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Case report

A case of post adenoviral bronchiectasis being managed at home with humidified high flow nasal cannula (HHFNC)

Divya Singh [a,1], Argha Rajbanshi [a,*,2], Prabhas Prasun Giri [b,3]

[a] Junior Resident, Institute of Child Health, India
[b] Associate Professor and Incharge of Pediatric Intensive Care Unit, Institute of Child Health, India

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ABSTRACT

Human adenovirus is an important cause of febrile illness affecting mainly respiratory system ranging from pharyngitis, coryza to fatal pneumonia. Though most of the infections are trivial and results in complete recovery but it may result in considerable morbidities and mortalities in selected patients who developed severe adenoviral infections especially Pneumonia(ADVP)/Lower respiratory tract infection(LRTI). Severe adenoviral pneumonia is notorious to produce long term sequelae in the form of post infectious bronchiolitis obliterans (PIBO) or even bronchiectasis. Here we present a case of a ten months old boy developed bronchiectasis as a sequela of severe adenoviral LRTI and needed prolonged and recurrent respiratory support in the pediatric intensive care unit(PICU) and ultimately discharged on home Humidified high flow nasal cannula(HHFNC).

1. Introduction

Humidified Hi-flow nasal Cannula (HHFNC) therapy is a relatively newer therapy for respiratory distress that offers non invasive respiratory support through the delivery of high flow humidified oxygen at various concentrations. There are studies which demonstrated that the appropriate use of HHFNC in infants and children with respiratory distress can reduce the need for invasive ventilation [1,2]. It is proposed that HHFNC reduces the work of breathing and improved the efficacy of ventilation through different mechanisms. It has been gained wide popularity in treating bronchiolitis, especially in infants. Its use had been widely restricted in acute care settings for different indications. The use of HHFNC in chronic lung diseases had not been well substantiated. Its use in chronic respiratory failure, as well as domiciliary use, had been restricted due to different reasons [2]. Here we present a case of a 10 months old kid who had been admitted with severe adenoviral LRTI, needed repeated mechanical ventilation, had a prolonged PICU stay, and developed bronchiectasis as a sequela of adenoviral pneumonia. His chronic respiratory failure had been managed by HHFNC in the hospital and later on, he had been discharged home with HHFNC.

1.1. Case report

Our proband, the 10 months old baby boy was doing apparently well for the initial nine months of life without any significant illness. In March 2019 he started having cough, cold, fever, and followed by respiratory distress and for which he had been admitted to three different hospitals for 7 days and intubated in the third hospital because of progressive respiratory failure. He had been referred to our PICU on March 24, 2019 on day 2 of mechanical ventilation. Initially, he needed moderate ventilatory support, chest auscultation revealed bilateral rhonchi and wheeze, and a chest x-ray was suggestive of bilateral patchy opacities with hyperinflation (Fig. 1).

He had been treated with iv antibiotics and nebulisation and Bronchoalveolar lavage PCR showed adenovirus. He had been extubated after 7 days of mechanical ventilation and discharged on the first week of April but only to be readmitted after 5 days with c/o cough and respiratory distress. This time he had been treated with nebulisation with salbutamol, Ipratropium with other supportive therapies, and condition improved. Due to recurrent and prolonged respiratory illness beyond 1 month one HRCT chest had been done which showed multifocal increased attenuation in both lungs (mosaic pattern) suggestive of

* Corresponding author. Biresh Guha street, Park circus, Kolkata, West Bengal, 700017, India.,
E-mail addresses: argharajbanshi@yahoo.in, argha.rajbanshi@gmail.com (A. Rajbanshi).
[1] 5, Janakpuri Saharanpur, UP 247001.
[2] Dr Biresh Guha Street, Park Circus, Kolkata, West Bengal 700017.
[3] Anandan, 173, Sarat Ghosh Garden Road, Dhakuria, Kolkata, West Bengal 700031.

