



Bilateral Choanal Stenosis Required Surgical Intervention in a Premature Infant Secondary to Nasal Cpap

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Abstract

Continuous positive airway pressure (CPAP) is defined as "The least harmful way to keep the alveoli open and provide adequate gas exchange" in the neonatal intensive care unit (NICU), thus there has been increased use of CPAP. However, the use of prolonged nasal CPAP (nCPAP), in the premature and especially extremely low birth weight (ELBW) infants might cause serious nasal trauma such as columella and nasal septum necrosis. Herein, we presented an ELBW infant developed bilateral choanal stenosis secondary to prolonged implementation of nCPAP and required surgical intervention.

Introduction

Most of the premature infants require mechanical ventilatory support within the early days of life. For many years, endotracheal intubation and invasive mechanical ventilation has been the main modality for this purpose. However, technologic improvements related to mechanical ventilation have given rise to the development of noninvasive ventilation to meet the newborn infant's needs. Noninvasive methods are preferred in the neonatal intensive care unit (NICU) due to the severe side effects caused by mechanical ventilation (hemodynamic effects, barotrauma, lung injury, oxygen toxicity, ventilator-associated pneumonia, patient discomfort, ventilator mismatch, requirement of excessive sedation, tube obstruction, vocal cord injury, tube problems including hemorrhage, etc.), especially in the preterm infants. Owing to the advantages, non-invasive ventilation should be applied primarily for respiratory failure in the neonates, if there is no contraindication [1,2].

Continuous positive airway pressure (CPAP) should be defined as "The least harmful known way to keep the alveoli open and provide adequate gas exchange". CPAP with nasal devices is widely used in the respiratory management of newborns. Nasal CPAP (nCPAP) prevents alveolar collapse and prevents pulmonary shunts by protecting functional residual capacity. It prevents obstructive apnea attacks by the stabilization of large and small airways and reduces the work of breathing, besides prevents destruction of the surfactant [3]. nCPAP can improve oxygenation, maintain lung volume, lower upper airway resistance, reduce obstructive apnea, and most importantly eliminate tube/ventilator and the associated risks. As nCPAP is well-documented non-invasive respiratory support since Gregory [4] first reported the efficacy for respiratory distress syndrome (RDS) in 1971, it is widely used in the NICUs all over the world [5,6]. However, long-term application of nCPAP via nasal devices can cause nasal trauma, such as nasal septum necrosis, especially in the extremely low birth weight (ELBW) premature infants [6-8]. Herein, we presented an ELBW premature infant developed bilateral choanal stenosis due to prolonged implementation of nCPAP and required surgical intervention.

Case Presentation

A female ELBW premature infant was referred to our NICU at 4 months old postnatally because of bilateral choanal stenosis. She was one of the twins born at 28 weeks of gestation by cesarean section and weighed 990 grams at birth. She was applied surfactant therapy with the diagnosis of RDS and nCPAP for supplemental oxygen support following birth. As she could not tolerate extubation, prolonged nCPAP and short period of mechanical ventilation were applied. She was given steroid therapy with the diagnosis of bronchopulmonary dysplasia (BPD), and antibiotic therapies on different periods. On admission, her physical examination revealed 2720 gr in weight, 32 cm in

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Figure 1: The appearance of paranasal computed tomography of the case.

head circumference, deformed nose, tachypnea, subcostal retractions, acrocyanosis and respiratory failure. Nasogastric catheter could not be advanced through the both nostrils. Laboratory analysis were normal except hypoxemia, her cranial ultrasonography was normal, echocardiography revealed secundum atrial septal defect. Advanced stage of retinopathy was not determined. The patient showed bilateral choanal stenosis on paranasal computed tomography (Figure 1).

Endoscopic dilation of bilateral choanal stenosis was performed by the ear-nose-throat department and polyethylene tubes were placed within the both nostrils for the prevention of restenosis. Polyethylene tubes were removed after 3 weeks following surgical intervention (Figure 2).

She was extubated after surgery and additional oxygen support was discontinued at 5.5 months old postnatally. Her oxygen saturation level was normal at 6 months of old and discharged to home on room-air to continue follow-up at outpatient clinic.

