Titration de la pression positive continue: manuelle ou par auto CPAP?

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Formation continue de Pneumologie aux HUG
Nasal CPAP therapy for sleep apnea was first described in Sydney in 1981 (Sullivan CE, Lancet 1981, 862-865)

Nasal CPAP is now the established treatment for sleep apnea-hypopnea syndrome

CPAP acts as a pneumatic splint to prevent collapse of the pharyngeal airway, that is, elevating the pressure in the oropharyngeal airway and reversing the transmural pressure gradient across the pharyngeal airway
The optimal pressure selected for an OSA patient is subject to interindividual variability.

There are several factors that have been identified as potentially influencing optimal pressure:

- The apnea-hypopnea index (AHI) Nino-Murcia G West J Med 1989;150:165-9
- The AHI has been observed only in patients whose apneas are dependent on body position. Pevernagie DA, Sleep 1992;15:162-7
- The REM sleep amounts, Sullivan CE Bull Eur Physiopathol Respir 1984;20:49-54
- Length of the soft palate, Sforza E et al Am J Respir Crit Care Med 1995;151:1852-6
- The degree of respiratory effort. Sforza E et al Am J Respir Crit Care Med 1995;151:1852-6

i.e., a pressure that controls the respiratory events of one patient may inadequately control those of another patient >> need for titration
**Titration**

- A central element of the CPAP prescription is the pressure level, which is typically derived through a titration study.

- While obstructive breathing events will reappear when the pressure is reduced below a critical lower limit, raising the pressure above an upper threshold will induce air leakage and bring on unwarranted side effects.

- A successful titration is one in which there is an optimized trade-off between increasing pressure to yield efficacy in elimination of respiratory events and decreasing pressure to minimize emergence of pressure-related side effects.

The titration goals should include both physiological and clinical parameters.

- The physiological goals can be assessed at the time of CPAP titration and will allow to predict how a given level of CPAP will be at eliminating target consequences.
  - Level is adjusted to eliminate obstructive respiratory-related events
    - Apneas, hypopneas, respiratory effort-related arousals [RERAs], and snoring

- Clinical goals are required because physiological parameters may not be totally predictive of clinical success.
  - CPAP pressure can be titrated to find a level that is likely to provide successful long-term therapy.
Finding the lowest pressure that *normalises* respiratory and sleep physiology

1. The extent to which *poor adherence* and side-effects are related to *excessive pressure* is controversial

2. The required *pressure level* changes with both *body position* and *stage of sleep*, with the highest pressure levels occurring during stage REM in the supine position. Oksenberg A et al. Chest 1999;116:1000-6

3. The *pressure level* that is required at the time of CPAP decreases with continued use of nasal CPAP. Seriès F. Eur Resp J 1994: 1776-1781

4. « *Sub-therapeutic* » pressures have good clinical outcomes. Loredo J. Chest 1999: 1545-1549
The effect of body posture on op-nCPAP

The sequence from highest to lowest op-nCPAP values was as follows:

Supine REM > Supine NREM > Lateral REM > Lateral NREM
Required levels of nasal continuous positive airway pressure during treatment of obstructive sleep apnoea

F. Séries, I. Marc, Y. Cormier, J. La Forge

Fig. 1. – Mean±SEM values of the effective nasal continuous positive airway pressure (NCPAP) level measured at the different visits. This pressure level progressively decreased with time, the difference being significant after 2 and 8 months of NCPAP therapy. Values with different letters are significantly different from one another. Mean±SEM. Note that the vertical axis is magnified and cut-off from zero.
Results: CPAP and placebo CPAP had comparable effects on sleep quality as assessed by sleep architecture, sleep efficiency, total sleep time, and wake after sleep onset time.

While essentially no data on the hypothetical upper pressure limit exist, it is known from the literature that “sham” nasal CPAP levels as low as 2 cm H2O may induce significant improvements in markers of sleep disordered breathing.
CPAP titration studies
Manual titration
**BACKGROUND**

- **Manual titration** of CPAP/BPAP is the **gold standard** for selection of the optimal pressure.

