

## Clinical Features of Acute Epiglottitis in Adults in the Emergency Department

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**Purpose:** Acute epiglottitis is a potentially fatal condition that can result in airway obstruction. The aim of this study is to examine the clinical features of adult patients who visited the emergency department (ED) with acute epiglottitis.

**Methods:** This retrospective observational study was conducted at a single tertiary hospital ED from November 2005 to October 2015. We searched our electronic medical records (EMR) system for a diagnosis of "acute epiglottitis" and selected those patients who visited the ED.

**Results:** A total of 28 patients were included. There was no pediatric case with acute epiglottitis during the study period. The mean age of the patients was  $58.0 \pm 14.8$  years. The peak incidences were in the sixth (n=7, 25.0%) and eighth (n=8, 28.6%) decades. The male-to-female ratio was 2.1:1. The most common symptom was sore throat (n=23, 82.1%), followed by dyspnea (n=15, 53.6%), hoarseness (n=7, 25.0%), fever (n=6, 21%), and dysphagia (n=5, 17.9%). The diagnosis of acute epiglottitis was confirmed when edema and hyperemia of the epiglottis were visualized by laryngoscopy. Twenty-six patients were treated conservatively with antibiotics and steroids without definite airway management. Two patients were intubated, but no patients required tracheostomy.

**Conclusion:** In adult patients with acute epiglottitis, sore throat and dyspnea were the most common symptoms but fever was infrequent. Most patients improved with conservative management only. Definite airway management was required in only two patients in whom endotracheal intubations were performed successfully in the ED by emergency physicians, and surgical airway management was not required.

**Key Words:** Epiglottitis, Emergency medical services, Fever, Intratracheal Intubation

### Article Summary

#### *What is already known in the previous study*

*While the incidence of acute epiglottitis in children has shown a marked decrease as a result of vaccination for Haemophilus influenzae type b, the incidence of acute epiglottitis in adults has increased. However, in Korea, few studies concerning adult patients with acute epiglottitis who present to the emergency department (ED) have been reported.*

#### *What is new in the current study*

*In our results there was no pediatric case with acute epiglottitis during the study period. Sore throat was the most common presenting symptom in adults with acute epiglottitis, while fever was relatively infrequent. Most patients improved with conservative management only, and surgical airway management was not required.*

### Introduction

Acute epiglottitis is a supraglottic inflammatory condition which is a potentially fatal condition resulting in airway obstruction. Acute epiglottitis in children is marked by an acute onset of high fever, sore throat, and rapid progression of toxicity. Previous studies reported that 85% of children with epiglottitis were symptomatic for less than 24 hours before presenting to the hospital<sup>1,2</sup>. Conversely, adults with acute epiglottitis typically experience a prodrome like that of upper respiratory infection over 1 to 2 days<sup>3</sup>. They have a sore throat, dysphagia, dyspnea, hoarseness, and stridor, particularly in the supine position. Previous studies showed that fever is

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relatively infrequent and absent in up to 50%. It might develop only in the later stages of the disease in adult patients<sup>9</sup>.

While the incidence of acute epiglottitis in children has markedly decreased as a result of vaccination for *Haemophilus influenzae* type b<sup>2,5,6</sup>, an increasing incidence of acute epiglottitis in adults has been reported<sup>7-10</sup>. There were about 1.9 cases of epiglottitis per 100,000 adults and 0.5 cases per 100,000 children in the United States in 2006<sup>11</sup>. Most cases in adults are caused by a broad range of bacteria, viruses, and fungi, although most frequently, no organism can be isolated<sup>10</sup>. In adults, males and advanced age are more commonly affected in acute epiglottitis, and it is associated with a number of comorbid conditions, including hypertension, diabetes, and immune compromised<sup>12</sup>. However, in Korea, there have been few studies concerning adult patients with acute epiglottitis who present to the emergency department (ED).

The aim of this study is to investigate the clinical features, diagnostic methods, managements and outcomes of adult patients with acute epiglottitis who present to the ED.

