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Intraoperative Management of the Patient with Sleep Apnea:
Anesthesia Techniques

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Current Practice Recommendations

Anesthesia technique

ASA Practice Guidelines
Perioperative management of patients with OSA.
Gross et al. 2006 and 2014

Society of Ambulatory Anesthesia
Consensus statement on preoperative selection of adult patients with OSA scheduled for ambulatory surgery.
Joshi et al. 2012

American Chest Physicians
Perioperative management of OSA.
Adesanya et al. 2010

Perioperative management of OSA in bariatric surgery: a consensus guideline. 58 Statements.
De Raaff et al. 2017

Management of sleep apnea in adults
Functional algorithms for the perioperative period.
Canadian Guidelines.
Seet et al. 2010

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Current Practice Recommendations

Anesthesia technique

“Presently, there is no definitive evidence supporting one anesthetic technique over another.”
American Chest Physicians

“The literature is insufficient to evaluate the effects of various anesthesia techniques as they specifically apply to patients with OSA.”
ASA

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Trends in perioperative practice in OSA – Orthopedic Surgery

Cozowicz et al.
Anesth Analg 2017

Population based analysis

Premier Perspective
>540 US hospitals
2006 - 2013

Population
1,107,438 patients (10% OSA)
THA/TKA

74% general anesthesia
11% neuraxial anesthesia
15% combined neuraxial/general

No difference in incidence of general and regional anesthesia by OSA status

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SASM Guideline Project

Systematic literature search

12,000+ references

Airway management
Anesthetic drug effects
Anesthesia technique

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Sleep Apnea and Total Joint Arthroplasty under Various Types of Anesthesia

Memtsoudis et al.
RAPM 2013

Population based analysis

Premier Perspective
>400 US hospitals
2006 - 2010

Population
30,024 OSA patients
THA/TKA

Comparison
Neuraxial vs general anesthesia

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Sleep Apnea and Total Joint Arthroplasty under Various Types of Anesthesia

Memtsoudis et al.
RAPM 2013

Multivariate analysis
Neuraxial vs. general anesthesia

⬇ combined complications
OR 0.83 p=0.03

⬇ mechanical ventilation
OR 0.64 p<0.0001

⬇ critical care services
OR 0.43 p<0.0001

⬇ prolonged length of stay
OR 0.75 p<0.0001

⬇ increased cost
OR 0.88 p=0.04

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Sleep Apnea and Total Joint Arthroplasty under Various Types of Anesthesia

Memtsoudis et al.
RAPM 2013

Multivariate analysis
Combined neuraxial/general vs general anesthesia

- ⬇ **pulmonary complications**
  OR 0.77 p=0.01
- ⬇ **combined complications**
  OR 0.89 p=0.03
- ⬇ **mechanical ventilation**
  OR 0.64 p<0.0001
- ⬇ **critical care services**
  OR 0.67 p<0.0001
- ⬇ **prolonged length of stay**
  OR 0.70 p<0.0001
- ⬇ **increased cost**
  OR 0.70 p<0.0001

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Postoperative complications in patients with sleep apnea undergoing total joint arthroplasty

Naqvi et al.
J Arthroplasty 2017

Retrospective analysis

Institutional data
Thomas Jefferson University, PA
2005 - 2016

Patients
1,246 OSA matched 3,738 non-OSA
TJA

Comparison
Regional vs general anesthesia

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Postoperative complications in patients with sleep apnea undergoing total joint arthroplasty

Naqvi et al.
J Arthroplasty 2017

Multivariate analysis
General anesthesia vs regional

- ↑ **pulmonary complications**
  OR 5.04 p<0.001
- ↑ **cardiac complications**
  OR 2.11 p=0.02
- ↑ **gastrointestinal complications**
  OR 4.60 p<0.001
- ↑ **acute hemorrhagic anemia**
  OR 3.58 p<0.001
- ↑ **shock**
  OR 3.26 p=0.003
- ↑ **wound complications**
  OR 13.01 p<0.001
- ↑ **mortality**
  OR 15.88 p<0.001