- The manual titration has been conducted for over a quarter of a century. *Juhasz J Sleep Breath 2007;11:65-7*

- Pressure adjustment by a sleep technologist step by step on a “trial-error basis” during attended laboratory polysomnography to eliminate:
  - Obstructive respiratory-related events (apneas, hypopneas, respiratory effort-related arousals [RERAs], and snoring)

- In addition, titration under attended polysomnography allows for **interventions** to adjust mask fit, eliminate leak, and help the patient adapt to the initial CPAP experience.
4.1.3.2 Polysomnography is indicated for CPAP titration in patients with sleep related breathing disorders (Standard)

1) A full night of PSG with CPAP titration is recommended for patients with a documented diagnosis of a SRBD for whom PAP is warranted

2) PSG with CPAP titration is appropriate for patients with any of the following results:
   a) An RDI of at least 15 per hour, regardless of the patient's symptoms
   b) An RDI of at least 5 per hour in a patient with excessive daytime sleepiness
4.2.1 Full-night, attended polysomnography performed in the laboratory is the preferred approach for titration to determine optimal positive airway pressure (Guideline)

- Pressure adjustment during attended laboratory polysomnography to eliminate obstructive respiratory-related events

- Apneas, hypopneas, oxygen desaturations, snoring, respiratory effort related arousals [RERAs]
Yet no **standardized protocols** exist for this procedure [Stepanski EJ J Clin Sleep Med 2005;1:311]

- In a survey from 51 accredited centers the procedures described for PAP titration varied widely among the centers
- 22% of these centers did not have a written protocol

The lack of standardization results in clinicians and technologists from different sleep laboratories developing their own protocols or relying on protocols obtained from industry or other sleep laboratories

When a standardized protocol is implemented, the optimal pressure for CPAP can be reproducible
Clinical Guidelines for the Manual Titration of Positive Airway Pressure in Patients with Obstructive Sleep Apnea

Positive Airway Pressure Titration Task Force of the American Academy of Sleep Medicine

CPAP Titration Algorithm for Patients ≥12 years
4.2.2.6 “exploration” of CPAP above the pressure at which control of abnormalities in respiratory parameters is achieved should not exceed 5 cm H2O (consensus)

- upper airway resistance can be abnormal despite selection of a pressure that eliminates apneas and hypopneas. Montserrat JM et al Am J Respir Crit Care Med 1995;152:1854-9

- and this residual high airway resistance can lead to repetitive arousals and insomnia. Guilleminault C et al Chest 1993;104:781-7

- Reduction of this resistance has been demonstrated by increasing pressure until esophageal pressure swings (if measured) or the shape of the inspiratory flow limitation curve are normalized. Condos R et al Am J Respir Crit Care Med 1994;150:475-8

- or by increasing pressure by 2 cm H2O but no higher than by 5 cm H2O. Berthon-Jones et al Sleep 1996;19(9 Suppl):S131-5
4.2.2.8 “Down” titration is not required but may be considered as an option (consensus).

A “down” titration is recommended due to the “hysteresis” phenomenon: during upward titration the PAP level at which flow limitation disappears is 2-5 cm H₂O higher than the level at which it reappears during downward titration. Condos R et al Am J Respir Crit Care Med 1994;150:475-8
4.4.1.2 Grading system (consensus):

- An optimal titration reduces RDI <5 per hour for at least a 15-min duration and should include supine REM sleep at the selected pressure that is not continually interrupted by spontaneous arousals or awakenings.

- A good titration reduces the overnight RDI ≤ 10 per hour or by 50% if the baseline RDI <15 per hour and should include supine REM sleep that is not continually interrupted by spontaneous arousals or awakenings at the selected pressure.

- An adequate titration is one that does not reduce the overnight RDI ≤ 10 per hour but does reduce the RDI by 75% from baseline (especially in severe OSA patients), or one in which the titration grading criteria for optimal or good are met with the exception that supine REM sleep did not occur at the selected pressure.