## Materials and Methods

This retrospective study was conducted at a single ter-

tiary hospital ED. We searched our electronic medical records (EMR) system for diagnoses of “acute epiglottitis with obstruction (International Classification of Diseases, ICD-10: J0510)” or “acute epiglottitis without obstruction (ICD-10: J0511)” from November 2005 to October 2015 and selected the patients who presented to the ED (n=31). Subsequently, a retrospective chart review of the selected patients was performed. Three patients whose final diagnoses were not epiglottitis (2 with laryngitis and 1 lymphadenopathy) were excluded. Then 28 patients whose final diagnoses were acute epiglottitis were enrolled. The diagnosis of acute epiglottitis was defined as the edema and hyperemia of the epiglottis documented in laryngoscope examinations by otolaryngologists or in contrast enhanced neck computed tomography (CT).

We collected clinical data with respect to gender, age, underlying comorbid conditions, the presences of clinical symptoms such as sore throat, dyspnea, hoarseness, dysphagia, and cervical lymphadenopathy, the duration from symptom onset to ED visit, initial vital signs in the ED including systolic blood pressure, diastolic blood pressure, pulse rate, respiratory rate, and body temperature, the laboratory results including white blood cell (WBC) count, C-reactive protein (CRP) level, and the presence of bacteremia, and the management provided to the patients. We also collected outcome data with respect to all causes of mortality within 28 days, ED disposi-

**Table 1.** Demographic characteristics of the patients with acute epiglottitis.

Variables	Value
Male, n (%)	19 (67.9)
Age, years (mean $\pm$ SD*)	58.0 $\pm$ 14.8
Co-morbidities, n (%)	17 (60.7)
Hypertension	4 (14.3)
Diabetes	2 ( 7.1)
Malignancy	6 (21.4)
Malignancy, involving the airway	5 (17.9)
Symptoms, n (%)	
Sore throat	23 (82.1)
Dyspnea	15 (53.6)
Hoarseness	7 (25.0)
Fever	6 (21.4)
Dysphagia	5 (17.9)
Others	2 ( 7.1)
Duration from symptoms onset to the ED <sup>†</sup> visit, days	2.5 $\pm$ 2.4

\* SD: standard deviation

<sup>†</sup> ED: emergency department

tions, and the length of hospital stay. This study was performed in compliance with the Declaration of Helsinki (Seoul, Korea, 2008) and was approved by the Institutional Review Board of Seoul National University College of Medicine/Seoul National University Hospital.

Data were presented as mean  $\pm$  standard deviation (SD). Statistical analyses were performed using SPSS version 21.0 for Windows (SPSS, Chicago, IL).

## Results

A total of 28 patients were included in this study. There were no patients in children (<18 years old) during the study period. The demographic and clinical characteristics of the patients are shown in Table 1 and Table 2, respectively.

The mean age of the patients was  $58.0 \pm 14.8$  years (range 29-78); the distribution of the patients by age is shown in Fig. 1. The peak incidences were in the sixth (seven cases, 25.0%) and eighth (eight cases, 28.6%) decades. There were nineteen males and nine female, with a male-to-female ratio of 2.1:1.

Seventeen patients (60.7%) had co-morbid diseases, four patients (14.3%) had hypertension, and two patients (7.1%) had diabetes. Six patients (21.4%) had malignant diseases, and among these patients, five had malignancies involving the airway, such as tonsillar cancer, tongue cancer, or naso/oropharyngeal cancer.

The peak incidence by month was in August (seven cases, 25.0%), as shown in Fig. 2. There was no significant time trend.

The most common symptom was sore throat (23 patients, 82.1%). Fifteen patients (53.6%) had dyspnea,