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The prevalence of perioperative complications in patients with and without obstructive sleep apnea

Ambrosii et al.
Rom J Anesth 2016

Prospective cohort study

Institutional data
Nicolae Testemitanu University, Romania
2014 - 2015

Population
400 OSA patients
Abdominal and orthopedic surgeries

Comparison
Neuraxial vs general anesthesia

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The prevalence of perioperative complications in patients with and without obstructive sleep apnea

Ambrosii et al.
Rom J Anesth 2016

Univariate analysis in OSA - abdominal cavity
General vs regional anesthesia

respiratory complications
+17.3%

unplanned ICU
+5.7%

stroke
+0.7%

postoperative fever
+1.4%

postoperative ventilation
+20.3%

difficult intubation
3.5% in GA

prolonged awakening from anesthesia
2.5% in GA

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The prevalence of perioperative complications in patients with and without obstructive sleep apnea

Ambrosii et al.
Rom J Anesth 2016

Univariate analysis in OSA - orthopedic
General vs regional anesthesia

respiratory complications
+16.3%

unplanned ICU
+4.3%

postoperative fever
-2.6%

postoperative ventilation
+20%

prolonged awakening from anesthesia
13% in GA

+ PNB
no respiratory complications

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Obstructive sleep apnea hypopnea syndrome: surgical complications and strategy for avoidance

Liu et al.
Zhonghua 2009

Prospective cohort study

Institutional data
1998 - 2007

Population
653 patients
Surgery for OSA (UPPP)

Comparison
Regional vs general anesthesia

Multivariate Analysis
General anesthesia - complications ⬆

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Risk of postoperative hypoxemia in orthopedic patients with obstructive sleep apnea

Liu et al.
HSS J 2011

Retrospective analysis

Institutional
Hospital for Special Surgery
2005 - 2008

Population
527 OSA patients
Orthopedic surgery

Univariate analysis
General anesthesia risk factor for hypoxemia

Hypoxemia associated with major respiratory complications, ICU, increased LOS

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Factors associated with postoperative exacerbation of sleep-disordered breathing

Chung et al.
Anesthesiology 2014

Prospective observational study

Institutional
Toronto Western and Mt. Sinai, Canada

Population
376 OSA and non-OSA patients
various surgeries

Polysomnography
Preoperatively and postoperatively
nights 1+3

Anesthesia
210 patients received general
166 patients received regional

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Factors associated with postoperative exacerbation of sleep-disordered breathing

Chung et al.
Anesthesiology 2014

Multivariate analysis
Postoperative outcomes

General anesthesia increased Central Apnea Index

AHI severity positively correlated to 72h opioid dose

AHI ↑ equally increased in both anesthesia techniques

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Patients with a high risk of OSA syndrome: postoperative respiratory complications

Pereira et al.
Rev Port Pneumol 2013

Prospective blinded cohort study

Institutional
Sao Joao, Brazil
2011

Population
179 OSA and 161 non-OSA patients
STOP BANG
Various surgeries, general anesthesia

PACU
70% higher incidence of residual neuromuscular blockade
4-fold increased incidence of respiratory compromise in OSA

Residual Neuromuscular blockade
independent risk factor for adverse respiratory complications after matching

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Comparative aspects of the airway during general anesthesia in obese sufferers of sleep apnea and matched controls

Biddle et al.
Adv Pract Nurs Q 1996

Prospective cohort study

Institutional
1996

Patients
38 OSA matched 38 non-OSA
General anesthesia

Intervention
Evaluation of airway patency

Difficult airway management in OSA vs controls
- Induction
- Emergence from general anesthesia

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Perioperative complications in obstructive sleep apnea

Loube et al.
Sleep Breath 1997

Retrospective analysis

Institutional
Walter Reed Army Medical Center
1997

Population
57 OSA patients

Airway management complications	OSA	Reported in general population*
Preoperative	17%	1%
Postoperative	34%	3%