Hirshkowitz M et al Semin Respir Crit Care Med 2005;26:68-79
4.4.4.1 Ideally, the patient should be recorded in supine REM sleep for at least 15 min at the designated optimal pressure during the PAP titration study (consensus).

Optimal CPAP has been defined as the highest pressure obtained during REM sleep with the patient having slept in the supine position. Lloberes P et al. Respir Med 2004;98:619-25

Since treatment emergent central sleep apnea is more likely to occur in NREM sleep, it is also important to evaluate patients at the designated optimal pressure during NREM sleep. Gilmartin GS et al Curr Opin Pulm Med 2005;11:485-93

There is evidence that the optimal CPAP level in the supine position is greater than 2 cm H$_2$O higher than the optimal CPAP needed while sleeping in the lateral position, both in REM and NREM sleep, in obese and nonobese subjects and in those younger and older than 60 years. Oksenberg A et al Chest 1999;116:1000-6
Figure 1—Mean ± SEM objective compliance (hours per night) in individuals whose sleep efficiency improved from diagnostic to titration night and individuals whose sleep efficiency did not improve from diagnostic to titration night. CPAP=continuous positive airway pressure.
Limitations

- It is labour intensive, time consuming, and expensive
- This procedure only provides useful information on the $P_{eff}$ level during one single night in a dedicated environment
  - Sleep conditions during the titration sleep study significantly differ from those encountered at home
  - Intra-night and night-to-night changes in $P_{eff}$
  - REM and supine position
  - The falling pressure over the first few weeks of treatment
    Monton C Arch Bronconeumol 1994;30:385-9
  - Variation in pressure due to changes in nasal resistance, alcohol consumption, drugs and sleep deprivation
The high prevalence of OSA and the demonstrated benefit of CPAP suggest that a substantial portion of the population might benefit from CPAP titration and therapy.

For this to be practical the cost of CPAP titration needs to be decreased and the availability increased.

A number of alternative approaches have been developed.
4) For CPAP titration, a **split-night study** (initial diagnostic PSG followed by CPAP titration during PSG on the same night) is an alternative to one full night of diagnostic PSG followed by a second night of titration if the following four **criteria** are met (**Standard**)

- a) An **AHI** of at least 40 is documented during a minimum of **2 hours** of diagnostic PSG. Split-night studies may sometimes be considered at an AHI of 20 to 40, based on clinical judgment (e.g., if there are also repetitive long obstructions and major desaturations). However, at AHI values below 40, determination of CPAP pressure requirements, based on split-night studies, may be less accurate than in full-night calibrations.
- b) **CPAP titration** is carried out for more than **3 hours** (because respiratory events can worsen as the night progresses)
- c) PSG documents that CPAP eliminates or nearly eliminates the respiratory events during REM and non-REM sleep, including **REM sleep** with the patient in the **supine position**
- d) A second full night of PSG for CPAP titration is performed if the diagnosis of a SRBD is confirmed but criteria b and c are not met
4.2.1 Full-night, attended polysomnography performed in the laboratory is the preferred approach for titration to determine optimal positive airway pressure; however, split-night, diagnostic-titration studies are usually adequate (Guideline)

Study design: Fourteen patients (13 men and one woman) received a daytime CPAP titration (day group). The day group was matched to 18 patients (17 men and one woman) who were titrated under a full-night regular nocturnal study (night group). Eligible patients were those with severe OSA (respiratory event index > 40). The groups were matched by age, sex, and body mass index. Results: Daytime and nocturnal CPAP titration studies yielded sufficient amounts of rapid eye movement (REM) and non-REM sleep to help determine CPAP settings. Importantly, the diurnal and nocturnal CPAP titrations resulted in comparable therapeutic pressures as well as comparable resolution of sleep-disordered breathing. After 1 week of treatment, the groups exhibited similar CPAP use and comparable improvements in subjective sleepiness as indicated by their increase in sleep/wake activity inventory scores. Conclusions: Daytime CPAP titration studies may be a viable alternative for the efficient and expedient implementation of CPAP therapy among some patients with severe OSA.
Nap-titration: An effective alternative for continuous positive airway pressure titration