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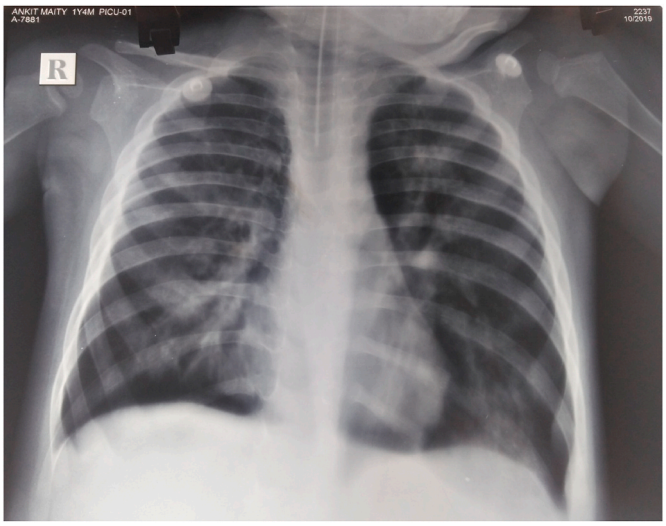

Fig. 1. Chest X ray showing bilateral patchy distribution of interstitial infiltrates and hyperinflation, suggestive of viral infection.

small airway obstruction. Assuming a case of early post-infective bronchiolitis obliterans he had been commenced on oral Hydroxychloroquine and thrice weekly Azithromycin and 3 doses of IV Pulse Methylprednisolone had been administered. After initial improvement, respiratory distress worsened again and he had been transferred to PICU on day 14 of the second admission and was put on Humidified high flow nasal cannula(HHFNC).

He was in PICU for the next two months in HHFNC and we were not able to wean him from that. A repeat HRCT done in June 2019 and it revealed features suggestive of bilateral extensive bronchiectasis associated with patchy ground-glass haziness in the left upper and right lower lobe (Fig. 2).

3% saline nebulisation followed by chest physiotherapy started. Several attempts had been made to wean him off the HHFNC in the next few months but failed. He had been tried on the BIPAP machine several occasions but he did not tolerate it. He had been continued on HHFNC for the next 6 months in PICU till December 2019. In this 6months (June 2019 to December 2019) he had a total of 4 episodes of exacerbation of his illness for which he had to be put on a mechanical ventilator every time. The minimum duration of mechanical ventilation was 3 days and the maximum was 9 days on these four occasions. From November 2019 to till discharge (February 2020), he had been relatively stable on HHFNC but he had not been weaned from HHFNC. Sweat chloride and CFTR mutation assays done and possibilities of Cystic Fibrosis had been excluded. A HHFNC(AIRVO2) had been arranged for him by crowdfunding and donations from different sources and the family members had been trained extensively about its usage. He had been shifted with the HHFNC in the general pediatric ward in December 2019 (Fig. 3). He stayed there for 2 months, the settings of HHFNC had been titrated and other management including chest physiotherapy had been continued.

He had been discharged home in February 2020 after eleven months

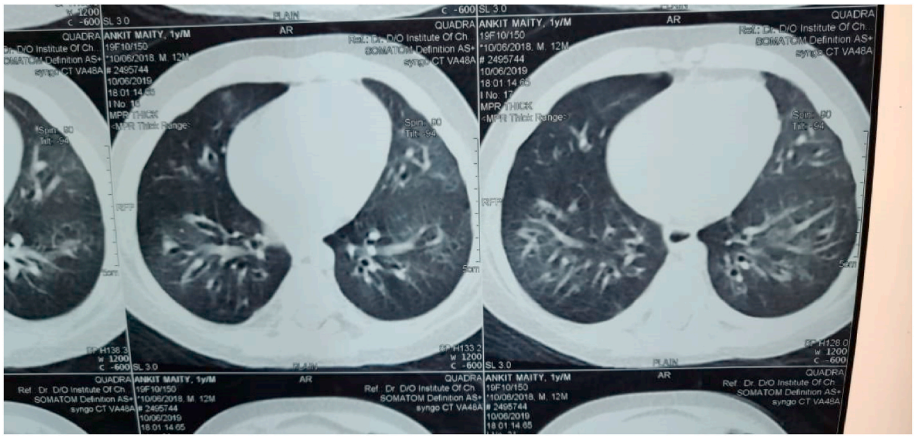

Fig. 2. High Resolution CT images showing bilateral bronchiectasis with ground glass opacities suggestive of bronchiolitis obliterans, a sequelae developed in this case.

