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CLINICAL REVIEW

Anesthesia and sleep apnea

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SUMMARY

Due to its low rate of diagnosis, in the general population over half of those experiencing obstructive sleep apnea (OSA) are unaware that they have the condition. However, any acute medical event may exacerbate OSA and could have serious health consequences. In this context the management of the perioperative period, from anesthesia through the surgery itself and into the postoperative period, is more problematic for patients with sleep disordered breathing than for others. There is prolific literature in this area although large randomized trials are few due to the high sample size needed and possible ethical difficulties of withholding OSA treatment in the perioperative period. In 2014 the American Society of Anesthesiologists published an updated set of recommendations to guide OSA management during the perioperative period. In this present review we provide an overview of the different issues that practitioners face with regard to OSA, from the initial consultation with the anesthesiologist to the extended post-operative period. There is considerable evidence that OSA patients are at high risk of perioperative complications, though the inherent risks from OSA *per se* and its comorbidities remain difficult to discern. Nevertheless, appropriate screening and management allow clinicians to minimize OSA associated risk.

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Introduction

Obstructive sleep apnea (OSA) and other sleep related breathing disorders are highly prevalent in the general population [1]. However, many people ignore their condition or go undiagnosed, partly due to lack of information and/or difficulties in access to diagnosis expertise. Undiagnosed OSA (UOSA) becomes an issue in critical health situations, such as during anesthesia and in the perioperative period. Nevertheless, while there is clearly a degree of perioperative morbidity associated with untreated sleep apnea, many methodological difficulties impede the clear demonstration of a direct causal effect between OSA and perioperative morbidity.

In response to this problem the American Society of Anesthesiologists (ASA) has proposed recommendations for the appropriate management of OSA patients [2].

Perioperative risk in OSA is related both to the specific pathological features of OSA (narrowed upper airway with or without altered ventilatory control) [3] and to the cardiovascular risk inherent in years of exposure to intermittent hypoxia [4].

The routine consultation with an anesthesiologist prior to surgery provides a unique opportunity to uncover OSA. Indeed, the anesthesiologist must screen for many undiagnosed conditions in order to propose appropriate measures to assure maximal patient safety.

The aim of this current review is to update all points concerning the perioperative management of OSA patients, from the anesthesiologist consultation and screening tools used, through intra-operative management, to preventing postoperative complications and improving management of pain and ventilation. Several unknowns are highlighted, such as how to monitor OSA patients

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Abbreviations

AHI	apnea hypopnea index
ASA	American Society of Anesthesiologists
BANG	BMI age neck circumference gender
BMI	body mass index
BZD	benzodiazepines
CABG	coronary artery bypass graft
CPAP	continuous positive airway pressure
CVD	cardiovascular diseases
CI	confidence interval
DOSA	diagnosed OSA
ICD-9	International classification of diseases-9th revision
MACEs	major adverse cardiac events

MACCEs	major adverse cardiac or cerebrovascular events
NIV	non-invasive ventilation
OSA	obstructive sleep apnea
ODI	oxygen desaturation index
ODI4%	4% oxygen desaturation index
OR	odds ratio
PACU	post-anesthesia care unit
P _{crit}	critical pressure
PSG	polysomnography
SACS	sleep apnea clinical score
SAS	sleep apnea syndrome
STOP	snoring tired observed blood pressure
UA	upper airways
UOSA	Undiagnosed OSA

after minor surgery, how to most efficiently screen patients, and the true risk of post-operative complications.

Methods*Literature search strategy*

We conducted an electronic literature search using the Medline medical research database. We looked for studies concerning OSA and perioperative outcomes. First, we used “obstructive sleep apnea AND perioperative outcome” as the search equation, then the following keyword associations were added: “obstructive sleep apnea AND surgery AND perioperative complications (cardiac, respiratory, mortality)”, “obstructive sleep apnea AND screening AND anesthesiology”, “obstructive sleep apnea AND ambulatory surgery” and “obstructive sleep apnea AND bariatric surgery AND outcomes”. We repeated searches until no additional articles were detected. The latest search was performed on January 3, 2016. Studies were also extracted from the references of previously found articles. No language restriction was imposed, however only reports in English were selected. We selected articles for our review according to the following criteria: a) adult patients with information available on OSA (pre- and/or post-operative apnea hypopnea index – AHI) collected in a perioperative setting; b) patients in this setting using, or not, continuous positive airway pressure (CPAP); c) articles reporting perioperative outcomes (cardiovascular, pulmonary, general) and also more general data like length of hospitalization and long-term outcomes. Review articles meeting our criteria were also included. Exclusion criteria were as follows: 1) case reports, 2) studies with no information on control group (i.e., non OSA for OSA and untreated for treated OSA), and 3) studies in which patients had upper airway surgery. Studies were selected independently by RT and FF who screened the titles and abstracts to determine whether the studies met the eligibility criteria. Data lists were then merged and a final list was obtained after validation by the two reviewers (RT and FF). As a result, 714 potential articles of interest were initially identified (Fig. 1). We finally selected 79 articles including 7 randomized controlled trials, matched cohort studies and retrospective studies, plus some meta-analyses, and reviews when appropriate. Among studies there was considerable heterogeneity as to how the OSA diagnosis had been established, ranging from questionnaires to full polysomnography (PSG) and from retrospective analysis of medical records to administrative databases (International classification of diseases [ICD]) (Tables 1–3).

During compilation of the present work, several articles were added in order to maintain an up-to-date review.

General introduction/scientific evidence*General outcomes*

Even though OSA is a common disease known to be associated with postoperative complications, diagnostic coverage and screening remain insufficient. Untreated or undiagnosed OSA continues to interfere with expected peri-operative patient outcomes. This translates into un-expected ICU admissions and prolonged hospital stays (Fig. 2).

Summary of data

Primarily, the goal of the consultation with the anesthesiologist is to unmask risk factors and conditions in order to improve outcomes. This requires a sufficiently detailed knowledge of possible risks and disease management. In 2012 Wang published a survey of anesthesiologists' knowledge about practical perioperative OSA management [5]. Although the knowledge scores increased with the hierarchy of the participants' academic titles, the results on OSA knowledge showed a need to improve training and to implement appropriate management. This highlights the need for targeted continuous medical education that recognizes OSA as a common disease whose prevalence is increasing along with that of obesity.

A meta-analysis published by Kaw et al. in 2012 on OSA and general postoperative outcomes [6] included 13 studies,

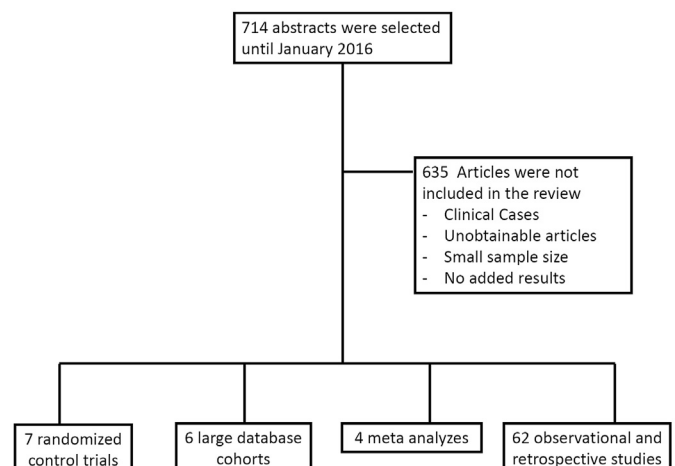


Fig. 1. Article selection flow chart (see methods section).

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