Aarnoud Hoekemaª,* , Boudewijn Stegengaª, Johannes G. van der Aaª, Aafke F. Meineszª,c, Johannes H. van der Hoevend, Peter J. Wijkstraª,c

Successful CPAP titration in 96% of OSAHS patients’
Clinical prediction

- **Mathematical equations** incorporating measures of OSA severity (AHI) and obesity (i.e., body mass index and neck circumference) have been developed to predict the optimal level of CPAP. Miljeteig H, Am Rev Respir Dis 1993;147:1526-30; Hoheisel GB, Am J Resp Crit Care Med 1994;149:A496; Hoffstein V, Am J Resp Crit Care Med 1994;150:486-8

Accuracy of CPAP Predicted From Anthropometric and Polysomnographic Indices

Formula was accurate for 14% of patients

\[ P = 0.16 \times \text{Neck} + 0.13 \times \text{BMI} + 0.04 \times \text{AHI} - 5.12 \]
Auto-CPAP
Since 1996, there have been technologies that allow automatic adjustment of CPAP.

Dynamically change the airway pressure based on the individual requirements of the patients within a single night or during a longer period of time.

APAP to perform titration: Auto-titrating devices can be used to determine an optimal fixed pressure level for long term treatment with a conventional CPAP device.

In the ward

At home, used for 1 or 2 wk at home
A number of auto-titrating PAP devices are commercially available. What is monitored (snoring, apnea, hypopnea, airflow limitation, impedance) and the algorithms for changing pressures vary between devices.

In general, pressure increases to maintain airway patency and then decreases if no events are detected over a set period of time.

APAP units store pressure vs. time data and many can record mask leak, apnea events, and hypopnea occurrences.

When transferred to a computer, this information provides both detailed and summary night by night results.

The clinician can use these results to select a fixed pressure for subsequent CPAP treatment.

They inevitably “hunt” around the ideal pressure and may respond inappropriately on some occasions, they could result in a more disturbed first night on CPAP and reduce the patient’s enthusiasm to try the treatment at home.
Practice Parameters for the Use of Auto-Titrating Continuous Positive Airway Pressure Devices for Titrating Pressures and Treating Adult Patients with Obstructive Sleep Apnea Syndrome

An American Academy of Sleep Medicine Report

4. Certain APAP devices may be used during attended titration to identify by polysomnography a single pressure for use with standard CPAP for treatment of OSA (Guideline)

6. Use of unattended APAP to either initially determine pressures for fixed CPAP or for self-adjusting APAP treatment in CPAP-naïve patients is not currently established (Option)
3.4. Certain APAP devices may be used during attended titration with polysomnography to identify a single pressure for use with standard CPAP for treatment of moderate to severe OSA (Guideline)

3.6. Certain APAP devices may be used in an unattended way to determine a fixed CPAP treatment pressure OSA without significant comorbidities (CHF, COPD, central sleep apnea syndromes, or hypoventilation syndromes) (Option)
3.4. Certain APAP devices may be used during attended titration with polysomnography to identify a single pressure for use with standard CPAP for treatment of moderate to severe OSA (Guideline)

- **Sleep** information
- Allow a technician to attend titration of more patients
- **Allow interventions** for problems with mask fit, mask leaks
- **As in technician-directed PAP titrations, a careful review of the whole PSG is recommended to determine the optimal pressure**
- **Only one night:** provides information on the Peff level during **one single night** in a dedicated **environment**
Automatic nasal continuous positive airway pressure titration in the laboratory: patient outcomes

J R Stradling, C Barbour, D J Pitson, R J Odavies

Thorax 1997;52:72–75

Horizon®, DeVilbiss

- NCPAP pressures were similar (manual 8.7 (2.5) cm H2O, automatic 8.2 (2.1) cm H2O)

- The percentage of patients successfully established on CPAP at six weeks was 64% and 73% for the manual and automatic groups

- 13% and 2%, respectively, in the manual and automatic groups had given up completely (p<0.05)

