

Haemophilus Influenza-B Epiglottitis in a Vaccinated Child: A Note of Caution

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Epiglottitis is an inflammation of the epiglottis as a result of direct invasion by a pathogenic organism or indirect invasion secondary to bacteremia. Without treatment, epiglottitis can progress to life-threatening airway obstruction, especially in young children whose airway diameter is small.

The treatment of epiglottitis includes rapid airway control and initiation of antimicrobial therapy. Since the introduction of the Haemophilus influenzae type B (Hib) vaccine in 1985, the incidence of invasive Hib disease has dramatically decreased. The incidence among children younger than 5 years has decreased by approximately 99% [1,2].

The epidemiology of invasive *H. influenzae* has dramatically shifted after vaccine introduction. Nontypeable *H. influenzae* is now the major cause of invasive disease across all age groups and causes 62.5% of invasive disease cases in children younger than 5 years of age (annual incidence of 1.73 per 100,000). Breakthrough cases of Hib disease still affect a small proportion of vaccinated children. Disease due to Hib primarily occurs in unimmunized children, including those living in closed communities; those diagnosed with human

immunodeficiency virus, impaired splenic function, and immunodeficiencies; and those with impaired immune function secondary to malignancy and/or chemotherapy [2,3]. Children who experience Hib disease despite vaccination may have a defect in immunological priming, leading to a qualitative difference in Hib-specific memory B cells. Development of invasive Hib disease after prior immunization is in part genetically determined.

In 2012, 30 cases of invasive Hib disease were reported in children younger than 5 years old. In the United States, invasive Hib disease occurs primarily in underimmunized children and among infants who are too young to have completed the primary immunization series [2].

In a 10 year retrospective study from a tertiary care children's hospital, Hib accounted for 6 of 19 cases of epiglottitis, 5 of which occurred in children who had been fully immunized. Another retrospective tertiary pediatric center study spanning 13 years showed that among 40 patients who were diagnosed with epiglottitis, *H. influenzae* was isolated from blood cultures in 28 cases (70%). In 12 of these cases, Hib was identified: 7 prior to 1993 and 5 after that time. Four of these five cases, which presented after introduction of the Hib vaccine, were known to have been fully vaccinated.

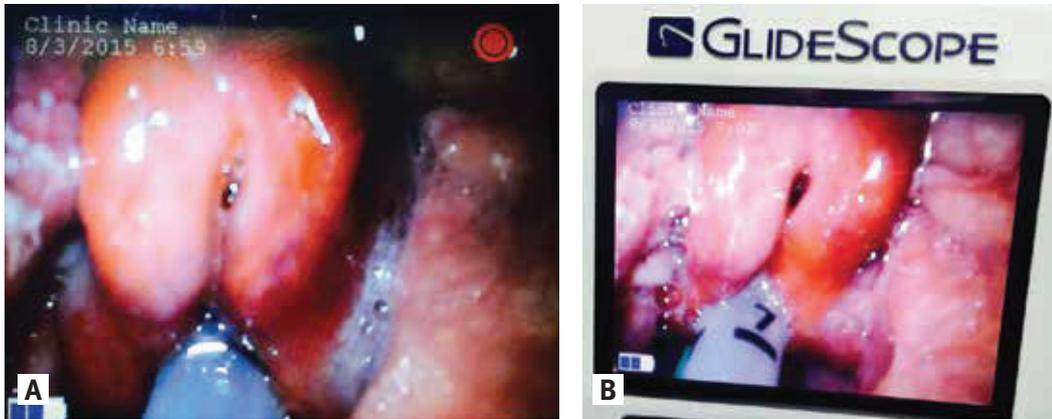
The initial therapy for children with invasive Hib infection is 3rd generation cephalosporins (ceftriaxone or cefotaxime). Ampicillin should be substituted if the Hib isolate is susceptible [2].

