The use of auto-titrating continuous positive airway pressure for treatment of adult obstructive sleep apnea

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Authors' objectives
The review was conducted by a Task Force appointed by the American Academy of Sleep Medicine to inform practice parameters for auto-titrating continuous positive airway pressure (APAP) titration and for APAP treatment in adults with obstructive sleep apnoea (OSA).

Searching
MEDLINE and EMBASE were searched from 1980 to 2001 using key terms that included 'autoCPAP', 'automatic CPAP', 'auto-titrating CPAP', 'self-titrating CPAP', 'self CPAP', 'autoset', 'auto PAP' and 'auto-adjusting CPAP'. The search was limited to articles published in English in peer-reviewed journals. Reviews, editorials and articles in journal supplements were not used to form conclusions.

Study selection
Study designs of evaluations included in the review
The study design was not specified in the inclusion criteria. The included studies were randomised controlled trials (RCTs; crossover and parallel), non-randomised trials, clinical series and a case report.

Specific interventions included in the review
Studies of APAP devices for continuous positive airway pressure (CPAP) titration were eligible for inclusion. This included the laboratory or unattended determination of an appropriate CPAP level to provide the prescription pressure for fixed CPAP treatment. Studies of APAP devices for chronic treatment of OSA were also eligible for inclusion. Many different devices were used in the included studies, details of which were tabulated in the report.

Participants included in the review
Studies in patients with OSA were eligible for inclusion. The majority of participants in the included studies were previously untreated.

Outcomes assessed in the review
Studies that determined the efficacy of APAP, or the effect of APAP on positive pressure acceptance and/or adherence, were included. One study was included specifically because it referred to an aspect of safety and side-effects.

How were decisions on the relevance of primary studies made?
The authors state that two reviewers (Task Force members) analysed each article for inclusion and exclusion criteria, but it is unclear whether this occurred before or after any pre-selection was applied to the database search results.

Assessment of study quality
The authors do not report a method for assessing validity.

The level of evidence was determined according to criteria adapted from the recommendations of Sackett (see Other Publications of Related Interest). The authors state that two reviewers (Task Force members) analysed each article for design and biases, but no further details are given.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction.
Methods of synthesis

How were the studies combined?
The studies were grouped according to eight questions about the effectiveness of APAP, and were combined in a descriptive summary within these groups.

How were differences between studies investigated?
The tables of the included studies showed differences between the studies in terms of the APAP device used, patient characteristics, outcomes and potential sources of bias. Some of these differences were highlighted in the text that summarised the evidence for each of the clinical questions addressed.

Results of the review

Thirty articles were included. These reported 13 crossover RCTs (n=329), 8 parallel-group RCTs (n=254), one non-RCT (n=15), 11 clinical series with an historical control (n = about 200) and one case report.

Only 3 of the included studies were rated as providing level I evidence; the majority of the other evidence was level II or IV (see Other Publications of Related Interest). The main findings for each of the questions addressed are summarised here. Can APAP effectively reduce the apnoea plus hypopnea index (AHI) in OSA patients? APAP reduced the AHI to acceptable levels (less than 10 per hour) in more than 80 to 95% of the OSA patients studied in 16 RCTs, one non-randomised trial and 9 clinical series. The RCTs, however, were not designed to answer this question and none had a placebo control group. None of the studies included patients with significant central apnoea, and most excluded patients with congestive heart failure or chronic lung disease.

Can APAP reduce the AHI as well as conventional CPAP, in laboratory titration or as chronic treatment? Is the mean pressure lower on APAP devices?

In 12 RCTs, one non-RCT and 3 clinical series, similar AHIs were shown on treatment nights with APAP compared with nights on fixed CPAP. The mean or median treatment pressure was lower with APAP than with CPAP in 9 studies, and was higher in one study.

Can APAP effectively improve sleep quality and subjective and objective measures of daytime sleepiness in OSA patients?

