Challenges Encountered by Emergency Physicians in Managing Acute Infectious Epiglottitis in Adolescent Patients

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Abstract

Acute infectious epiglottitis, or supraglottitis, is a potentially fatal disease. It is reported infrequently in adolescents, but its exact prevalence in this age group is unclear. We describe the course and treatment of a 16-year-old girl who presented to the Emergency Department (ED) with acute infectious epiglottitis. This will be followed by a review of epiglottis in the 12-18-year age group.
Owing to its seemingly benign presentation, epiglottitis should be high on the differential diagnosis in adolescents with sore throat. Ongoing surveillance for early or delayed obstruction of the airway is required. The gold standard for diagnosis is direct visualization of the epiglottis and surrounding structures. Epiglottitis in adolescents has a similar clinical presentation and progression in the ED as that in adults and warrants a similar diagnostic and therapeutic approach, although the rate of complications seems to be lower.

MeSH words: Epiglottitis, infection, pediatric, adolescent, emergency physician, emergency department

Introduction

Acute infectious epiglottitis, or supraglottis, is a potentially fatal disease. It is endemic to Europe, North America, Australia and Asia, and less frequently described in Africa and South America [1-15].

There are 2 distinct forms of infectious epiglottis. The classical disease, found in children aged 2-5 years, progresses rapidly, often with airway compromise, and is typically caused by *Haemophilus influenza*e type B (HIB) infection [16,17]. Airway intervention is required in 68% to 100% of children [5,6]. The reported mortality rate is approximately 2% [6,18] The introduction of the HIB vaccine decreased HIB disease by 99% and reduced incidence of epiglottitis by 19-fold, to 1.3 cases per 100,000 children [2,8.19-21]. The second form of epiglottitis usually occurs in adults. The symptoms are typically less obvious and the disease progresses at a slower rate [5,8-10]. The need for airway support has been documented in 6.6% to 23.9 % of cases [10-12]. By contrast to children, the reported mean annual incidence of adult epiglottitis has increased from 0.78 per 100,000 to 3.1 per 100,000 population [6,10]. Mortality ranges from 0 to 7% [1,5,6,12,18]

The cut-off age of pediatric epiglottitis varies in the literature. Some studies included even 19- and 20-year-olds [1,6,18], whereas others were conducted in countries where 16-year-olds are no

longer considered pediatric patients. At times, even individuals younger than 16 years were included in adult studies [7,10,13]. Furthermore, the term "older children" is confusing, because sometimes it refers to immunological maturity (age 9 years) and other times to chronological age (5-15 years) [22,23]. Adolescence is defined in PubMed as ages 13-18 years, and by the World Health Organization, as ages 10-19 years [24,25].

In the present article, we describe a 16-year-old girl who presented to the Emergency Department (ED) with acute infectious epiglottitis, followed by a review of epiglottis in the 12-18-year age group. We defined adolescence as ages 12-18 years because, on the one hand, the airway often reaches adult proportions by age 12 concomitant with immunological maturity, and on the other, 18 years is the legal age of maturity in many regions and countries.

Case Report

A 16-year-old girl arrived by private vehicle to the ED of an urban teaching hospital. Her chief complaints were sore throat, pain and difficulty on swallowing, and fever. The patient was previously healthy and fully immunized. She reported that the pain had started about 20 hours previously and had intensified progressively thereafter. Over-the-counter analgesics and anti-inflammatory medication did not provide relief. The patient localized the pain to the upper part of the throat. She also noted that swallowing was getting increasingly more painful and difficult. Oral temperature taken at home was 38.6^{o} C.

Vital signs recorded in the ED were within normal limits, except tympanic temperature, which measured 39.3^{o} C. The patient was alert and oriented; in pain, but not in distress. The anterior cervical lymph nodes were enlarged and tender bilaterally. Inspection of the oropharynx yielded no abnormalities. Findings for the rest of the head and neck, cardiovascular, and abdominal examination were unremarkable.