Fig. 3. On the day of discharge with attached nasal cannula and HHFNC(AIRVO).

stay in hospital with home HHFNC. On follow up for the next 3 months he is doing well at home with home HHFNC with a flow of 12–16 L and fiO2 of 30%. The parents also tried to wean it off in the home after telephonic consultation with the PICU team but failed to do it.

2. Discussion

Adenovirus (AdV) is a DNA virus that typically causes mild infections involving the upper or lower respiratory tract, gastrointestinal (GI) tract or conjunctiva. Rare manifestations of AdV infections include hemorrhagic cystitis, hepatitis, hemorrhagic colitis, pancreatitis, nephritis, or encephalitis [3,4]. Adenoviral infection is severe in Immunocompromised states especially impaired T cell immunity but many studies have been published where severe AdV pneumonia has been reported in immunocompetent children [5]. Disseminated adenovirus disease in immunocompetent patients is often caused by adenovirus serotypes 3, 7, and 21, and it usually occurs during epidemics of infection [5].

Another unique feature of severe adenoviral pneumonia is that it can cause chronic respiratory sequelae in the form of bronchiolitis obliterans characterized by persistent and recurrent wheezy symptoms [4,5].

Bronchiectasis is another respiratory sequelae of the severe adenoviral disease, though uncommon than bronchiolitis obliterans. A high incidence of bronchiectasis is noted in young children with severe adenoviral pneumonia caused by serotype 3, 5,7h, and 21 [6].

Callaway Z et al. published their data about sequelae of severe adenoviral pneumonia where few of them developed bronchiectasis [7]. A study done by Murtagh P et al. found that adenovirus 7 was associated with the most severe course of the disease and resultant long-term pulmonary sequelae [8]. In our hospital from December 2018 to May 2019, we got 33 cases of severe adenoviral disease that needed PICU care. 2 of them developed bronchiectasis including the index case.

The treatment of bilateral generalised bilateral bronchiectasis is usually symptomatic aiming at a good clearance of thick secretions by good hydration of airways and physiotherapy and treatment of exacerbations by proper antibiotics and respiratory support if needed. Few patients with extensive bilateral bronchiectasis are oxygen dependent and put on domiciliary oxygen support. Few of them also need intermittent or continuous respiratory support in the form of CPAP or BIPAP, mostly in adults. Though the use of HHFNC has gained widespread popularity among the pediatric intensivists in acute care settings especially in bronchiolitic illness, post-extubation, and sometimes in mild ARDS patients, its use as respiratory support in bronchiectasis especially as a domiciliary respiratory support has not been defined clearly. Our proband with post adenoviral bronchiectasis had been tried initially on CPAP and BIPAP as a mode of respiratory support, but he did not tolerate it well and thereafter was kept in HHFNC support for almost 11 months in the hospital and then discharged with home HHFNC·HHFNC can be used to treat bronchiectasis, as it gives PEEP to airways to remain open and have effective oxygenation [9]. It can prevent airway collapse and can also provide effective humidification that later helps in mucosal clearance. By preventing atelectasis and producing effective humidification, mucosal clearance will be easier by effective chest physiotherapy.

Domiciliary use of HHFNC as a mode of respiratory support that too in a kid is not well reported to our knowledge. Pandya et al. reported the feasibility of using home HHFNC therapy after the recent acute exacerbation of COPD in adults. They had 15 subjects after initial screening. The average air gas flow rate was 32.2 L/min and Fio2 of 26.1% respectively. The subjects were able to use HHFNC O2 for an average of 7.5 hours a day. One patient discontinued she preferred to sleep lying prone. No trends towards the worsening of subjective dyspnoea were noted during the study period [10].

Till today there are minimal pieces of literature about the use of home HHFNC, that too in kids and bronchiectasis. Whatever scantly literature available they showed its use mainly in adult COPD or chronic ILD patients as a domiciliary respiratory support. HHFNC as a mode of home respiratory support in bronchiectasis whether in adults or children is not well reported. Our case was on continuous HHFNC for his entire hospital stay for 11 months and ultimately discharged on home HHFNC. The parents had been trained about the use of the machine. He is doing well for the last 5 months in home HHFNC and settings had been reduced.

Declaration of competing interest

None.

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