Discussion

CPAP is a well-established noninvasive method of respiratory support for all weight groups of neonates. It is often preferred and widely used in the respiratory management of the neonates with RDS, apnea and weaning from the ventilator. Early nCPAP is harmless, recommended as the first choice, because it is less invasive, cost-effective and easy to apply. It causes 50% reduction in the need for intubation and surfactant requirement, decreases mortality, and provides a falling trend in the BPD. Early nCPAP and surfactant therapy reduce mechanical ventilation requirements, side effects associated with intubation/ventilation and related risks [2,3,5]. In this report, our case has been applied early nCPAP and surfactant therapy, but could not be weaned from the ventilator, developed BPD and bilateral choanal stenosis secondary to prolonged use of nCPAP.

Although, there are various devices to deliver CPAP such as nasopharyngeal tube, different prong systems and mask, bi-nasal prongs have been most widely used in the respiratory management of newborns. On the other hand, positioning the tip of the tube, prong or cannula through the nose might be difficult [9]. There were reports describing systemic and local complications related to nCPAP delivery methods. Gastric distention, air leaks, nasal congestion, skin and mucosa hyperemia, local erosion, bleeding, necrosis, septum breakdown, columella and septal ulcerations are complications of the nCPAP [5-10]. Nasal injury is the most common form of complication due to nCPAP, but long-term cosmetic sequelae are



Figure 2: The appearance of the patient postoperatively.

very rare. The true incidences of these complications are uncertain. To our knowledge, this case with severe choanal stenosis developed secondary to nCPAP is the second one reported in the literature. Previously Moloney et al. [11] have been reported severe choanal stenosis due to the implementation of nasopharyngeal CPAP. This case also required surgical intervention because of choanal stenosis caused by prolonged nCPAP.

The increased pressure around nostrils decreases the blood flow to local tissues, impairs perfusion and causes ischemia and skin breakdown during nCPAP implementation [9,10]. Nasal injuries caused by prongs were classified in three stages: mild, moderate and severe [10,12]. The mild stage described as redness or nasal hyperemia; the moderate referred bleeding injury and the severe stage referred necrosis [12]. The pressure of delivery systems and the duration of nCPAP are important factors causing nasal injury. Prongs with inappropriate size and fixed into the newborn's nostrils very tight defined as harmful. Prolonged duration of CPAP defined as a major risk factor for the development of nasal injury and trauma [6,9,12]. We thought that the main risk factor causing nasal injury was prolonged nCPAP implementation in this case. Nascimento et al. [13] supposed that the longer the device had used, the more severe the lesion. They found that CPAP more than 2 days had been risk factor nasal damage. To avoid nasal trauma, protection of nostrils by adhesive tapes, such as common patches, hypoallergenic tapes, silicon gel and hydrocolloid dressings were recommended [9,10,14-16].

The nasal tissue injury caused by the tube, cannula or prongs placed in the nose is easy to occur and more common in premature infants on nCPAP. Because, nasal tissue is more vulnerable to damage, and also muscle tone is looser in preterm infants. nCPAP may progress to severe nasal ulceration or septal perforation especially in the preterm and/or very low birth weight infants [5-11]. The physicians are recommended to have a command of indications and contraindications to nCPAP. Besides close observation of the baby in terms of disadvantages and complications of nCPAP is a necessity. The topical protective measures, the implementation of strict monitoring and scoring systems for the patients on nCPAP have been reported to decrease the ratios of complications. The accordion tube system easy to shape, matching prongs to nostril properly, and a good hat should be used in order to prevent nasal complications [5-11]. The proper position of the head, using pillows to support the position, frequent moistening of the nostrils, careful and frequent airway control are recommended [15,16].

Conclusion

In conclusion, prolonged use of nCPAP in especially premature

neonates can cause serious complications, and each NICU administering nCPAP should monitor the babies for complications, develop appropriate protocols and proper care methods. We wanted to underline the preventive treatments, appropriate position of the nose and head, frequent monitoring of the patient might be beneficial on the prevention of nasal damage.

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