

Use of Ketamine for Refractory Wheezing in an Infant

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Ketamine has bronchodilator properties and is used for severe bronchospasm in adults and children with asthma. Here, we report successful use of ketamine in a young infant with bronchospasm.

Key words: Asthma, Infant, Ketamine.

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Wheezing is common in infants with bronchiolitis and the treatment is challenging; bronchodilators and steroids have been used although without much success. Ketamine had been used effectively and safely for procedural sedation in children for many years. It has powerful bronchial relaxant effect and has been shown to improve pulmonary compliance [1] and decrease airway resistance in patients with obstructive airway disease [2]. The bronchodilator effect of ketamine is postulated to be due to catecholamine release and inhibition of catecholamine reuptake processes, thus acting as sympathomimetic agent resulting in bronchial relaxation [2]. Ketamine has been used in acute severe asthma in adults and children [3-9] but rarely used in infants [8,9]. Here, we report successful use of ketamine in an infant with refractory wheezing due to bronchiolitis.

CASE REPORT

A two month old boy presented to pediatric emergency with history of paroxysmal cough for 2 weeks and low grade fever and rapid breathing for 10 days. He was born at term by caesarean section with birth weight of 3.4 kg and had an uneventful perinatal period. He was on exclusive breast feeding and this was his first episode of respiratory illness. The symptoms had no relation to feeding and position of child. His father had history of allergic rhinitis. At presentation, child had a respiratory rate of 66/min with subcostal and intercostal retractions and heart rate of 136/min with normal perfusion. Oxygen saturation (SpO₂) was 90% on room air. Chest examination revealed bilateral wheezing and occasional rales. Other systemic examination was unremarkable except for irritability.

Oxygen supplementation and adrenaline nebulization were started in view of possibility of bronchiolitis. Hemogram, serum electrolytes and renal function tests were normal. Chest X-ray revealed bilateral hyperinflation. After marginal improvement for two 2 days, his respiratory distress worsened. Salbutamol nebulization with oral prednisolone were started due to

poor response to adrenaline nebulization. The respiratory distress did not respond and he was shifted to pediatric intensive care unit (PICU) for further management. In PICU, child continued to worsen (increasing respiratory distress and wheezing, oxygen saturation between 88-93%) and was treated with ipratropium nebulisation, intravenous (IV) hydrocortisone, terbutaline infusion, magnesium sulfate and aminophylline sequentially over 2 days. He was empirically administered IV antibiotic (amoxicillin-clavulanic acid), which was stopped after 3 days once blood culture was sterile. Arterial blood gas examination revealed compensated respiratory acidosis. On repeat chest X-ray, the hyperinflation persisted. The condition continued to deteriorate and on day three of PICU stay, IV ketamine was used as last measure before ventilation. It was given as 1 mg/kg bolus followed by continuous infusion at the rate of 10 µg/kg/min. The use of ketamine was not preceded by atropine. There was mild improvement. The ketamine infusion rate was increased to 15 µg/kg/min. At this dose he improved further; respiratory distress and wheezing decreased and oxygen saturation increased. The aminophylline, terbutaline and ketamine infusions were tapered off gradually in 48 hours. He did not require intubation and mechanical ventilation. No side effects of ketamine were noted during the course of therapy. He was shifted out of PICU after eight days of stay and was discharged from hospital after another two days.

DISCUSSION

The differential diagnoses of first-time wheezing in a 2-month old infant include: viral (bronchiolitis) or Chlamydial infection, congenital airway and heart anomalies, mediastinal masses and foreign body aspiration. There are no definite guidelines for the treatment of acutely wheezing infants. Betts, *et al.* [3] first reported use of ketamine in an asthmatic child in 1971. Since then, there are case reports/series and a few observational studies and randomised control trial (RCT) related to use of ketamine for acute exacerbation of asthma in pediatric age group (**Web Table I**). In these studies ketamine had been used for

both nonventilated [3-6] and ventilated [7-9] children with benefits and there were either no or minor side effects. Ketamine has been used mostly for acute exacerbation of asthma, for patients who failed standard therapy except for study by Youssef-Ahmed, *et al.* [8] where it was also used for ventilated patients with severe bronchospasm due to Respiratory Syncytial Virus bronchiolitis ($n=4$) and bacterial pneumonia ($n=2$) (**Web Table I**). Ketamine, when used in nonventilated patients, obviated the need for mechanical ventilation [3-6], as seen in index case also. The present case is probably the youngest non-ventilated infant where ketamine was used successfully for bronchospasm. Earlier, ketamine was used for 8 months old ventilated infant for bronchospasm [8]. Ketamine had been used safely and effectively successfully for sedation in infants *e.g.* an 11 week old infant and infants with mean age of 6.1 ± 3.1 months, range 8 days to 11 months [11]. One limitation of was the inability to test infant's nasopharyngeal secretions for any viruses, especially respiratory syncytial virus, as this facility was not available at our centre.

To summarize, the use of ketamine in an infant with refractory wheezing due to bronchiolitis was successful and obviated need for intubation and mechanical ventilation. Well designed large randomized control trials are needed before recommending ketamine routinely for moderate to severe bronchospasm refractory to standard treatment in pediatric patients.

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