



# A rare complication of high flow nasal cannula therapy in COVID-19: Caudal septal cartilage necrosis

Serra Topal<sup>1</sup>, Ayça Sayan<sup>1</sup>, Gülbahar Çalışkan<sup>2</sup>, Gökhan Tüzemen<sup>3</sup>

<sup>1</sup>Department of Anesthesiology and Reanimation, Bursa Faculty of Medicine, Bursa City Hospital, Türkiye

<sup>2</sup>Department of Intensive Care, Bursa Faculty of Medicine, Bursa City Hospital, Bursa, Türkiye

<sup>3</sup>Department of Otorhinolaryngology, Bursa Faculty of Medicine, Bursa City Hospital, Bursa, Türkiye

Journal of Bursa

Faculty of Medicine

e-ISSN: 2980-0218

## Case Report

### Intensive Care

#### Received

March 20, 2024

#### Accepted

April 24, 2024

#### Published online

May 4, 2024

J Bursa Med 2024;2(2)  
74-77

## ABSTRACT

A high-flow nasal cannula (HFNC) therapy has been frequently performed in adult patients with acute respiratory failure during the COVID-19 pandemic. With the increasing long-term use of HFNC, different complications have been observed. We aimed to share the nasal necrosis complication that occurred in our patient who had used HFNC for a long time.

A 65-year-old male patient with COVID PCR (+) was admitted to hospital with fever symptoms after 5 days of favipravir treatment at home and had no comorbidities. He was hospitalized due to the development of COVID pneumonia and fever symptoms. During the hospitalization, the favipravir treatment was planned to be completed to 10 days with 250 mg methylprednisolone for 3 days and 40 mg maintenance was continued. Favipravir was discontinued on the ninth day due to increased liver function tests. On the 7th day of hospitalization, he was admitted to intensive care unit with clinical deterioration such as sudden decrease in oxygen saturation, respiratory distress, and fever symptoms.

The patient's Glasgow Coma Score (GCS) was 15 at intensive care unit (ICU). HFNC therapy was started while the oxygen saturation was 72 with a reservoir oxygen mask. HFNC therapy was performed by High-flow nasal cannula. The flow was started at 80L / minute and the fraction of

inspired oxygen (FiO<sub>2</sub>) was set at 50% to maintain peripheral oxygen saturation above 92%. The temperature was set between 35°C and 37°C. The patient's hemodynamics were stable without inotropic drugs and sedation was not administered. Oral feeding was continued. Diuresis, liver function tests and other laboratory parameters were monitored regularly and medical treatments were adjusted. The daily HFNC therapy settings during the follow-up of the patient are summarized in Table 1. On the 33rd day of the patient's stay at ICU, HFNC therapy was terminated and reservoir oxygen mask therapy was planned to be started. However, on the last day of HFNC therapy, epistaxis was developed. Necrosis and ulceration were noticed in our patient's nasal columella skin and upper lip filter skin due to compression. It was observed that the caudal end of the nasal septal cartilage and the medial crus of the alar cartilage were visible (Figure 1). The patient was evaluated by Otorhinolaryngology clinic. These



#### How to cite this article

Topal S, Sayan A, Çalışkan G, Tüzemen G. A rare complication of high flow nasal cannula therapy in COVID-19: Caudal septal cartilage necrosis. J Bursa Med 2024;2(2):74-77

#### Address for correspondence

Serra Topal, Department of Anaesthesiology, University of Health Sciences, Bursa City Hospital, Bursa Türkiye  
E-mail: dr.serra@msn.com

Available at <https://dergipark.org.tr/pub/bursamed>

**Table 1. Setting parameters of High-flow nasal cannula (HFNC) and arterial blood gas parameters**

Time (days)	HFNC flow (%)	HFNC FiO2 (%)	pH	PaO2 (mmHg)	PaCO2 (mmHg)	Saturation (%)
1.	50	80	7,49	78,4	32,8	96,5
2.	60	90	7,48	81,2	38,1	96,2
3.	60	90	7,52	81,4	35,7	97,3
5.	60	100	7,49	49,0	37,2	87
7.	60	90	7,49	61,8	37,0	92,9
10.	60	100	7,49	55,5	37,0	90,3
15.	60	90	7,48	94,7	37,7	98,3
18.	60	80	7,47	64	42,9	93,5
21.	50	80	7,54	60,9	34,8	93,7
24.	50	65	7,61	56,2	50,9	96,7
27.	60	60	7,49	140	45,1	99,5
30.	40	50	7,54	151,2	39,6	99,8
32.	30	45	7,52	94,2	41,7	98,5

tissues of the patient were debrided, nasal columella skin and upper lip filter skin were sutured in vertical axis with primary 2/0 silk by Otorhinolaryngologist (Figure 2). Since systemic broad-spectrum antibiotic therapy was administered, only Furacin (nitrofurazone) was recommended daily. After this intervention, the patient was followed up with oxygen mask with reservoir for one week and then, when respiratory distress increases, he was entubated in clinic and mechanical ventilation was administered. But the patient died on the tenth day of intubation at ICU.