The examining emergency physician got called away at that point, and upon his return 20 minutes later, he noted that the patient's voice was getting muffled. This prompted concern of possible progressive airway occlusion, and the patient was transferred to the resuscitation room with a presumptive diagnosis of acute epiglottitis. Urgent consultation with a critical care and ear, nose, and throat (ENT) specialists was requested. Preparations were made to secure a potentially difficult airway. The patient remained alert, oriented and cooperative. With the patient sitting upright in bed, topical anesthesia was applied, and the emergency physician performed rapid fiberoptic nasolaryngoscopy. Red, edematous epiglottis, aryepiglottic folds and arytenoids were visualized, confirming the diagnosis of epiglottitis. The patient was sedated and, after uneventful orotracheal intubation, mechanically ventilated.

Computed tomography (CT) demonstrated an edematous epiglottis and several small epiglottic abscesses and edema of the aryepiglottic folds and arytenoids (images not available). Prior to transfer of the patient to the intensive care unit (ICU), complete blood count (CBC), blood cultures and surface culture of the epiglottis were done. The CBC was normal. While still in the ED, the patient was treated with intravenous cefotaxime, 50mg/kg, for broad-spectrum coverage.

On the patient's admission to the ICU, direct visualization of the epiglottis by the ENT resident reconfirmed the diagnosis. The patient improved rapidly on cefotaxime, and extubation was performed within 24 hours. The blood cultures and culture of the epiglottis were negative. The abscesses resolved without surgical intervention, and the patient was discharged home after 4 days, with no further complications. She was prescribed oral antibiotics. Follow-up information was not available.

Literature Review

A search of the PubMed, EMBASE, and Cochrane Library databases was conducted on May 18, 2009 and repeated on June 29, 2009 using the MeSH search terms "epiglottitis" and "adolescent", alone or combined. Limits were set to English language publications from 1984 to date. The 634 PubMed "epiglottitis" publications were further limited to 70 review articles. When we entered both "epiglottitis" AND "adolescent", PubMed yielded 91 articles, EMBASE 149 articles, and the Cochrane Library, 7 articles. The duplicate publications in PubMed and EMBASE were eliminated, and the

remaining articles, including the 7 from the Cochrane Library, were individually reviewed for content relevance. Relevance was defined by several criteria. Publications where all the patients had a definitive diagnosis of epiglottitis and those containing current epidemiology were included. Inclusion extended to pediatric or adult studies that described patient presentation, management, complications, or outcomes in adolescents. Sixty-seven publications met the inclusion criteria, of which 44 were selected for this review.

Discussion

Incidence and Anatomo-pathophysiology

Our review of the literature yielded 16 cases of adolescent epiglottitis [5,6,26-34]. All the other pediatric or adult studies did not classify patients by age, so the true incidence in this age group (12-18 years) is unknown. Seven studies of 9 cases identified gender: 6 male and 3 female [26-32]. The trend of male predominance is in keeping with adult data [6,7,10-12,19]. When mentioned, there were no seasonal variations in disease incidence in the Far East or North America [6,7,11,12,18].

Epiglotittis occurred mainly on the lingual side of the epiglottis and affected the aryepiglottic folds and arytenoids [16]. Anatomically, the airway of adolescents is larger and more rigid than that of children, and their tighter subepitheliel tissue swells less rapidly [26].

Transport of Patients with Presumed Epiglottitis

Prehospital care of patients with suspected acute epiglottis is not easy. One review of all cases of epiglotittis, including those diagnosed by autopsy, showed that respiratory arrest occurred in 3.9% of patients (16/407) during transport or shortly after arrival in the ED, before receipt of medical care; 1.7% of these patients (7/407) died [6]. There was no specific reference to adolescents in this study.

Surveys of primary pediatric care providers showed that only 25% felt confident in managing epiglottitis in the office, and 40-54% believed the family automobile was the appropriate form of transportation to the ED [35-37]. This is in contrast to the view of 41 pediatric emergency physicians, intensivists, surgeons, and neonatologists, of whom all but one recommended the ambulance for transport [38]. Our patient was brought to the ED by private vehicle.

