Use of High-Flow Nasal Cannula in Management of Respiratory Failure among Adult Patients

Aya Nabil Mostafa, Rabieh Mohammed Hussain, Maha Elsayed AL Sadik, Mohammad Walaa Said
Chest Diseases Department, Faculty of Medicine - Zagazig University, Egypt

Email: ayanabil359@gmail.com

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Abstract
Background: A number of therapeutic settings have lately utilised the high-flow nasal cannula (HFNC) to oxygenate people. When compared to low-flow oxygen systems or non-invasive ventilation, HFNC has several benefits. These include making the patient more comfortable, making expectoration easier by humidifying secretions, washing out the nasopharyngeal dead space to make ventilation more efficient, providing a small positive end-inspiratory pressure effect, and quickly and accurately delivering a fraction of inspired oxygen (FiO2) by minimising room air entrainment. Hypercapneic respiratory failure (an aggravation of chronic obstructive lung disease), hypoxemic respiratory failure, post-extubation respiratory failure, pre-intubation oxygenation, and other disorders have all been effectively treated using HFNC in critically ill patients. While there is some evidence of benefit, it is mostly subjective and based on physiological factors; furthermore, the signs are not conclusive. This study delves into the practical and clinical uses of HFNC in adults, including topics such as its distinct impact on respiratory physiology, device settings, and clinical indications.

Keywords: Thoracoscopic Sympathectomy, Compensatory Hyperhidrosis

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Nasal cannulae and masks are examples of low-flow systems, while high-flow systems are more commonly used for oxygen therapy (e.g., venturi masks or nonrebreathers). An innovative noninvasive breathing support system, the high-flow nasal cannula (HFNC) can supply humidified, warmed oxygen at a flow rate of up to 60 litres per minute (L/min) with a percentage of inspired oxygen (FiO2) ranging from 0.21 to 1.0. Patients with respiratory failure caused by a variety of medical issues are candidates for HFNC.

Patient comfort and physiological benefits are enhanced with HFNC compared to noninvasive ventilation (NIV; continuous or bilevel positive airway pressure ventilation) and traditional oxygen devices (nasal cannulae or masks, Venturi masks, and high-flow systems). The second group include traits such as enhanced ventilation and oxygenation, enhanced pulmonary compliance, decreased anatomical dead space, moderate positive end-expiratory pressure, enhanced respiratory effort efficiency, decreased labour of breathing, and enhanced secretion clearance [1]. This review aims to summarise the literature on HFNC in adults, focusing on studies that have investigated its physiological effects, device calibration, and various clinical uses.

Physiologic Effects

When treating respiratory failure, supplemental oxygen therapy should be started first. In most cases, low-flow systems are used to supply oxygen (nasal cannulae or masks). Low efficacy and oxygen delivery tolerance are two of the many documented drawbacks compared to high-flow systems. Patients with spontaneous breathing nevertheless experience discomfort, particularly dry nose, dry throat, and nasal pain, due to the low absolute humidity, even when using bubble humidifiers with low-flow systems [2,3]. Users are less likely to adhere to these gadgets' instructions when the temperature and humidity levels are inadequate. The discrepancy between the patient's inspiratory flow and the oxygen flow given is a final issue with traditional treatments for respiratory failure. In these patients, the inspiratory flow can be anywhere from thirty to one hundred litres per minute, whereas the oxygen flow cannot exceed fifteen litres per minute. This huge difference causes the percentage of inspired oxygen (FiO2) to fluctuate and is often lower than what was anticipated.

A heated circuit is used to deliver the gas that has been heated and actively humidified from an air/oxygen blender. Up to 60 litres per minute of flow is within the blender's capabilities. This method of administering gas has the physiological consequences listed in Table 1.

Table 1.

