

High flow nasal cannula

High-flow [nasal cannula](#) (HFNC) therapy is an oxygen supply system capable of delivering up to 100% humidified and heated oxygen at a flow rate of up to 60 liters per minute. All settings are controlled independently, allowing for greater confidence in the delivery of supplemental oxygen as well as better outcomes when used. In addition to greater control over the delivery of FiO₂, there are several benefits to using a high-flow nasal cannula.

In adult patients in ICU, HFNO may improve oxygenation and decrease pneumonia rate without affecting the length of ICU stay, intubation or reintubation rate, mortality, and SpO₂ at the end of oxygen therapy ¹⁾.

Case series

Sixty-five patients who underwent [awake craniotomy](#) were randomly assigned to use HFNC with oxygen flow rate at 40 L/min or 60 L/min, or nasopharynx airway (NPA) device in the anesthetic management. Data regarding airway management, intraoperative blood gas analysis, intracranial pressure, gastric antral volume, and adverse events were collected and analyzed.

Results: Patients using HFNC with oxygen flow rate at 40 or 60 L/min presented less airway obstruction and injuries. Patients with HFNC 60 L/min maintained longer awake time than the patients with NPA. While the intraoperative PaO₂ and SPO₂ were not significantly different between the HFNC and NPA groups, HFNC patients achieved higher PaO₂/FiO₂ than patients with NPA. There were no differences in Brain Relaxation Score and gastric antral volume among the three groups as well as before and after operation in any of the three groups.

HFNC was safe and effective for the patients during awake craniotomy ²⁾.

Lin YC, Liu YT, Wu ZF, Chan SM. The successful application of high flow nasal cannula for awake craniotomy. J Clin Anesth. 2019 Aug;55:140-141. doi: 10.1016/j.jclinane.2019.01.012. Epub 2019 Jan 15. PMID: 30658329.

3 cases of post-operative PNC who we felt were symptomatic from PNC. With administration of high-flow nasal cannula (HFNC), all patients improved both clinically and radiographically within a few hours, faster than in both anecdotal experience and published trials. Due to its steady FiO₂ administration, positive pressure, comfort, and low side-effect profile, HFNC may be the ideal mode of oxygen delivery in PNC. We present a review of the physiology of PNC and the characteristics of several oxygen delivery systems to build a case for HFNC in this disease process ³⁾.

Case reports

Two cases of awake craniotomy with [Monitored anesthesia care](#) (MAC) using [high flow nasal cannula](#) (HFNC) and [oxygen reserve index](#) (ORi). Gook et al. adjusted the fraction of inspired [oxygen](#) of the HFNC according to the ORi level. The patient underwent successful awake craniotomy without a [desaturation](#) event or additional [airway](#) intervention.

Combined HFNC and ORi monitoring may provide adequate oxygen reserves in patients undergoing awake craniotomy ⁴⁾.

Super obesity with a body mass index (BMI) >50 kg/m² presents a challenge for the neuroanesthesiologist during awake craniotomy procedures and poses increased perioperative risk of complications, even vis-à-vis morbid obesity. This article presents a super obese patient (BMI 57 kg/m²) with drug-refractory epilepsy and obstructive sleep apnea who underwent left anterior temporal lobectomy through awake craniotomy to preserve language and memory, using warmed humidified high flow nasal cannula (HFNC) oxygen therapy. Awake craniotomy was facilitated by the use of HFNC, which proved essential to prevent airway collapse by creating continuous positive airway pressure through high flow and facilitated intraoperative neurologic language and memory testing while maintaining adequate oxygenation ⁵⁾.

A patient who developed HFNC-induced tension pneumocephalus from an unrecognized skull base fracture. Physicians should be cautious when applying HFNC to patients with suspected skull base or paranasal sinus fracture, especially when applying a higher flow rate ⁶⁾.

Smith SC, Burbridge M, Jaffe R. High Flow Nasal Cannula, A Novel Approach to Airway Management in Awake Craniotomies. J Neurosurg Anesthesiol. 2018 Oct;30(4):382. doi: 10.1097/ANA.0000000000000447. PMID: 28737566.

A 32-year-old man with severe pulmonary arterial hypertension and Eisenmenger syndrome secondary to congenital ventricular septal defects presented for ventriculoperitoneal shunt insertion. Consultation between surgical and anesthesia teams acknowledged the extreme risk of performing this case, but given ongoing symptoms related to increased intracranial pressure from a large third ventricle colloid cyst, the case was deemed urgent. After a full discussion with the patient, including an explanation of anesthetic expectations and perioperative risks, the case was performed under monitored anesthesia care. Anesthetic management included high-flow nasal cannula oxygen with capnography and arterial blood pressure monitoring, dexmedetomidine infusion, boluses of midazolam and ketamine, and local anesthetic infiltration of the cranial and abdominal incisions as well as the catheter track. Hemodynamic support was provided with an epinephrine infusion, small vasopressin boluses, and inhaled nitric oxide. The patient recovered without any significant problems and was discharged home on postoperative day 3 ⁷⁾.

Liang S, Liu Z, Qin Y, Wu Y. The effect of high flow nasal oxygen therapy in intensive care units: a systematic review and meta-analysis. *Expert Rev Respir Med*. 2021 Oct;15(10):1335-1345. doi: 10.1080/17476348.2021.1937131. Epub 2021 Jun 21. PMID: 34078218.

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Yi P, Li Q, Yang Z, Cao L, Hu X, Gu H. High-flow nasal cannula improves clinical efficacy of airway management in patients undergoing awake craniotomy. *BMC Anesthesiol*. 2020 Jun 27;20(1):156. doi: 10.1186/s12871-020-01073-z. PMID: 32593287; PMCID: PMC7320587.

3)

Siegel JL, Hampton K, Rabinstein AA, McLaughlin D, Diaz-Gomez JL. Oxygen Therapy with High-Flow Nasal Cannula as an Effective Treatment for Perioperative Pneumocephalus: Case Illustrations and Pathophysiological Review. *Neurocrit Care*. 2018 Dec;29(3):366-373. doi: 10.1007/s12028-017-0464-x. PMID: 28932993.

4)

Gook J, Kwon JH, Kim K, Choi JW, Chung IS, Lee J. Awake craniotomy using a high-flow nasal cannula with oxygen reserve index monitoring - A report of two cases. *Anesth Pain Med (Seoul)*. 2021 Oct;16(4):338-343. doi: 10.17085/apm.21022. Epub 2021 Oct 29. PMID: 35139614.

5)

Banik S, Parrent AG, Noppens RR. Awake craniotomy in a super obese patient using high flow nasal cannula oxygen therapy (HFNC). *Anaesthesist*. 2019 Nov;68(11):780-783. English. doi: 10.1007/s00101-019-00695-4. Epub 2019 Nov 4. PMID: 31686115.

6)

Chang Y, Kim TG, Chung SY. High-flow Nasal Cannula-induced Tension Pneumocephalus. *Indian J Crit Care Med*. 2020 Jul;24(7):592-595. doi: 10.5005/jp-journals-10071-23482. PMID: 32963447; PMCID: PMC7482350.

7)

Burbridge MA, Brodt J, Jaffe RA. Ventriculoperitoneal Shunt Insertion Under Monitored Anesthesia Care in a Patient With Severe Pulmonary Hypertension. *A A Case Rep*. 2016 Jul 15;7(2):27-9. doi: 10.1213/XAA.0000000000000329. PMID: 27224039.

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