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Review Article

Death or near-death in patients with obstructive sleep apnoea: a compendium of case reports of critical complications

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Abstract

The care of surgical patients with obstructive sleep apnoea (OSA) invokes concerns with safety and liability because of the risk that exists for perioperative death or near-death. The purpose of this review is to analyse the available literature to identify risk factors for perioperative critical complications in patients with OSA. Literature reports were screened for life threatening complications and deaths in surgical patients with OSA. The critical complications were sub-grouped as death/near-death events (death and anoxic brain damage) *vs* critical respiratory events (CRE)/other events and analysed for various risk factors. Both univariate and multivariate analyses were conducted to identify the potential risk factors.

In total, 15 case reports and two medico-legal reports, comprising of 60 total patients with OSA were included in our analysis. Overall, there were 43 deaths or near-death events and 12 critical respiratory events and five other life threatening events. Ten patients (17%) with OSA were undiagnosed before surgery. Only 31% (11/35) were on preoperative continuous positive airway pressure (CPAP), with 36% (4/11) of them continuing CPAP in the postoperative period. The majority of them received a morphine equivalent daily dose less than 10 mg. Eighty percent of the events occurred in the first 24 h and 67% occurred on the general hospital ward.

Patients with OSA are at risk of critical complications including death during the initial 24 h after surgery. Morbid obesity, male sex, undiagnosed OSA, partially treated/untreated OSA, opioids, sedatives, and lack of monitoring are risk factors for death or near-death events.

Key words: death; obstructive sleep apnoea; postoperative complications; screening; surgery

Obstructive sleep apnoea (OSA) is a highly prevalent sleep breathing disorder which may be associated with an increased risk of cardiopulmonary complications for patients undergoing surgical procedures.[1–3] Studies using screening questionnaires found that 20 to 40% of elective surgical patients were at high risk for OSA.[4 5] These patients may have undiagnosed OSA at the time of their surgery.[6 7] The effects of anaesthetics, sedatives and opioids on ventilatory responsiveness, arousal mechanisms and upper airway muscle tone have been implicated in potentially aggravating OSA in the postoperative period leading to life threatening hypoxia and hypercapnia, particularly in patients with untreated OSA.

Respiratory depression may occur in patients with OSA who receive opioids in the postoperative period. Patients with OSA may be at a higher risk of respiratory arrest when they are given analgesics to treat postoperative pain, especially in an unmonitored environment. Recent literature has shown that patients with OSA can develop critical complications in the postoperative period.[1 3 8] A closed malpractice claims of 12 surgical patients with OSA who were found 'dead-in-bed' was recently reported.[9] Identifying risk factors for these postoperative deaths in patients with OSA constitutes a significant step in advancing perioperative patient safety. As deaths or near-deaths are rare events, prospective studies are often unable to provide sufficient information for these critical complications. To overcome this knowledge gap, case reports have a unique value in providing crucial insight on rare clinical outcomes.[10] The objective of this review is to identify the perioperative pattern and risk factors for major mortality and morbidity in patients with OSA by evaluating the medical literature and assessing the available case reports, case series and medico-legal reports in the perioperative period.

Methods

We screened case reports, case series and medico-legal reports to analyse life threatening complications and deaths in adult patients (≥18 yr) with OSA in the perioperative period. The literature search was performed with the help of an expert librarian. We searched the Medline database during the period of 1946 - June 2016. Our search was restricted to English language articles only.

The search used the Medical Subject Heading (MeSH) free-text and index terms "perioperative," "complications," "adverse events," "anaesthesia," "anesthesia," "obstructive sleep apnea," "obstructive sleep apnea syndrome," "obstructive sleep apnoea," "obstructive sleep apnoea syndrome," "sleep disordered breathing," "obesity hypoventilation syndrome," "apnea or apnoea," "hypopnea or hypopnoea." To supplement our database searches, a citation search of references from primary or review articles was also performed.