Advantages and disadvantages of high-flow nasal cannula treatment

Advantage	Disadvantage
Comfort due to similarity of humidified, warmed air to physiologic conditions of the airway	Potential discomfort due to high flow and relatively hot air sensation
Carbon dioxide washout (reduced anatomical dead space)	Not immediately available
Clinician can set precise fraction of inspired oxygen.	Aerosol-generating procedure that can potentially increase the risk of viral transmission
Provides low positive end expiratory pressure effect	
Leaves mouth free for talking, eating, or coughing	

Anatomical Dead Space Washout

If carbon dioxide has built up in the anatomical dead space of the nasopharynx, HFNC can remove it. Oxygen supply, thoracoabdominal synchronisation, and ventilation efficiency can all be improved by reducing buildup [4-6]. Because of the enhanced washout with HFNC compared to other oxygen delivery systems, a greater proportion of minute ventilation can take part in alveolar gas exchange.

Maximal End-Explosive Pressure Benefit

Despite being an open system, HFNC increases airway pressure due to the high flow rate from the cannula, which prevents expiratory outflow [7]. The "positive end expiratory pressure (PEEP) effect"), wherein HFNC increases the peak nasopharyngeal airway pressure at the end of expiration [8-10], is also observed in neonates and infants, but it is more pronounced in adults, especially when the mouth is closed. As a result of this "PEEP effect," oxygenation can be improved, auto-PEEP can be lessened, and the effort required to breathe can be decreased. For every 10 L/min increase in oxygen flow, the patient's PEEP increases by around 0.7 cm H2O (up to about 3 cm H2O) while their mouth is closed and by about 0.35 cm H2O when it is open [11].

Oxygen Inhaled Percentage

According to physiological principles, tidal volume and inspiratory flow change with each breath [12]. Inspiratory flow rates required by patients with respiratory failure are higher than those of conventional oxygen delivery systems, leading to the mixing of ambient air with the given gas and a decrease in its fractional oxygen saturation (FiO2). As a result of fluctuations in the FiO2 level, low-flow oxygen delivery is often more difficult than anticipated by equipment algorithms [13,14]. The gas flow rate to the patient is substantially higher with HFNC compared to low-flow oxygen systems. When compared to more traditional methods of oxygen delivery, high flow rates provide more precise dosages because they reduce the amount of ambient air that is entrained. Furthermore, it has been shown that higher flow rates improve the overall pattern of breathing by reducing the respiratory rate and increasing the tidal volume [9,15].

Humidification

A heated humidifier is a common component in HFNC ventilation systems. As a result, these devices outperform traditional oxygen systems in providing patients with gas that is both properly heated and humidified. The additional humidification raises the mucosal water content, which helps with secretion clearance and may make breathing easier. In addition to preventing epithelial harm from airway desiccation, this moistens the airway [16,17].

Supple and Tiny Nasal Prongs (Comfortable Interface)

Because of its exceptionally flexible and supple nasal prongs, HFNC demonstrates exceptional acceptability and tolerability. Consequently, compared to traditional methods of administering oxygen, such as a face mask or nasal cannula, HFNC has been found to be more comfortable for patients in multiple trials [18–20]. On the flip side, NIV can be a pain to manage for long periods of time, therefore HFNC is a promising new option for patients who prefer not to be intubated.

CLINICAL SETTINGS (DEVICE TITRATION)

The use of HFNC to provide oxygen to patients in critical care, particularly those with respiratory failure, is on the rise. Nevertheless, suggestions for its practical implementation are still lacking. Although HFNC can be given on an unattended floor, it is most commonly used in a monitored environment like an emergency room, intermediate care ward, or intensive care unit (ICU) [6,17].

A special wide-bore nasal cannula, often constructed of softer, more malleable plastic than the cannulae used in low-flow systems, is used to distribute humidified oxygen gas once it has been heated to the proper temperature. The cannula is secured in place by a head strap and fits tightly inside the snares (Figure 1).