Ambulance transport does not necessarily guarantee a good outcome. Bag-mask ventilation in the supine position may be impossible in cases of epiglottitis, and ventilation in the upright position may need to be attempted, or invasive airway measures, such as needle cricothyrotomy, may need to be performed in the field [6,39,40].

Patient Presentation to the ED

Emergency physicians can expect to see a limited number of affected adolescents arriving in respiratory or cardio-respiratory arrest, or in distress. The clinical features in these cases include toxic appearance, fever and sore throat, and the "4D" symptoms of drooling, dysphagia, dyspnea, and dysphonia [6, 7, 10, 11,12, 41]. The majority of patients, however, much like most adults, have a seemingly milder presentation. In studies of adults, sore throat (88%-94%) and odynophagia and dysphagia (50%-75%) were the most frequent symptoms. Hoarseness, dyspnea, tachypnea, and fever were also reported, but their frequency varied from study to study [6,7,11,12,17,18,26,42]. Symptoms may progress over days or even a week [10,41, 42]. This pattern was reported in all 13 adolescents with epiglottitis whose ED presentation was described in the literature [5,26,32].

It is noteworthy, that previous HIB vaccination does not rule out epiglottitis. Infectious epiglottitis can be caused by other organisms; additionally, HIB vaccine failure, incomplete immunization, or illness due to *Haemophilus* serotypes may occur [42,43].

Frequent findings on physical examination are tenderness over the anterior neck (79%), inflamed pharynx (71%), and tender anterior cervical nodes (52%-55%) [6,7]. However, a clear oropharynx does not exclude the diagnosis of epiglottitis, because the inflamed epiglottis may be well hidden in the retrolingual position. In stable patients presenting with sore throat and a clear oropharynx, gentle depression of the tongue may show the tip of the inflamed epiglottis. There are no reported cases of complications of this examination [19].

Diagnosis

In patients in respiratory or cardiorespiratory arrest or with impending airway closure, the airway needs to be secured immediately. The diagnosis is of secondary importance in such situations.
In all other patients, direct visualization of the inflamed epiglottis is the current diagnostic gold standard. Although the ED approach and protocols may vary worldwide, patients can be formally diagnosed in the ED. The epiglottis should be visualized in a room equipped for resuscitation. Flexible, fiberoptic nasolaryngoscopy is the preferred method because it is well tolerated and easier to use in people with a strong gag reflex [6,10,11]. ENT and critical care physicians and an anesthesiologist need to be consulted. Emergency physicians who choose to scope must be proficient in the use of the fiberoptic laryngoscope and in securing difficult airways [44,46].When ENT experts are unavailable and the emergency physicians do not have expertise with fiberoptic nasolaryngoscopy but are skilled in airway management, indirect laryngoscopy can establish the diagnosis. This procedure has been used for years without complications [10,11].

Lateral neck radiological imaging is associated with a 12.2% to 28.6% rate of false negatives and is therefore less useful [6,7,12]. CT is not recommended as an initial investigative test when potential airway occlusion has not been ruled out. It is, however, the best test for diagnosing deep epiglottic abscesses [19]. In our patient, the abscesses were detected on CT scan.
CBC, blood cultures, and surface cultures of the epiglottis do not assist the emergency physician in making the diagnosis. They should only be done after concern about the airway has been eliminated or the patient's airway has been secured.

Predictors of Airway Obstruction

In the medical literature, intubation was performed in 6 adolescent patients with epiglottitis, although the reasons for doing so were recorded in only 2. An additional 5 patients were observed in ICU settings, and in 5, information was not available [5,6,26-34]. Therefore, the rate of the authentic need for airway intervention is unknown.

Routine prophylactic intubations are no longer indicated, and most adult patients are managed through close monitoring in the ICU or special wards [5,7,10-12,47].