* Moller et al. I. Anesth 1993

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Multimodal analgesia and opioid prescription levels in OSA patients undergoing total hip and knee arthroplasties

Cozowicz et al.
SASM Abstract 2017

Population based analysis

Premier Perspective
>540 US hospitals
2006 - 2016

Population
181,182 OSA patients

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Multivariate analysis
Implementation of multi-modal analgesia

	Total Hip Arthroplasty			Total Knee Arthroplasty		
Opioid analgesia +	1 additional mode	2 additional modes	≥3 additional modes	1 additional mode	2 additional modes	≥3 additional modes
Opioid dose	%	%	%	%	%	%
POD-1	-7.5%	-12.9%	-16.7%	-7.6%	-12.9%	-15.9%
POD-1+	-7.7%	-13.0%	-13.8%	-7.5%	-10.5%	-13.2%
LOS	-7.4%	-11.5%	-14.0%	-5.6%	-9.3%	-12.8%
Cost	-2.2%	-2.8%	-2.6%	-2.5%	-3.3%	-3.5%

→ Dose response relation

all outcomes $p < 0.0001$

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Decades of comparative effectiveness research

10 meta-analyses: general vs regional anesthesia (RCTs)

Year	Author	RCTs	Outcomes decreased with Neuraxial anesthesia	Types of Surgery
2000	Rodgers	141	Mortality 30%, DVT 40%, pneumonia 50%, respiratory depression 60%, myocardial infarction, blood transfusion, wound infections renal failure	Various surgeries
2000	Parker	17	Mortality 30 day, DVT	Hip fracture
2006	Mauerman		DVT, PE, blood transfusions	Hip replacement
2010	Luger	34	Mortality, reduced postoperative confusion, DVT, postoperative hypoxia, pneumonia	Hip fractures in geriatric patients
2009	McFarlane	18	Postoperative pain, morphine consumption, opioid related adverse effects	Hip replacement
2013	Barbosa		Pneumonia	lower limb arterial vascularization
2016	Guay		Hypertension	Hip fractures
2016	Johnson	29	LOS	Lower joint arthroplasties
2016	Meng	8	LOS, Intraoperative hypertension and tachycardia, Analgesic requirement in the PACU, PONV	Lumbar spine surgery
2014	Guay 9 Cochrane reviews	117	Mortality 30 day 29%, Pneumonia 55%	Various surgeries including orthopedic abdominal and vascular surgery

Neuraxial and combined neuraxial/general anesthesia compared to general anesthesia for major truncal and lower limb surgery: a systematic review and meta-analysis

Smith et al.
Anesth Analg 2017

Systematic Review
Neuraxial vs general anesthesia

27 large observational studies
11 randomized controlled trials

- ↓ respiratory complications
- ↓ ICU
- ↓ length of stay
- ↓ blood transfusion
- ↓ thromboembolic events
- ↓ surgical side infections

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Arguments supporting the use of neuraxial/regional anesthesia

Suppression of surgical stress response

Omission of airway manipulation

Efficient pain relief

Reduced opioid consumption

Multimodal analgesia

Intermittent hypoxia and sleep fragmentation

Impact pain and opioid sensitivity

Expedited recovery

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SASM Guideline Task Force
What is the preferred anesthesia technique in patients with OSA?

Regional anesthesia techniques should be preferred over general anesthesia whenever adequate.

- **to reduce the risk for perioperative complications**
- **to avoid airway manipulation**

Regional anesthesia should be considered for postoperative analgesia in the context of multimodal analgesia

- **Reduce opioid consumption**
- **Reduce drug relates side effects**
- **Improve pain management**

Grade of Recommendation: Strong

Level of evidence: Low

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Current Practice Recommendations

Anesthesia technique

Regional preferred over general anesthesia

when feasible

Regional anesthesia for postoperative analgesia

General anesthesia

difficult airway

short acting agents

Multimodal analgesia

minimize opioid consumption

improve pain management

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