The flow rate and FiO2 levels are two variables that need to be defined. The first thing to do is adjust the flow rate, which is usually between 5 and 60 litres per minute (L/min). Additionally, the FiO2 is adjusted to provide the required peripheral oxygen saturation, which can range from 21% to 100%. If the respiratory rate doesn't improve, oxygenation doesn't improve enough, or breathing is still difficult, the flow rate can be increased in 5 to 10 L/min increments. Peripheral oxygen saturation can be enhanced by raising the FiO2 or the flow rate. First, try to maximise the flow rate while keeping the FiO2 $\leq$ 60%; nevertheless, you might need to increase the FiO2 to get enough oxygen.

It is possible to administer HFNC for multiple days, and it is usually well-tolerated. At 20 L/minute or lower flow rate and 50% FiO2 or below, patients can be transferred to a low-flow system (nasal cannula or mask).

Acute Hypoxemic Respiratory Failure

HFNC versus low-flow oxygen

Research on patients with hypoxemic respiratory failure, both in randomised trials and observational research, supports the prescription of HFNC. Studies have shown that HFNC improves oxygenation and reduces the need for intubation compared to low-flow oxygen systems, however the data are inconsistent [4,5,18,21–34]. Despite this, there has been no conclusive evidence of benefits in terms of comfort, dyspnea, duration of intensive care unit and hospital stay, or death.

The FLORALI trial was a big randomised study that compared HFNC to traditional oxygen therapy and NIV in the resuscitation of patients with acute lung injury [22]. Subjects were randomly randomised to either HFNC therapy, oxygen administered through a nonrebreather face mask, or noninvasive ventilation (NIV) if they had no history of lung disease or respiratory failure. All treatment approaches resulted in a comparable intubation rate, the main goal. But other outcomes, such as ventilator-free days and 90-day mortality, were significantly lower in the HFNC group compared to the NIV or conventional oxygen therapy groups. Patients with a partial pressure of oxygen (PaO2)/FiO2 ratio below 200 also had a reduced intubation rate when HFNC was considered in a post hoc analysis. Unfortunately, the study's power was inadequate to answer this question due to lower-than-expected overall intubation rates. The authors concluded that there was no significant difference in the time to intubation between HFNC and NIV, which was the last step in determining if delays in intubation potentially affected treatment outcomes.

Three hundred and twenty-two patients admitted to the emergency department due to hypoxemia were the subjects of the Randomized Controlled Trial of Humidified High-Flow Nasal Oxygen for Acute Respiratory Distress in the Emergency Department (HOT-ER) research, another landmark HFNC randomised trial. The researchers discovered that HFNC was not better than traditional oxygen therapy [21]. After 24 hours, intubation rates were lower with HFNC (5.5% vs. 11.6% with traditional oxygen treatment), but this difference was not statistically significant (P=0.053). The rates of death within 90 days were comparable among the groups (HFNC, 21.2 percent ; conventional oxygen treatment, 17.4 percent).

Differences in research design and patient characteristics, like underlying comorbidities, may explain why the FLORALI and HOT-ER trials found inconsistent outcomes. Pneumonia was the leading cause of respiratory failure in the FLORALI study (approximately 80 percent of patients). On the other hand, pneumonia was present in only about 25% of patients in the HOT-ER trial. Furthermore, the FLORALI trial did not include people with asthma, heart failure, or chronic obstructive pulmonary disease (COPD), which was also the case for more than 50% of the HOT-ER study participants. The FLORALI trial used a 48-hour continuous HFNC therapy methodology, which may have led to insufficient HFNC treatment in HOT-ER as it did not have a specified protocol. Additionally, HOT-ER failed to compare HFNC with NIV. The studies also varied in the specifics of the high flow settings used; for example, the FLORALI protocol had a flow rate of 10 L/min higher than the HOT-ER. There may have been fewer intubations and less effort required to breathe thanks to increased CO_2 clearance in the FLORALI trial, which may have been caused by a modest but significant difference in flow rate.

