical ill patients.

Methods: Nineteen hemodynamically stable and deeply sedated patients within the first 72 hrs of mechanical ventilation were enrolled in a single 20 minute passive leg cycling exercise using an electric cycle ergometer. A minute-by-minute evaluation of hemodynamic, respiratory and metabolic variables was undertaken before, during

Conclusions: In our study, this very early passive cycling exercise in sedated, critically ill, mechanically ventilated patients was considered safe and was not associated with significant alterations in hemodynamic, respiratory or metabolic variables even in those requiring vasoactive agents.

Results: We enrolled 19 patients (42% male, age 55±17 years, SOFA = 6 ± 3, SAPS 3 score = 56 ± 15, PaO_2/FIO_2 = 223±75). The median time of mechanical ventilation was 1 day (02), and 68% (n=13) of our patients required norepinephrine (maximum concentration = 0.47 $\mu g.kg^{-1}.min^{-1}$). There were no clinically relevant changes in any of the analyzed variables during the exercise, and two minor adverse events unrelated to hemodynamic instability were observed.

Conclusions: In our study, this very early passive cycling exercise in sedated, critically ill, mechanically ventilated patients was considered safe and was not associated with significant alterations in hemodynamic, respiratory or metabolic variables even in those requiring vasoactive agents.