Conclusions - The substitution of automatic NCPAP titration for manual titration during the first night of NCPAP in patients with OSA does not reduce the number accepting the treatment at six weeks and may slightly improve it. This has important cost saving potential.
Manual titration vs in lab auto-titration (Autoset-T®, ResMed) vs formula with domiciliary adjustment report

\[ P = (0.16 \times \text{BMI}) + (0.13 \times \text{neck circ}) + (0.04 \times \text{AHI}° - 5.12) \]

Follow up 12 weeks: polysomnography

AHI, ESS, QOL, compliance =
Automatic Pressure Titration with APAP Is as Effective as Manual Titration with CPAP in Patients with Obstructive Sleep Apnea

Ingo Fietze\textsuperscript{a}  Martin Glos\textsuperscript{a}  Isabel Moebus\textsuperscript{a}  Christian Witt\textsuperscript{b}  Thomas Penzel\textsuperscript{a}
Gert Baumann\textsuperscript{c}

\textbf{REMstar® Auto} (Respironics)

- Attended automatic titration vs manual
- 2 random nights
- Outcome at 6 weeks
- Compliance and ESS =

- Sleep better the first night with Auto-CPAP
Comparison of manual titration and automatic titration based on forced oscillation technique, flow and snoring in obstructive sleep apnea

Wolfgang Galetke, Winfried J. Randerath, Sven Stieglitz, Cordula Laumanns, Norbert Anduleit, Kerstin Richter, Thorsten Schäfer

SOMNOSet®

Participants were randomly assigned to attended in-laboratory manual titration and automatic titration in two consecutive nights.

The follow-up period was six weeks.

AHI and ESS showed a similar improvement.

Careful evaluation of raw data and polysomnography recording is mandatory before choosing a fixed CPAP pressure after automatic titration.
Pressure recommendation by the device and the technician, although not statistically different (8.7 ± 2.9 vs. 9.0 ± 3.3 mbar), corresponded only in 50% of the patients.
3.6. Certain APAP devices may be used in an unattended way to determine a fixed CPAP treatment pressure OSA without significant comorbidities (CHF, COPD, central sleep apnea syndromes, or hypoventilation syndromes) (Option)

The need for attended laboratory CPAP titration would be reduced, this may extend CPAP availability to a wider patient group, deliver treatment in a more timely manner, and potentially reduce costs.

CPAP titration conducted at home during several nights.

Take into account the night-to-night variability in the Peff level.

NO SLEEP INFORMATION
Determine the adequate setting for fixed CPAP therapy after an automatic CPAP trial at home for several days without need of an in-hospital titration sleep study: 1-2 weeks.

Sleep improved with fixed CPAP, with a normalization of the AHI in 38 of 40 and resumption of diurnal hypersomnolence.

CPAP compliance remained excellent (CPAP use: 6.1 ± 1.7 h/night) after 6.5 ± 2.8 mo of CPAP treatment.

These results indicate that auto-CPAP therapy represents a new useful and accurate way to identify conventional CPAP setting outside hospital and sleep laboratories.
Comparison of CPAP Titration at Home or the Sleep Laboratory in the Sleep Apnea Hypopnea Syndrome

Melanie D. Cross, MRCP\textsuperscript{1}; Marjorie Vennelle, RGN\textsuperscript{1}; Heather M. Engleman, PhD\textsuperscript{1}; Sandra White, BSc\textsuperscript{1}; Thomas W. Mackay, FRCP\textsuperscript{1}; Sarah Twaddle, PhD\textsuperscript{1}; Neil J. Douglas, FRCP\textsuperscript{1}

- **Standard 1-night in-hospital CPAP titration vs 3 nights’ home CPAP titration (Spirit\textsuperscript{®}; Res Med, San Diego, Calif) and then issued with fixed pressure CPAP**

- **At 3 month follow-up, there was no significant difference in CPAP use, ESS, OSLER or SF36 between the sleep-laboratory and home titrated groups**
Titration at the sleep laboratory vs the REM+ auto® (Respironics) device in automatic mode initiated at the patient’s home (1 week)

After 2 months, the efficacy and cost of nCPAP therapy and the time from diagnosis to nCPAP were evaluated