Patients suffering from acute hypoxemic respiratory failure were compared in a meta-analysis of fourteen trials to those receiving traditional oxygen treatment against HFNC. Neither the intubation rate (26 percent in both groups; odds ratio, 0.98; 95 percent CI, 0.34-2.82) nor the death rate (26 percent for HFNC vs. 27 percent for conventional oxygen therapy; relative risk [RR], 0.97; 95 percent CI, 0.82-1.14) were significantly affected by HFNC treatment [35]. The same meta-analysis found that the HFNC group experienced less dyspnea and more comfort, and there was a potential decrease in hospital-acquired pneumonia; however, the effects on intensive care unit admissions and duration of stay were unclear.

Patients with hypoxemic respiratory failure were found to require less intubation and less escalation of respiratory support when HFNC was used instead of low-flow oxygen, according to a meta-analysis of nine trials [36]. Death rate, duration of stay, dyspnea, and patient comfort were not different, nevertheless.

Patients with acute hypoxemic respiratory failure were found to have a lower intubation rate with HFNC compared to conventional low-flow oxygen in a network meta-analysis, but there was no effect on death (RR, 0.76; 95 percent CI, 0.55-0.99) [37].

HFNC versus NIV

The benefits of NIV for patients with hypoxemic nonhypercapnic respiratory failure have been the subject of conflicting findings [38–46]. Results in patients with acute hypoxemic respiratory failure treated with noninvasive modalities (HFNC, facemask NIV, and helmet NIV) were compared to those in patients treated with low-flow oxygen in a network meta-analysis of 25 randomised studies [37]. When compared to patients treated with low-flow oxygen, those given nasal or face mask NIV had a lower risk of death (RR, 0.40; 95 percent CI, 0.24-0.6; RR, 0.83; 95 percent CI, 0.68-0.99). Helmet NIV (RR,0.26; 95 percent CI,0.14-0.46); face mask NIV (RR,0.76; 95 percent CI,0.62-0.90); and HFNC (RR,0.76; 95 percent CI,0.55-0.99) were the three noninvasive modalities linked with decreased intubation rates. Because of the large variety of etiologies for respiratory failure and sickness severity across participants, as well as the high likelihood of bias owing to the absence of blinding, it is important to approach this network meta-analysis with caution. Furthermore, individuals suffering from severe hypoxemia, defined as a PaO_2/FiO_2 ratio less than 200 mm Hg, did not experience the mortality advantage.

A meta-analysis comparing HFNC and NIV was conducted in a study that drew from 29 randomised trials involving a variety of groups and individuals with acute respiratory failure [42]. There was an improvement in patient comfort and a decrease in mortality, intubation, and potentially hospital-acquired pneumonia when HFNC was used (RR, 0.44; 95 percent CI, 0.24-0.79, 0.53-0.95, and RR, 0.46; 95 percent CI, 0.15-1.45). The study's methodology, patient demographic characteristics, type of respiratory failure, and outcomes were all heterogeneous, and the small sample size further hinders the ability to evaluate the results. Notwithstanding these caveats, HFNC seems to be on par with other options and is a good fit for this particular clinical situation.

Another small study compared HFNC with helmet NIV in patients with severe hypoxia [34]. Improved oxygenation, less dyspnea and respiratory effort, and stable $PaCO_2$ levels were all found to be linked with helmet NIV.

Some worry that HFNC would make patients wait longer for intubation, which could have negative effects on their condition [47]. Therefore, doctors using HFNC should keep an eye out for symptoms of respiratory failure that could lead to the need for intubation or mechanical ventilation. In patients without tachypnea, HFNC may be effective even with a high FiO_2. Clinicians may also find the ROX index useful, which is the sum of the following: respiratory rate, proportion of inspired oxygen (as a percentage), and peripheral arterial oxygen saturation. Results from a single small series demonstrated that the risk of endotracheal intubation was reduced when the ROX index was >4.88 at 2, 6, and 12 hours following the start of HFNC. Before ROX can be used consistently, further research are needed to validate its benefit in this population.