Eleven RCTs, one non-RCT and 4 clinical series found some evidence that APAP improved sleep quality. An improvement in subjective measurement of daytime sleepiness, assessed using the Epworth Sleepiness Scale (ESS), was found with both APAP and CPAP in 4 crossover and 3 parallel-group RCTs; these also found no significant difference between APAP and CPAP. The only non-RCT found no improvement in ESS after one month' APAP when compared to baseline. The objective measures of daytime sleepiness reported were sleep latency (Multiple Sleep Latency Test improved in one clinical series) and the maintenance of wakefulness test latency (similarly improved with APAP and CPAP in 2 parallel-group RCTs).

Can APAP prevent significant nocturnal oxygen desaturation?

The evidence from various studies, which used different indices of arterial oxygen saturation, suggests that APAP prevents significant oxygen desaturation in most patients with OSA.

Are all APAP technologies equally effective?

No studies that met the inclusion criteria compared different APAP technologies.

Is APAP effective in determining an optimal fixed CPAP pressure for chronic fixed CPAP treatment during an attended or unattended APAP titration? Does APAP titration affect acceptance or adherence?

Four RCTs (2 of attended titration, one unattended, 1 partially attended) and 3 clinical series (one attended, 2 unattended) found that APAP could be used to select a fixed CPAP pressure that reduced the AHI to less than 10 per hr
in up to 95% of the patients studied. One RCT suggested that using APAP to define a fixed pressure for treatment, rather than traditional CPAP, decreased the percentage of patients who declined to continue CPAP treatment at 6 weeks.

Does auto-CPAP increase the acceptance or utilisation with positive pressure treatment when used as long-term treatment for OSA?

The available evidence was inconsistent.

Are there safety considerations in selecting patients for auto-CPAP titration or treatment?

Only 2 studies specifically addressed safety. One was a case report that described the appearance of central apnoeas that occurred as pressure was increased during APAP titration. In one clinical series, complications including central apnoea with arrhythmia and hypoxemia were reported in 6 out of 21 patients with congestive heart failure or lung disease undergoing CPAP titration; however, the device used was not a true APAP unit.

Authors' conclusions
The data indicated that APAP can be used to treat many patients with OSA (self-adjusting), or to identify an optimal fixed level of CPAP for treatment (auto-titration).

CRD commentary
This review addressed many questions about more than one application of the intervention of interest; this could be why the inclusion criteria were broadly defined rather than explicit. Two databases were searched but inclusion was limited to articles published in English in peer-reviewed journals, so it is possible that relevant studies were missed. Since details of how the studies were selected for inclusion were not reported, there is no reassurance that steps were taken to minimise bias. Furthermore, it is implied that some articles were included on the basis of the results they reported, which adds doubt that the study selection process was systematic and unbiased throughout. The included studies were presented clearly in tabular format, but there were insufficient details to assess whether the validity assessment and data extraction were methodologically sound. A narrative synthesis was appropriate given the differences between the studies. The findings were interpreted in the context of study design and the features of the participants, intervention and outcomes that might have influenced the results.

The authors' main conclusion is too general considering that it encompasses several review questions for which there were varying degrees of evidence, and the limitations inherent in the designs of the studies on which it was based.

Implications of the review for practice and research
Practice: The authors state that there is insufficient evidence that APAP can be used to treat patients with significant congestive heart failure, chronic obstructive pulmonary disease, or significant amounts of central apnoea.

Research: The authors recommendations for future research are many, some are listed here and the others can be found in the report. Further studies are needed to determine the effectiveness of APAP in mild OSA; to determine the safety and efficacy of initial titration of APAP in CPAP-naive patients in an unattended setting; and to determine whether chronic treatment with APAP can increase acceptance or adherence with positive pressure treatment. No study has yet shown that APAP improves patient outcomes. There is little information on the safety of unattended APAP in at-risk patient groups, and more information is needed on patients who need high levels of CPAP. There are few data comparing different APAP technologies.

Bibliographic details

PubMedID  PubMedID
Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Disorders of Excessive Somnolence /diagnosis; Equipment Design; Equipment Failure; Humans; Positive-Pressure Respiration /instrumentation; Sleep Apnea, Obstructive /complications /therapy; Time; Treatment Outcome

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.