Similar decreases in the AHI and ESS

With auto-nCPAP initiated at home, the time from diagnosis to final adjustment of nCPAP was shorter and the cost was lower
Limitations

❌ Selected patients

❌ 3.2. Patients with congestive heart failure, significant lung disease such as chronic obstructive pulmonary disease, patients expected to ave nocturnal arterial oxyhemoglobin desaturations due to conditions ther than OSA (e.g., obesity-hypoventilation syndrome), patients who don’t snore (either naturally or as a result of palate surgery), and patients who have central sleep apnea syndromes are not currently candidates or APAP titration treatment. (Standard) Juhász J, Schillen J, Urbigkeit A, Ploch T, Penzel T, Peter JH (1996) Am J Respir Crit Care Med 154:359–365

❌ Titration procedure is not standardized

❌ Precise monitoring of the raw data during polysomnography or collected by the APAP device

❌ Substantial differences in the performance of automatic nCPAP devices in the clinical setting
The bench study allows the comparison of the responses of different devices when they are subjected to exactly the same patterns of disturbed breathing, which is not possible in patients, given the variability in their disturbed breathing patterns.

- D1: DeVilbis AutoAdjust LT® (Sunrise Medical, Somerset, PA)
- D2: Autoset Portable II Plus® (Resmed, North Ryde, Australia)
- D3: Autoset-T® (Resmed, North Ryde, Australia)
- D4: Virtuoso LX® (Respirronics, Murrysville, PA)
- D5: Goodknight 418P® (Mallinckrodt, Villers-les-Nancy, France)
Response of Automatic Continuous Positive Airway Pressure Devices to Different Sleep Breathing Patterns
A Bench Study

Ramon Farré, Josep M. Montserrat, Jordi Rigau, Xavier Trepat, Paula Pinto, and Daniel Navajas

Figure 2. Actual flow events used to generate breathing patterns for testing automatic CPAP devices: different types of apneas, hypopneas (Hypo-A to Hypo-D), snoring, and a persistent pattern of flow limitation (PFL).
Figure 3. Response of the automatic CPAP devices (D1–D5) when subjected to a flow ($V'$) breathing pattern consisting of repetitive apneas (Apnea-A in Figure 2). $P$ and $V'$ are actual pressure and flow, respectively, measured at the entrance of the automatic CPAP devices ($V' > 0$: inspiration).
Figure 4. Response of the automatic CPAP devices (D1–D5) when subjected to a flow (displayed as $V'$) breathing pattern consisting of repetitive hypopneas (Hypo-D in Figure 2). $P$ and $V'$ are actual pressure and flow, respectively, measured at the entrance of the automatic CPAP devices ($V' > 0$: inspiration).
Automatic CPAP titration with different self-setting devices in patients with obstructive sleep apnoea

A. Stammnitz, A. Jerrentrup, T. Penzel, J.H. Peter, C. Vogelmeier, H.F. Becker

Compare three automatic nCPAP devices with fixed nCPAP using a crossover protocol

- **AutoSet™®;** ResMed, San Diego, CA, USA; using flow limitation in addition to vibration
- **Horizon®;** DeVilbiss Sunrise Medical, Inc., Carlsbad, CA, USA; using flow limitation in addition to vibration
- **Virtuoso®;** Respironics, Inc., Murrysville, PA, USA; does not utilise a pneumotachograph; using only vibration
Fig. 1.—Apnoea/hypopnoea index (AHI) during the diagnostic (D) and treatment nights using various continuous positive airway pressure (CPAP) devices. Data are presented as mean±SD. *, p<0.05 versus all other groups; #, p<0.05 versus diagnostic night, fixed CPAP and Virtuoso.
Fig. 4.—Mean (□) and maximum (⊗) pressure with the various continuous positive airway pressure (CPAP) devices. Data are presented as mean±SD. *: p<0.05 versus fixed CPAP; #: p<0.05 versus AutoSet; ‹: p<0.05 versus Horizon; †: p<0.05 versus Virtuoso.
Hospital 2 random nights