Acute Hypercapnic Respiratory Failure

Acute worsening of chronic obstructive pulmonary disease (COPD) can also lead to hypercapnic respiratory failure, a common clinical complication. Prior to endotracheal intubation, noninvasive invasive ventilation (NIV) has been the mainstay of respiratory support for individuals with this condition when alternative oxygen devices have not been effective. Some patients should not use it, nonetheless, due to poor mask compliance [48,49]. Due to its generally low toxicity, HFNC is an effective treatment for hypercapnic respiratory failure in these individuals [50].

Research has demonstrated that HFNC can enhance tidal volume in COPD patients, even if the treatment does not offer active inspiratory support [51]. Some patients with hypercapnic respiratory failure due to chronic obstructive pulmonary disease (COPD) experienced a decrease in breathing frequency, while others had a decrease in $PaCO_2$ as a result of HFNC (Nilius et al., 52). In stable chronic obstructive pulmonary disease (COPD) patients, HFNC improves oxygenation compared to spontaneous breathing and boosts exercise capacity [53]. These findings point to HFNC as a very potential treatment option for specific types of hypercapnic respiratory failure.

Pre-intubation Oxygenation

Preoxygenation is a common technique used to avoid desaturation during intubation support. Before intubation, most specialists administer oxygen using traditional systems and bag-mask ventilation; the patient wears an oxygen mask or bag mask just during the intubation process. Patients undergoing intubation can be adequately oxygenated before (preoxygenation) and throughout the process with HFNC, albeit it is not a routine operation (to prevent desaturation). Nevertheless, there is inconclusive evidence about the efficacy of HFNC for preoxygenation before intubation [54-57].

The adoption of HFNC methods has been demonstrated to increase oxygenation in multiple experiments. Before intubation, one randomised single-center trial compared four minutes of preoxygenation with HFNC (100 percent FiO_2 at 60 L/minute) and concurrent NIV (10 cm H_2O pressure support ventilation and 5 cm H_2O PEEP) versus four minutes of NIV alone. Patients receiving HFNC/NIV were less likely to experience episodes of desaturation below 80% (0% vs. 21%) and had a greater peripheral oxygen saturation (100% vs. 96%) [54]. In a study of 101 patients, Miguel-Montanes et al. [55] found comparable outcomes: HFNC resulted in greater peripheral oxygen saturation levels at the end of the preoxygenation phase (100 percent vs. 94 percent) and fewer bouts of severe hypoxemia (2 percent vs. 14 percent). In conclusion, the authors found that HFNC significantly reduced the incidence of severe hypoxemia and that its use could enhance the safety of intubated patients in the intensive care unit.

However, compared to preoxygenation using a traditional high-flow oxygen face mask, HFNC did not decrease the lowest saturation during intubation in a multicenter study of 124 patients with severe hypoxemia (PaO_2/FiO_2 ratio <300 mm Hg, respiratory rate >30 breaths/min, and a FiO_2 >50 percent to achieve a saturation of >90 percent) [56]. Research variations in intubation indications and pre-intubation hypoxemia severity may account for the contradictory findings.

It is essential to ensure that every patient is oxygenated after extubation in order to prevent the need for reintubation. This is accomplished for the majority of patients using low-flow systems (nasal prongs or simple masks). Venturi masks or high-flow non-compressor systems can be used when more flow is needed. A patient's oxygen needs, the cause of their respiratory failure, and their personal preferences should all be considered when making a personalised decision about which oxygen equipment to use.

One study that showed HFNC to be effective after extubation was involving 527 patients who were at low risk for reintubation after the procedure, including both surgical and medical patients. Reduced rates of reintubation (4.9 percent vs. 12.2 percent) and better secretory clearance (14 patients treated to avoid 1 reintubation) were linked with HFNC for the first 24 hours after extubation [57]. Six hundred and four patients were randomised to receive either HFNC or NIV if they were at high risk of reintubation (mixed surgical and medical populations). Following 72 hours, a higher percentage of patients in the HFNC group (22.8%) needed to be reintubated compared to the NIV group (19.1%) [58]. Patients who received HFNC had shorter intensive care unit stays, but there was no change in the incidence of death, sepsis, or multiorgan failure. Furthermore, the data are not strong enough to support HFNC for COPD patients with chronic hypercapnia, a group whose guidelines and evidence point to NIV, even though 20% of trial participants had moderate to severe COPD.

