

Delayed Onset Brain Hypoxia and Subsequent Seizures: a Rare Fatal Consequence of Undiagnosed Foreign Body Aspiration

Aghakhani K¹, Asgari M², Soltani S¹, Farhidnia N¹, Fallah F^{1*}

¹ Department of Forensic Medicine and Toxicology, Iran University of Medical Sciences, Tehran, Iran

² Forensic Medicine Organization, Tehran, Iran

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ABSTRACT

Background: Foreign body aspiration is a common medical emergency among children that can lead to lethal complications especially in neglected or misdiagnosed cases.

Case Report: This article is a report of a 15-month-old child who aspirated food materials and after choking crisis, she presented with unspecific respiratory symptoms and treated for respiratory tract infections. After five days, sudden airway obstruction led to hypoxic brain damage and seizure. Due to unavailability of bronchoscopic facilities, extraction of foreign body was postponed and persistent hypoxia led to irreversible brain damage, seizures and finally death. This report reveals the key role of physicians in prompt diagnosis and the importance of early extraction of aspirated foreign bodies, even in asymptomatic cases, to prevent later complications and related mortality and morbidity.

Conclusion: This report contains warning hints for professionals in different fields of medicine that deal with pediatric patients.

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► *Implication for health policy/practice/research/medical education:* Delayed Onset Brain Hypoxia and Subsequent Seizures: a Rare Fatal Consequence of Undiagnosed Foreign Body Aspiration

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1. Introduction:

Foreign body aspiration in childhood is a life-threatening condition with the highest prevalence and mortality rate in children less than 3 years old (1, 2). Foreign body aspiration can be highly fatal, but due to recent endoscopic methods for diagnosis and removal, the mortality rate has significantly declined (3). Based on available reports,

mortality rate of foreign body aspiration among children is less than 2% (4-6), but it should be in mind that reported mortality rates usually obtain from developed countries that endoscopic facilities and experts are available and accessible. Morbidity and financial costs of foreign body aspiration is still considerable even in developed countries (4). In the absence of appropriate and timely diagnosis and therapeutic interventions, high morbidity and mortality should be anticipated (7, 8). Unavailability of experts and equipment (especially endoscopic facilities) that are essential in the management of such cases is a problem of many developing countries

Corresponding author: Fardin Fallah, MD;
Department of Forensic Medicine and Toxicology,
Iran University of Medical Sciences, Tehran, Iran,
E-mail: fardin.fallah@gmail.com

especially in disadvantaged and rural areas (9). Sudden death will happen at the time of initial aspiration due to complete airway obstruction and asphyxia, which is dependent on the size and lodging site of foreign body (5, 10). In addition, there are available reports of delayed deaths due to remained and neglected airway foreign bodies. Delayed case fatalities are usually due to unresolved respiratory infections, hypoxic ischemic encephalopathy (11) or secondary displacement of foreign bodies which causes obstruction and asphyxia (12). In this report, we describe a rare presentation of foreign body aspiration in a pediatric case. This patient had been misdiagnosed and delayed airway obstruction led to brain hypoxic damage and death. We discuss the different reasons of failure in this case. This report contains warning hints for professionals in different fields of medicine that deal with pediatric patients.

2. Case Report:

A 15-month-old girl had been admitted to the regional general hospital of a small city because of sudden cyanosis and seizure during playing. She had been intubated because of low arterial oxygen saturation and prescribed Diazepam and Phenytoin for seizure control. She had been referred to a tertiary care hospital in Tehran for PICU admission and management of suspected foreign body in her airways. Vital signs and Chest X-ray at referring hospital were not available. Between-hospital Referring process took two hours and the patient had been oxygenating by Ambo bag on the way. At the time of PICU admission, she was in active seizure with dilated and reactive pupils and following vital signs: Pulse Rate=162/min, Systolic Blood Pressure = 75mmHg, SPO₂=85% and GCS=4. In her past medical history (obtained at the referral hospital) parents reported an episode of choking and vomiting during eating lunch five days beforehand, which had been recovered after vomiting and extraction of foods from her mouth. After recovery of choking attack, she had been presenting with frequent coughs, wheezing and fever. During this period she had been visited by



Fig. 1. Chest X-ray of the victim taken at referral hospital admission. Unilateral findings and tracheal shift are suggestive of foreign body aspiration.



Fig. 2. Missed aspirated kidney-bean in the carina of the victim that caused delayed obstruction and hypoxia.

two physicians, but both had diagnosed her problem as viral respiratory infection, and prescribed antihistamines and antipyretics but they were not effective and symptoms had been continuing. While the history of choking had been stated by parents at the hospital, it is not evident that it had been also reported to initial physicians. Anyway, maybe due to underreporting of parents or lack of physician's suspicion or attention, diagnosis of foreign body aspiration in this case had been missed. At PICU, seizures were controlled by Propofol and Brain CT scan and CSF analysis was normal. Underlying cardiac problems were excluded. Laboratory findings showed mixed acidosis