**Table 2.** Clinical characteristics of the patients with acute epiglottitis.

Variables	Value
Initial radiologic investigations, n (%)	
Lateral neck radiograph	27 (96.4)
Neck contrast CT*	16 (57.1)
Laryngoscopy	26 (92.9)
Initial laboratory findings	
WBC <sup>†</sup> count, cells/mm <sup>3</sup> (mean $\pm$ SD)	$12.7 \times 10^3 \pm 4.3 \times 10^3$
Patients with leukocytosis <sup>†</sup> , n (%)	9 (32.1)
CRP <sup>§</sup> , mg/dL (mean $\pm$ SD)	$4.3 \pm 5.2$
Patients with elevated CRP <sup>  </sup> , n (%)	2 ( 7.1)
Blood cultures, n (%)	15 (53.6)
Antibiotics, n (%)	
Ceftriaxone	25 (89.3)
Clindamycin	2 ( 7.1)
Ampicillin/sulbactam	1 ( 3.6)
Others	2 ( 7.1)
Steroids, n (%)	24 (85.7)
Patients admitted to ICU <sup>¶</sup> , n (%)	3 (10.7)
Patients with definite airway management, n (%)	2 ( 7.1)
Overall hospital days (mean $\pm$ SD)	$4.6 \pm 2.0$
Hospital days of the patients who were administered steroids for longer than 5 days (mean $\pm$ SD)	$5.3 \pm 1.8$
Hospital days of the patients who were administered steroids for shorter than 5 days or not at all (mean $\pm$ SD)	$3.2 \pm 1.6$
Hospital days of the patients admitted to the ICU (mean $\pm$ SD)	$7.7 \pm 1.5$
Hospital days of the patients admitted to the general ward (mean $\pm$ SD)	$3.8 \pm 2.1$
Hospital days of the patients with definite airway management (mean $\pm$ SD)	$8.5 \pm 0.7$
Hospital days of the patients with conservative management (mean $\pm$ SD)	$4.3 \pm 1.7$

\* CT: computed tomography

† WBC: white blood cell

‡ Definition of leukocytosis: WBC>10,000 cells/mm<sup>3</sup>

§ CRP: C-reactive protein

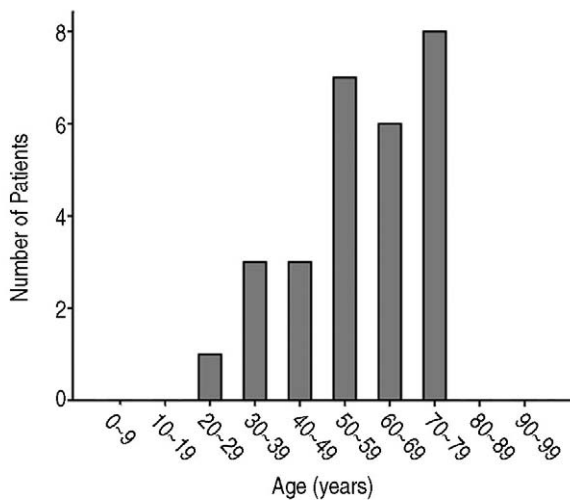
|| Definition of elevated CRP: CRP>0.5 mg/dL

¶ ICU: intensive care unit

and seven patients (25.0%) complained of hoarseness. Fever ( $\geq 38^{\circ}\text{C}$ ) was observed in only six patients (21.4%), and five patients (17.6%) had dysphagia.

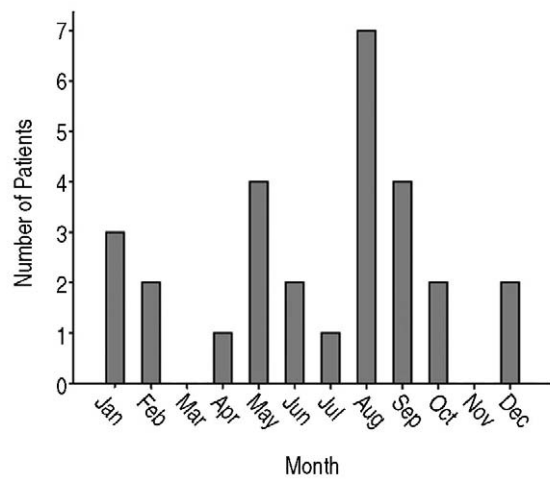
The mean duration from symptoms onset to the time of visiting the ED was 2.5 days.

Lateral neck radiographs were performed in 27 patients (96.4%), and among these patients, 26 (96.3%) showed swelling of the epiglottitis, the “thumb sign” (Fig. 3), in their radiographs. In 16 patients (57.1%), neck contrast CT scans were performed.