*AutoSet®* (Resmed) vs *SomnoSmart®* (Weinmann)

$P_{95}$

Significant differences ($AHI: 9.9 \pm 2.6$ vs $7 \pm 2.5$)

Lack of agreement
One week home titration
Cross over
GK 420® Tyco (90th) vs
AutoSet Spirit® Resmed (95th) vs
Rem Star Auto® Respironics (90th)
Figure 1
Individual values of the recommended effective pressure (Peff) level obtained after one night and one week of automatic CPAP titration with the three tested apparatus.
There is a margin of pressure tolerance around an optimal CPAP level in a given patient at a given time (several centimeters of water). Within this conceptual margin, however, pressure adjustments will not appreciably affect sleep or breathing outcomes.

- Obsessional titration on the first(-s) night(-s) superfluous.
- Establishing patients successfully on nCPAP depends more on their training and support than on the subtle adjustment of NCPAP pressure.
Take home messages: Manual or Auto-CPAP?

**Manual:**

+ Gold standard
- Labour intensive, time consuming, and expensive
- Information during one single night in a dedicated environment

**Auto-CPAP:**

+ Cost and time saving
+ Substantial clinical equivalency between manual and Auto-CPAP titrations
- Selected patients
- Caution should be exercised in selecting a particular device: APAP must be robust and reliable, adequate knowledge of the technique must be ensured
Questions...?
Rencontres Genevoises de Pneumologie
Rencontre d'hiver

Apnées du sommeil: quoi de neuf?

Mercredi 18 février 2009, 13h00-17h00, salle 7A-7-731/732

Formation continue de Pneumologie aux HUG
Clinical prediction: formulas

- Manual titration
  - Full night PSG
  - Split night PSG
  - Daytime CPAP titration

- Auto-CPAP titration
  - In-laboratory attended
  - Unattended home
**TABLE 1. RESPONSE OF THE AUTOMATIC CPAP DEVICES WHEN SUBJECTED TO DIFFERENT BREATHING PATTERNS**

<table>
<thead>
<tr>
<th>Breathing Pattern</th>
<th>Automatic CPAP Device</th>
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<tbody>
<tr>
<td></td>
<td>D1</td>
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<tr>
<td>Repetitive events</td>
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<td>Apnea-A</td>
<td></td>
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<tr>
<td>Hypo-A</td>
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<td>Hypo-A + Snoring</td>
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<td>Hypo-B</td>
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<td>Hypo-C</td>
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<td>Hypo-D</td>
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<td>Prolonged flow limitation</td>
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<tr>
<td>Hypo-A</td>
<td></td>
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<tr>
<td>Hypo-A + Snoring</td>
<td>↑</td>
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<tr>
<td>Hypo-C</td>
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<tr>
<td>Hypo-C + Snoring</td>
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<tr>
<td>CPAP-dependent events</td>
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*Definition of abbreviation: CPAP = continuous positive airway pressure.*

D1, D2, D3, D4, and D5 are the different automatic CPAP devices tested. The different breathing patterns are described in the text. The device increased (↑) or did not modify (→) CPAP when subjected to the breathing pattern.
Essentials of Sleep Technology: CPAP Titration

American Academy of Sleep Medicine
November 2005

The American Thoracic Society, the American College of Chest Physicians and the AASM
CPAP titration by an auto-CPAP device based on snoring detection: a clinical trial and economic considerations

M. Berkani, F. Lofaso, C. Chouaid, M. Pia d’Ortho, D. Theret, V. Grillier-Lanoir, A. Harf, B. Housse


- **AutoSet® clinical** (ResMed, Sydney, Australia)
- Ambulatory polysomnography 2 weeks after initiating nCPAP treatment at the same fixed pressure
- The highest pressure obtained during titration was therefore considered as the minimum fixed pressure required to prevent upper airway narrowing.
- All patients started nCPAP treatment with this fixed pressure for 2 weeks and then underwent, in a conventional hospital room, another ambulatory full polysomnography to determine the efficacy of this fixed-pressure device, i.e. constant nCPAP treatment.