in ABG with PH of 7.13, leukocytosis with WBC count of 16000 per microliter and PMN=87%. Urine Screening Test was negative for routine drugs or toxins. Her Chest X-Ray at PICU showed unilateral atelectasis in right lung (figure1). During PICU hospitalization despite all intensive cares and receiving anesthetic drugs for controlling seizure, her oxygen saturation was low with arterial saturation of 70_85%. Twelve hours after admission she underwent a CPR due to cardiac arrest that was successful but led to right side pneumothorax and a chest tube was fixed consequently. Two hours after first CPR, she again developed cardiac arrest and died despite CPR. Her corpse was explored by legal medicine department for the reason of death. A kidney-bean was observed in carina with right side orientation (figure2). Based on available evidence, forensic physicians concluded that because of deep breathing during playing, lodged bean had moved and caused airway obstruction and hypoxia. Her death reason was brain ischemic injury due to persistent hypoxia. Persistent brain hypoxia had led to uncontrollable seizures. The lag between the beginning of seizure and intubation and also delay in PICU admission had exacerbated brain hypoxic damage. Brain CT scan didn't detect any ischemic lesion because it obtained at early phase of hypoxia.

3. Discussion:

Diagnosis of foreign body aspiration is a challenge even among the experts as the condition can mimic different respiratory diseases (3). Three phases with different presentations are defined for cases of foreign body aspiration (13). The first presentation is usually a sudden attack of "penetration syndrome" which is described as choking, coughing and sometimes vomiting (13, 14). Penetration syndrome can lead to sudden death due to asphyxia (15), but it usually resolves spontaneously and at second phase, foreign body lodges somewhere in the airways and causes unspecific respiratory symptoms (13, 16). The second phase can last for a long duration and foreign body aspiration usually remains undiagnosed or

misdiagnosed with other conditions such as respiratory infections or asthma (16). In third phase, respiratory complications of the retained foreign body occur and increase morbidity and mortality (13, 17). Drug-resistant respiratory infections, atelectasis, bronchiectasis, pneumothorax and bronchoesophageal fistulas are some of these complications that should rise the clinicians' suspicion for foreign body aspiration (17, 18). Delayed obstruction can also happen as a complication of remained foreign body; but it is not common (19). Complete obstruction can cause sudden death or hypoxia-related consequences (2). General statistics show that rate of anoxic brain damage due to foreign body aspiration in pediatric cases is about 2% which is comparable to the rate of death in these patients (4); although anoxic and hypoxic brain damages in these cases are less regarded and reported.

In the presented case, maybe movement of foreign body or tissue edema or even swelling of bean due to water absorption had caused airway obstruction and hypoxia. Seizure had also been a sign of brain hypoxia and as the obstruction had not been resolved, irreversible brain damage had occurred. In cases of foreign body aspiration, delayed hypoxic brain damage and subsequent seizure due to retained foreign body is a rare presentation. We could find only one report with the clinical presentation similar to our patient: Deepak et al, reported a pediatric case of foreign body aspiration that had been treated for coryza for two weeks and she suddenly developed cardiac arrest and despite successful CPR, irreversible hypoxic brain damage led to persistent seizures (20).

Delay in diagnosis, delay in hospital delivery after initiation of cyanosis and seizure and delay in foreign body extraction due to unavailability of bronchoscopic facilities at referring center were avoidable contributors to this victim's death. In this victim, death could be easily prevented by obtaining accurate history from parents and early removal of foreign body. In the absence of a specific diagnostic standard for foreign body aspiration, the most indicative diagnostic

tool is a history of observed foreign body aspiration or "penetration syndrome" (21-23) which is more sensitive than any sign, symptom and radiologic findings (24, 25). In children with a sudden choking episode or any medical history suspicious to foreign body aspiration, bronchoscopy is indicated to confirm diagnosis (22, 26-28). Even in cases without any reported or observed history of aspiration, persistent and irresponsive to treat- respiratory symptoms should rise the physicians' suspicion for aspiration (29) and any doubt should be resolved by bronchoscopy (12). Some findings on physical examination and radiographies can help for diagnosis confirmation (especially unilateral pathologic findings), but even normal auscultation or graphies do not exclude aspiration (5). Delay in hospital delivery by parents of this patient was another contributor to further consequences. After initiation of cyanosis and seizure, it took about one hour to deliver child to local hospital and this late intubation had led to brain hypoxic damage. Unawareness of caregivers about the significance and complications of foreign body aspiration is a cause of delayed referral and diagnosis. Education programs for parents and caregivers about the hazards of foreign body aspiration in children and its appropriate management can prevent such faults (30). Unavailability of bronchoscopic and PICU equipment at regional hospital was the reason of the victim's referral. The lag due to transferring process contributed to exacerbation of brain hypoxia damage. Despite advantages in the diagnosis and management of such cases, still required facilities for the management of such emergencies are not available in many deprived or rural areas. Health care providers and policy makers should focus on the appropriate distribution of equipment to avoid such fatalities (9). Hospital failures in the management of this case are not discussed in this report; even though it seems that irreversible brain damage had been occurred before arriving to referral hospital.

4. Conclusion:

In situations without accessibility to bronchoscopic equipment, the role of first line physicians in prompt diagnosis of pediatric patients with foreign body aspiration is life saving. High suspicion of physicians for aspiration is a key factor for early diagnosis of cases with foreign body aspiration. In all pediatric cases suspected to foreign body aspiration, even at stable condition, bronchoscopy is indicated for diagnosis confirmation and preventing lethal consequences.

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