**Fig. 1.** Distribution of the patients with acute epiglottitis by age.

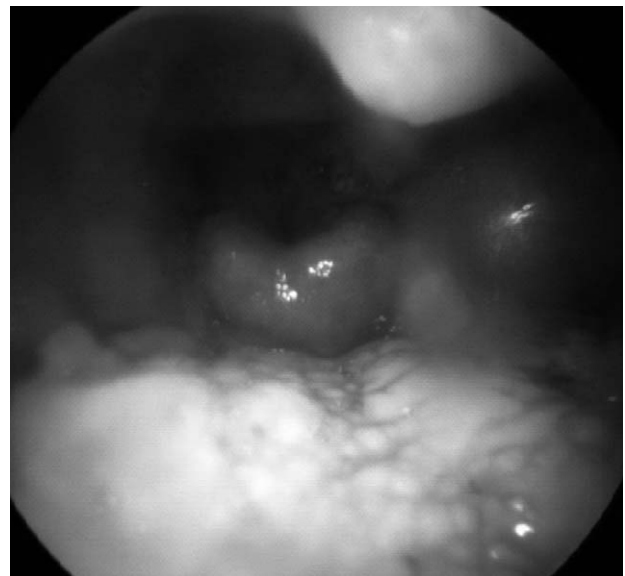
The final diagnosis of acute epiglottitis was established by laryngoscopy performed by otolaryngologists for all patients, except in two patients, who were intubated. Edematous and hyperemic epiglottitis was shown by laryngoscopy (Fig. 4). Because the two patients had stridor with very severe dyspnea, hoarseness, and tachypnea when they visited the ED, they were intubated immediately, so their laryngoscopy examination could not be performed. In these patients, the diagnosis of acute epiglottitis was confirmed by neck contrast CT.



**Fig. 2.** Monthly incidence of the patients with acute epiglottitis.



**Fig. 3.** Lateral neck radiograph of a patient with acute epiglottitis showing the “thumb sign” marked by arrows.



**Fig. 4.** Representative laryngoscopic photograph by otolaryngologists in patient with acute epiglottitis showing edematous and hyperemic epiglottitis and narrowed vocal cord.

Laboratory tests, including WBC count and CRP concentration, were performed for all 28 patients. The mean WBC count was  $12.7 \times 10^3 \pm 4.3 \times 10^3$  cells/mm<sup>3</sup>. The mean CRP concentration was  $4.3 \pm 5.2$  mg/dL. Nine (32.1%) of 28 patients had a normal range of WBC count ( $4.0 \sim 10.0 \times 10^3$  cells/mm<sup>3</sup>), and two (7.1%) had a normal range of CRP concentration (0~0.5 mg/dL).

Blood cultures before antibiotic use were performed in 15 patients (53.6%) who had symptoms with respect to febrile/chilling sense or whose initial body temperature was  $\geq 38^\circ\text{C}$ , but there was no growth in the blood cultures.

Most patients diagnosed with acute epiglottitis were treated conservatively. Twenty-four patients (85.7%) were admitted to the general ward in the department of

otolaryngology. Three patients (10.7%) were admitted to the emergency intensive care unit (EICU) in the ED. The characteristics of the patients admitted to the ICU are displayed in Table 3. Among the patients admitted to the ICU, two patients were intubated and received mechanical ventilator assistance. No patient underwent tracheostomy. The mean length of hospital stay of the patients admitted to the ICU was  $7.7 \pm 1.5$  days, whereas that of the patients admitted to the general ward was  $3.8 \pm 2.1$  days ( $p=0.005$ ).

All patients received intravenous antibiotics. The most commonly used antibiotic was intravenous ceftriaxone 2 g administered once daily.