**DISCUSSION**

High-flow nasal cannula (HFNC) oxygen ther-

apy, generally has been performed for acute respiratory failure in COVID-19 pandemic [1]. We used HFNC therapy in our patient who developed acute respiratory failure with COVID-19. Currently, recommendations are for HFNC use in patients with hypoxemic respiratory failure, following extubation, in the peri-intubation period, and postoperatively for bedside clinicians [2]. Most patients tolerate oxygen therapy with HFNC. Although frequently used, complications are rare in adults. Abdominal distension, aspiration and rarely barotrauma (eg, pneumothorax) are complications of HFNC [3-4]. In adults, as a complication of high-flow nasal cannula therapy, epistaxis has observed only in a small study sample [5]. We also observed nasal necrosis complication in our patient by using HFNC for a long time in COVID-19.



**Figure 1. Caudal septal cartilage necrosis**



**Figure 2. Sutured nasal columella skin and upper lip filter skin**

The mechanism has been developed that, reliably deliver heated and humidified oxygen at high flows via nasal cannula. High-flow nasal cannula can be administered for prolonged periods (eg, days) and patients can be switched to conventional low-flow nasal cannulae once the flow rate reaches  $\leq 20$  L/minute and  $\text{FiO}_2 \leq 50$  percent. Velasco et al. attributed epistaxis to the following causes the maximum flow rate in the study by Velga et al. was 40L/min, while the high flow rate in use was 65L/min and did not differ between patients with or without epistaxis [ 5-6]. We also used HFNC in our patient for 32 days. During this time, other invasive or non-invasive methods were not used. Since hypoxemia was very resistant to oxygen therapy, we could not reduce the flows for a long time. We used the high flow rate between 50-60L /minute for a month.

The temperature of HFNC was between 34-37°C. Warming inspired oxygen and heating it to core temperature is more effective at high flow rates (typically  $>40$  L/minute) than low flow rates. Increased humidification results in increased water content in mucous, which can facilitate secretion removal and may also decrease the work of breathing and avoid airway desiccation and epithelial injury [7]. Mauri et al. reported that, patient comfort as significantly higher during steps at the lower temperature 31 °C in comparison to 37 °C, with the HFNC set at both 30 and 60 l/min [8].

Although proper using, epistaxis was observed in our patient on the 32th day. Necrosis and ulceration occurred in our patient's nasal columella skin and upper lip filter skin due to compression. We thought that adverse event was caused by prolonged cannula compression. Small, soft and flexible nasal prongs are recommended for patient comfort. In infants, snug fitting nasal prong systems may cause trauma to the septum as well as other mucosal complications [9]. Recommendations for children are for the cannula to occupy approximately 50 percent of the internal diameter of the nares to permit some leak and prevent excessive airway pressure [10]. Although there are recommendations about the size and diameter of the nasal cannula in adults, unfortunately there are no relevant studies. Actually, there was only one type of nasal cannula for adults in our hospital. They were suitable for adult patients but not small enough. Temperature and humidification were in accordance with recommended standards in HFCN setting for our patient [11].

## CONCLUSION

As a result, the indications for the use of HFNC in the adult patient are increasing day by day. Therefore, HFNC therapy complications are observing more common in adults. We suggest that using the lowest effective flow rates and appropriately selecting the nasal cannula size to allow adequate leakage may be protective and prevent complications. Although as a rare complication, we suggest that, the caudal septal cartilage necrosis, should be keep in mind.

### *Conflict of Interest*

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### *Authors' Contribution*

Study Conception: ST, AÇ; Study Design: ST, GÇ; Literature Review: AÇ, GT; Critical Review: ST, GÇ; Data Collection and/or Processing: ST, AÇ; Analysis and/or Data Interpretation: GÇ, GT; Manuscript preparing: ST, GÇ.

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