Study population

The inclusion criteria were as follows: (1) case reports, case series reports or medico-legal reports with information available on OSA; (2) patients who underwent a surgical procedure that was associated with a life threatening adverse event or death that was attributable to the presence of OSA, which was either suspected or diagnosed preoperatively.

Studies were selected independently by two reviewers (Y.S. and M.N.) who screened the titles and abstracts to determine whether the studies met the eligibility criteria. Both reviewers independently considered all materials for possible inclusion. In the preliminary phase of the review, irrelevant articles were excluded based on the title of the article. In the later stage, the abstract and/or full-text articles were evaluated to determine suitability for inclusion. The number of excluded articles and the rationale for exclusion were recorded. Any disagreements were resolved by consensus or by consulting the senior author (F.C.).

Data extraction

The following information was collected from each study: author, yr of publication, age, sex, BMI, mode of diagnosis, severity (AHI events h^{-1}) of OSA, data on continuous positive airway pressure (CPAP) therapy, type of surgery and anaesthesia, administration (and routes) of opioids and sedatives, serious postoperative outcomes and timing and location of the outcomes.

Outcome data

Cases were categorized by outcomes: death, anoxic brain injury, critical respiratory events (CREs) and other life threatening events attributable to OSA. A CRE was defined as an unresponsive and hypoxic or apneic patient needing rescue by medical therapy or resuscitation. Other life threatening complications included cardiac complications such as heart block or cardiac arrest with successful resuscitation of the patient.

Statistical analysis

Our main objective was to analyse all the critical perioperative outcomes associated with OSA in relation to the diagnosis, severity and treatment of OSA, opioid/sedative administration, timing and location of the events.

Frequency statistics were presented about perioperative patterns (e.g. timing and location) for major mortality and morbidity in patients with OSA. Critical complications were sub-divided into two groups based on the severity of complications - death/near-death events (death and anoxic brain damage) *vs* CREs/other events to analyse various risk factors such as the diagnosis and severity of OSA, preoperative and postoperative CPAP use and opioid use (mode and dose). Both non-parametric (χ^2) and parametric statistics (univariate and multivariate logistic regressions) were conducted to identify the potential risk factors by pooling together individual patient data (IPD) across all studies. Age (≥41 yr *vs*<41 yr), sex, BMI category (≥35 kg/m^2 *vs*<35 kg/m^2), and presence or absence of comorbidities served as the covariates in the logistic model. We used Stata version 14 for data analysis.[11]

Results

Our initial electronic search identified 935 case reports or case series and 73 medico-legal reports. After the initial screening, 920 case reports or case series and 71 medico-legal reports were excluded because they did not satisfy the predetermined eligibility criteria. Only reports of mortality and near-deaths associated with patients with suspected or diagnosed OSA undergoing surgery were included. In total, 15 case reports and two medico-legal reports were included in our analysis (Fig. 1). Seventy percent of the reports are from the USA, 18% from Canada and 12% from Europe.

The descriptive data of the population included in the selected case-reports are summarized in Table 1. Details of the critical postoperative events in patients with OSA are listed in Table 2.

In our analysis of 15 case reports and two medico-legal reports, a total of sixty patients with OSA suffered critical complications. Overall, there were 26 deaths, 17 anoxic brain injuries, 12 CREs and five other life-threatening complications including two patients who were successfully resuscitated from cardiac arrests, and three patients with heart blocks. Sixty-two percent were males and 38% were females. The mean age of males was 49(9) yr (mean SD), and the mean age of females was 46(8) yr. The BMI was 42(13) kg m^{-2}. Among the sixty patients, 12 underwent orthopaedic surgery, 12 general surgery, 10 bariatric surgery, 10 upper airway surgeries, three ear, nose, and throat procedures, four cardiac surgery and the remaining nine various procedures such as genitourinary surgery. Table 3 presents the summary of characteristics of risk factors associated with