Steroids, either dexamethasone or methylprednisolone, were administered to 24 patients (85.7%). The mean

**Table 3.** Characteristics of the patients admitted to the ICU\*.

	Patient 1	Patient 2	Patient 3
Sex	Male	Male	Male
Age (years)	52	69	54
Co-morbidities	None	Dementia	Alcoholic liver cirrhosis
Duration from symptoms onset to the ED <sup>†</sup> visit, days	1	10	1
Mental status	Alert	Alert	Drowsy
ED initial vital signs			
Blood pressure (mmHg)	117/89	178/93	131/82
Heart rate (/min)	107	145	97
Respiratory rate (/min)	32	36	24
Body temperature ( $^\circ\text{C}$ )	36.6	39.3	36.5
Saturation (%)	99	96	96
Chest retraction	Mild	Severe	Severe
Definite airway management	Not performed	Endotracheal intubation	Endotracheal intubation
Initial radiologic investigations			
Lateral neck radiograph	Swelling of epiglottis	Swelling of epiglottis	Swelling of epiglottis
Neck contrast CT <sup>‡</sup>	CT, not performed	Edematous change of epiglottis	Diffuse swelling of hypopharynx and supraglottic area
Laryngoscopy	Edematous epiglottitis	Laryngoscopy, not performed	Laryngoscopy, not performed
Initial laboratory findings			
WBC (cells/mm <sup>3</sup> )	$18.5 \times 10^3$	$18.8 \times 10^3$	$13.3 \times 10^3$
CRP (mg/dL)	2.88	5.13	0.82
Blood cultures	Blood cultures, not performed	No growth	No growth
Antibiotics (days of use)	Ceftriaxone 2 g IV qd (6)	Piperacillin/tazobactam IV 4.5 g qid (8)	Ampicillin/sulbactam IV 1.5 g qid (9)
Steroid (days of use)	Dexamethasone (6)	Dexamethasone (2)	Dexamethasone (7)
Hospital days	6	8	9

\* ICU: intensive care unit

<sup>†</sup> ED: emergency department

<sup>‡</sup> CT: computed tomography

length of hospital stay of the patients who were administered steroids longer than 5 days was  $5.3 \pm 1.8$  days, and that of the patients who were administered steroids shorter than 5 days or who did not receive steroids was  $3.2 \pm 1.6$  days ( $p=0.007$ ).

## Discussion

Acute epiglottitis is a potentially life-threatening disorder that can lead to fatal airway obstruction. Traditionally, it has been considered to be primarily a pediatric disease, but in our study, there were no patients in children during the 10-year study period. The incidence of acute epiglottitis in children has decreased from 4.9 to 0.02 cases/100,000/year as a result of vaccination with *Haemophilus influenzae* type b<sup>2,5,6</sup>. Subsequently, the focus has shifted towards acute epiglottitis in adults, in whom the disease is now more common than in children, emphasizing the clinical importance of this disease in adult patients. Similar to the results of Nonoyama et al.<sup>7</sup>) and Guldfred et al.<sup>13</sup>), our data showed that acute epiglottitis frequently occurs in males in the sixth decade. There was no seasonal trend in the occurrence of the disease.

Our study revealed that the most common symptom of acute epiglottitis was sore throat, followed by dyspnea, and hoarseness. Fever was relatively rare in adults. Abrupt onset of fever, stridor, and dyspnea are commonly associated in acute epiglottitis in children<sup>2</sup>). Given the narrow trachea, combined with the redundant, mobile periglottic tissues, the young child has a greater risk of rapid progression to complete airway obstruction, and the subglottic space is the narrowest portion of the pediatric airway, prone to inflammation<sup>14,15</sup>). Therefore, there might be relatively more pediatric cases requiring airway intervention for acute epiglottitis, and many experts agree that children with epiglottitis require an artificial airway as a precaution<sup>16-18</sup>). Conversely, the most common presentation of acute epiglottitis in adults begins with a sore throat that progresses over 1 to 2 days and develops into dyspnea, hoarseness, and dysphagia<sup>4,7,10</sup>).