When compared to traditional oxygen treatment, a meta-analysis of nine trials found that HFNC reduced the rates of reintubation (RR, 0.46; 95 percent CI, 0.30-0.70) and incidence of post-extubation respiratory failure (RR, 0.52; 95 percent CI, 0.30-0.91) [59]. On the other hand, HFNC does not outperform NIV in terms of rates of reintubation or post-extubation respiratory failure.

The Inability to Breathe After Surgery

Among patients requiring ventilatory assistance, almost 20% experience postoperative respiratory failure [60,61]. There is a high morbidity rate, longer hospital stays, and an increase in 30-day mortality associated with respiratory failure requiring unexpected reintubation in the postoperative interval [62-64]. The first six hours following primary extubation were associated with an increased risk of reintubation and its complications, which included pneumonia (including aspiration), pulmonary edoema, atelectasis, airway blockage, and reduced brain function.

In most cases, NIV is the method of choice for preventing reintubation due to moderate evidence [65]. As a result, HFNC is not usually used as a first-line treatment to prevent or manage postoperative respiratory failure because there are no randomised trials assessing its effectiveness. However, for patients who have poor NIV tolerance, it could be a viable alternative.

When compared to traditional oxygen treatment, Hernández et al. [57] found that HFNC applied immediately reduced the likelihood of respiratory failure and reintubation at 72 hours. A study conducted by Corley et al. [66] compared the effects of HFNC (35-50 L/min) and nasal cannula or face mask (2-6 L/min) for 8 hours after extubation on 155 obese patients (body mass index 30 kg/m2) who were undergoing cardiopulmonary bypass surgery. Radiographic characteristics of atelectasis, dyspnea, and oxygenation were similar between groups. Yu et al. [67] contrasted HFNC with standard oxygen therapy following thoracoscopic lobectomy in a separate investigation. After their surgeries, 110 patients who were moderately to highly likely to need reintubation were randomly assigned to receive low-flow oxygen through a nasal cannula or face mask, or high-flow nasal cannula (ranging from 35 to 60 L/min). Hypoxemia was less common (12 percent vs. 29 percent) and NIV was less often used after HFNC therapy (4 percent vs. 17 percent). Five reintubations were necessary for patients receiving conventional oxygen therapy, whereas none were necessary for the HFNC group.

Randomly randomised to either HFNC or NIV, 830 patients who had or were predicted to experience acute respiratory failure following cardiothoracic surgery were studied. While HFNC was administered at a rate of 50 L/min with a 50% FiO_2 level, NIV required bilevel positive airway pressure for a minimum of four hours daily (pressure support, 8 cm H_2O; PEEP, 4 cm H_2O) [68]. In terms of treatment failure rate, there were no statistically significant differences found between the HFNC and NIV groups (reintubation, switch to the other treatment, or treatment discontinuation; HFNC 21 percent and NIV 22 percent). Likewise, there was no statistically significant difference in the death rates (7 percent and 6 percent , respectively). The projected increase in skin breakdown cases with NIV was, however, more prevalent (10 percent vs. 3 percent).

Conventional oxygen therapy (RR, 0.58; 95 percent CI, 0.21-1.60) and noninvasive ventilation (NIV) (RR, 1.11; 95 percent CI, 0.88-1.40) were found to have comparable rates of reintubation compared to HFNC in a meta-analysis of seven randomised trials including 2,781 patients [69]. The HFNC group showed a lower reintubation rate than the standard oxygen therapy group in a subgroup analysis of critically sick patients (RR, 0.35; 95 percent CI, 0.19-0.64).

The intubation rate and length of hospital stay were both shown to be statistically insignificantly reduced when HFNC was considered non a different meta-analysis of fourteen trials [70]. On the other hand, a meta-analysis of 9 trials showed that HFNC reduced the requirement to escalate respiratory support (e.g., switching to NIV) and reintubation rates (RR, 0.32; 95 percent CI, 0.12-0.88) compared to traditional oxygen therapy after surgery [59]. Postoperative hypoxia rate, length of intensive care unit or hospital stay, and mortality rate were unaffected by HFNC.