PATIENT DESCRIPTION

A 2 year old girl, who was previously healthy and fully vaccinated for her age, was brought to the pediatric emergency department due to fever, dyspnea, stridor, and cough that started a few hours prior to her admission. Parents denied foreign body aspiration. At arrival the girl was alert, her vital signs were: pulse 203 beats per minute (bpm), rectal temperature 39°C, 42 breaths per minute, and 97% saturation on room air. Her physical examination revealed pallor and dyspnea with use of accessory muscles. Lung auscultation revealed reduced breath sounds to both lungs, inspiratory stridor, and prolonged expiratory phase. The rest of the physical examination was within normal range. Preliminary laboratory tests revealed hemoglobin level was 11.9 gr%, normal indices, 17,300 white blood cells, 79.2% neutrophils, LUC 1%, and 303K platelets. Chest X-ray was normal. She was treated with an oxygen mask, bronchodilators, and steroids by inhalation and intravenously, which showed a slight improvement in her respiratory status. She was admitted to the pediatric department for further treatment and evaluation.

In the pediatric department, blood cultures were drawn and cefuroxime (2nd generation cephalosporin antibiotics) was started. Due to a second respiratory distress event at the pediatric department, accompanied with a low oxygen saturations (90%) while on an oxygen mask, as well as usage of respiratory accessory muscles, perioral cyanosis, venous blood

Figure 1. The child's inflamed, edematous epiglottis as documented by glidoscope in the pediatric intensive care unit. The endotracheal tube can be seen as well



gases were drawn, which revealed respiratory acidosis with pH level 7.09, PO₂ 38 mmHg, oxygen saturation 49%, PCO₂ 91 mmHg, lactate 1.5 mmol/L, and HCO₃ 27 mEq/L. Clinical impression of impending airway obstruction, together with abnormal blood gases led to the decision to perform intubation. Due to a red swollen epiglottis and larynx, intubation was difficult to perform [Figures 1A and 1B]. A 3.5 mm diameter endotracheal tube was inserted due to a narrow pathway. There were no complications during the intubation and the patient was hemodynamically stable with blood pressure 88/53, heart rate of 167 bpm, and oxygen saturation 100%. No thumb sign was seen on a lateral neck X-ray.

Initial treatment in the pediatric intensive care unit (PICU) included intravenous (IV) cefuroxime (2nd generation cephalosporin), which was switched later to IV ceftriaxone (3rd generation cephalosporin) due to two positive blood cultures for Hib. After a 3 day course of IV Abx, steroids, and sedation, significant clinical, laboratory, and radiological improvement was noted and the girl was extubated and transferred to the pediatric department for further evaluation and treatment. After completing an 8 day course of IV antibiotic treatment, the girl was discharged from the hospital.

After her discharge, immunologic evaluation was performed to determine whether an immunologic impairment

exists. Immunoglobulin (Ig) A, IgG, IgM, and complement fragments were within the normal range. Moreover, antibodies for previous vaccines were within the normal range. Asplenia was also ruled out. These results, along with a negative history for recurrent infectious diseases and a normal history for growth and development, lower the possibility of an underlying immunologic impairment.

COMMENT

We present the case of a 2 year old girl with epiglottitis secondary to Hib infection who was admitted to our pediatric department with fever, dyspnea, and eventually respiratory failure, but with no other signs of epiglottitis such as drooling, hot potato voice, or thumb sign on lateral chest X-ray. Inflamed, edematous epiglottis was detected during intubation. The child was later diagnosed with bacteremia secondary to Hib infection, a rare entity in a child who is fully vaccinated with the conjugated Hib vaccine.

The conjugated Hib vaccine is considered extremely efficacious, as the incidence of invasive Hib in children under the age of 5 years dropped by 99% following its introduction and implementation of booster vaccine shots, whose necessity was substantiated following re-emergence of invasive Hib cases several years after the conjugated Hib vaccine was first introduced. Today, polyribosylribitol phosphate antibody levels of > 0.15 mcg/ml are considered sufficient to prevent

infection. These levels were shown to be achieved by 100% of infants receiving the heptavalent vaccine. A study that examined the incidence of invasive Hib in the United Kingdom from 2009 to 2012, found only a single case of Hib infection in a fully vaccinated child.

CONCLUSIONS

This case serves as a reminder and a warning that despite the extremely high efficacy of the conjugated Hib vaccine, cases may still occur in the immunized and apparently immunocompetent child. A high clinical suspicion in cases such as this one, presenting with high fever, dyspnea, and stridor, is critical for diagnosing invasive Hib infection.

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