The diagnosis of acute epiglottitis is made by a patient's history, clinical presentation, physical examination, simple radiographs, and laryngoscopy. Simple lateral neck radiographs demonstrate an enlarged and

thumb-shaped epiglottitis, and a well-performed lateral neck radiograph can be a useful diagnostic tool<sup>19</sup>). Direct laryngoscopy examination can confirm the diagnosis of acute epiglottitis through direct visualization of an edematous and hyperemic epiglottitis, but it usually requires extreme caution to avoid sudden airway obstruction<sup>3,20</sup>). Neck contrast CT can be dangerous for patients with dyspnea, especially in supine position, and it is not needed to make a diagnosis of epiglottitis. Nevertheless, it can be useful for patients for whom laryngoscopy cannot be performed<sup>21</sup>). In our cases, a thumb-shaped epiglottitis was demonstrated by lateral neck radiographs in almost all of the patients, and all patients were confirmed as having acute epiglottitis by laryngoscopy examination, except for two patients who were intubated to maintain their airway as soon as they had reached the ED. The diagnosis of acute epiglottitis in the two intubated patients was made by neck contrast CT.

Whereas *Haemophilus influenzae* type b causes almost all cases of epiglottitis in children, a more diverse range of microbiological agents is recognized in adults. Streptococcus species, Staphylococcus species, viruses, and fungi cause most cases of epiglottitis in adults, although no organism is isolated more frequently<sup>10</sup>). Only 20~25% of adult epiglottitis patients have blood or laryngeal cultures positive for *Haemophilus influenzae* type b<sup>22-24</sup>). No microbiological organism was isolated in our blood cultures. If the patients had presented to other hospitals before they presented to our ED, antibiotics might have been administered to the patients at that time, which could attribute to the negative results in cultures. Throat cultures were not taken in our cases.

With the exception of two patients, most of the patients in our study were managed conservatively without any definite airway management. General principles in the treatment of acute epiglottitis are maintenance of the airway and administration of appropriate antibiotics. Most of the patients can recover with appropriate conservative management. However, patients with signs and symptoms of severe respiratory distress have to undergo placement of an artificial airway, such as endotracheal intubation and tracheostomy. The current antibiotic recommendation is intravenous ceftriaxone 2 g once daily as the first-line drug. Alternative antibiotics include ampicillin-sulbactam, cefotaxime, piperacillin-tazobactam, with consideration for the use of anti-staphylococ-

cal agents against MRSA (i.e., clindamycin, vancomycin) when a patient has risk factors for MRSA infection<sup>25,26</sup>. Steroids are known to decrease airway inflammation and edema, but the role of steroids in the airway management of patients with acute epiglottitis is controversial<sup>27</sup>.

The mean length of hospital stay of the patients who were administered steroids for longer than 5 days was longer than that of the patients who were administered steroids shorter than 5 days or not at all (5.3 days vs. 3.2 days,  $p=0.007$ ). It is possible that clinicians tend to administer more steroids to patients whose conditions are considered to be more serious and the more serious the patient's condition, the longer the hospital stay.

We did not perform surgical airway management, such as tracheostomy, during the study period. Kim et al.<sup>28</sup> performed tracheostomy in four of 13 patients with epiglottitis, and Kim et al.<sup>29</sup> performed tracheostomy in two of 24 patients with epiglottitis. To maintain the airway, endotracheal intubations were performed in only two patients successfully in the ED by emergency physicians. Early hospital visit and administration of broad spectrum antibiotics might attribute to decrease the incidence of the need for placement of artificial airway in patients with acute epiglottitis.

This study has some limitations. First, this was a retrospective review conducted at a single center ED. Only a small number of patients were included in this study. Second, because there were no pediatric patients during the study period, we could not compare the differential characteristics of acute epiglottitis between adult and pediatric patients. Third, throat cultures for microbiological examination were not performed because it was thought that potentially life-threatening conditions could be aggravated by manipulating supraglottic structures with inflammation.

## Conclusion

Sore throat and dyspnea were the most common symptoms but fever was infrequent in adult patients with acute epiglottitis. Most of the patients improved with conservative management only. A few patients required definite airway management, and in these patients, endotracheal intubation was successfully performed in the ED

by emergency physicians and surgical airway management was not needed. When a patient with sore throat and dyspnea visits the ED, the clinician should consider the possibility of acute epiglottitis.

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