Hypoxemic Respiratory Failure in Patients with Immunosuppression: Acute and Chronic

Patients on immunosuppressants who experience acute respiratory failure and require mechanical ventilation have a somewhat high mortality rate [71]. Because of its efficacy in alleviating dyspnea symptoms, NIV is suggested as a first-line treatment in such cases. Two studies have shown that compared to traditional oxygen therapy, NIV results in fewer intubations and reduced fatality rates [72].

In immunosuppressed patients, NIV was linked to more intubations and a higher mortality rate than HFNC or standard oxygen therapy, according to a post hoc analysis of the FLORALI research [27]. Treatment with HFNC was linked to a reduced 28-day mortality rate than treatment with conventional oxygen therapy, NIV, or both, according to a retrospective study of cancer patients [73]. The mortality rate was 35% in the HFNC group vs. 57% in the non-HFNC group. Reduced intubation frequency (35 percent vs. 55 percent, respectively) and mortality (20 percent vs. 40 percent, respectively) were linked with HFNC as compared to NIV as first-line therapy in a prospective observational research [74]. It should be noted that HFNC did not work as a rescue treatment following the failure of traditional oxygen therapy or NIV [24], suggesting that HFNC is most successful when administered early on.

Even in immunocompromised patients, HFNC has been found to alleviate dyspnea and respiratory rate similar to that seen in non-immune patients [26,75-77]. So, HFNC could be a less invasive option that "do not intubate" patients with compromised immune systems can yet benefit from appropriate oxygenation and palliation.

Respiratory Failure Due to Acute Hypoxia in COVID-19

One can choose between invasive mechanical ventilation following intubation, HFNC, or a noninvasive intravenous device (NIV) as the patient's oxygen requirement or respiratory effort increases. In most cases, clinical doctors would rather use HFNC or NIV, which are noninvasive techniques, than intrusive mechanical ventilation.

For patients with coronavirus disease 2019 (COVID-19), one retrospective study found that HFNC reduced the need for mechanical ventilation and intubation [78]. However, another study that included noninvasive modalities found no differences in the intubation rate among patients treated with HFNC (29 percent), continuous positive airway pressure (25 percent), or other forms of noninvasive ventilation (28 percent) [79]. Furthermore, there were no disparities in fatalities.

Helmet NIV and HFNC were compared in a study of 110 people with moderate to severe acute hypoxemic respiratory failure caused by COVID-19, according to Grieco et al. [80]. At the 28-day milestone, there was no discernible change in the number of days without breathing support (helmet NIV, 20 days; HFNC, 18 days). The use of helmet NIV was associated with fewer intubations (30% vs. 51%) and more days without invasive mechanical ventilation for patients (28 vs. 25 days).

The risk of viral transmission may be increased by HFNC, an aerosol-generating process. When using HFNC in patients who are able to breathe on their own and who have confirmed or suspected COVID-19, it is important to take extra precautions to prevent the spread of the virus through the air (i.e., full personal protective equipment; placing a surgical mask on the patient during HFNC when health care workers are in the room or the patient is being transported, or starting at the lowest effective flow rate).

Contraindications

Contraindications to HFNC as a main endpoint have not been documented in any randomised clinical trials. Therefore, there are no known absolute contraindications. Any condition that makes it impossible to properly fit a nasal cannula, such as a previous operation on the nose, face, or airway, is a relative contraindication to HFNC. Due to the theoretical possibility that the high pressure could induce venous thromboembolism, some specialists advise against HFNC after upper airway surgery.

Conclusions

A one-of-a-kind gadget known as the HFNC delivers a high flow of heated and humidified oxygen at a predetermined concentration, providing respiratory assistance. Patients with respiratory failure due to various causes are increasingly undergoing HFNC.

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