Parameters that help to identify adolescents at high risk of airway obstruction are derived from adult studies. Risk factors include past history of diabetes mellitus, rapid disease progression (usually less than 12 hours), upright position, presence of drooling, stridor, hoarseness, respiratory distress, dyspnea, or chest wall retractions [6,10,12]. Classification of findings on direct visualization of the airway is called Scope Classification. It has added value to the clinical parameters in predicting airway occlusion (Table 1) [11]. All patients with category III swelling, even those who seem to be stable, should be considered at high risk for occlusion [10,11]. The presence of epiglottic abscesses, not an uncommon finding, is an additional risk factor for acute or delayed occlusion [10,19]. Delayed obstruction can occur any time after a "stable" presentation [10]. In the present case, the patient was in stable condition on arrival, and the disease worsened toward airway occlusion in the ED. The diagnosis was made in the ED by flexible nasolaryngoscopy. The patient was found to have epiglottic abscesses. The disease progression mirrored that in adults with delayed occlusion [10].

Other Treatment and Outcome

The judicious use of heliox and humidified oxygen can be considered in order to facilitate the work of breathing [7,48,49].

The choice of antibiotics in the ED for adolescents with infectious epiglottitis should reflect the varied pathogens found in this age group. *Haemophilus influenzae* type B and nontypable *Haemophilus*, *Streptococcus spp*, *Staphylococcus aureus*, and *Klebsiella pneumoniae* are the most frequent causative bacteria [5,7,10,11,16,17,21,41]. Viruses and fungi are more common in immune-compromised hosts [31,33]. In the latter patients, an uncommon entity, necrotizing epiglottitis, is associated with high morbidity [19,29].

Epiglottic cultures are negative in 40% to 78% of cases [5,7,11], and blood cultures are negative in 40% to 91% [6,7]. In one study, blood cultures

Table 1: Scope Classification

I (slight swelling)	II (moderate swelling)	III (severe swelling)	Arytenoid swelling
Epiglottis slightly swollen, and the entire length of the vocal folds can be seen with the scope	Epiglottis moderately swollen, and more than half the posterior vocal folds can be seen with the scope	Epiglottis severely swollen, and less than half the posterior vocal folds can be seen with the scope	A: Without extension of swelling to the arytenoids and aryepiglottic folds
			B: With extension of swelling to the arytenoids and aryepiglottic folds

From: Katori H, Tsuskuda M. Acute epiglottitis: analysis of factors associated with airway intervention. J Otolaryngol Otol 2005;119:967-972.

were performed in 2 of 11 adolescent patients, and both were negative [27]. Epiglottic cultures were documented in 5 patients. Three cultures grew *Streptococcus spp*. and one, nontypable *Haemophilus* [27,28]. Cultures from immune-compromised patients grew multiple organisms, including diphtheroids, *Streptococcus spp.*, *Bacteroid spp.*, *Neisseria spp.* and *Candida* [29,30,32]. Our patient's blood and epiglottis cultures were negative.

Second- or third-generation cephalosporins and ampicillin/sulbactam are the intravenous antibiotics of choice, as they provide broad-spectrum coverage [16,17,21]. In immune-compromised hosts, treatment for atypical agents needs to be considered. We used a third-generation cephalosporin.

Although the use of corticosteroids is common, they are not indicated because there is no evidence proving their effectiveness [10,17,19,21].

All 16 adolescents reported in the literature survived the epiglottitis. The 11 previously healthy patients had short hospitalizations, recovered fully and did not have any complications either in the ED or throughout their hospital stay [5,6,26-28]. The course and outcome was similar for our patient, despite the presence of epiglottic abscesses.

Conclusion

Although acute infectious epiglottitis often has a seemingly benign presentation, it should be high on the differential diagnosis in adolescents presenting with sore throat because of the potential for early or delayed obstruction of the airway. The gold standard for diagnosing epiglottitis is direct visualization of the epiglottis and surrounding structures. In adolescents, the clinical presentation and progression in the ED, and the diagnostic and therapeutic approaches, are more like in adults than in small children, although the risk of complications appears to be lower.

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