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Acute epiglottitis in children: experience in diagnosis and treatment in Lithuania

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Background. Acute epiglottitis which is usually caused by *Haemophilus influenzae b* (Hib) is a rare but serious, potentially life-threatening infection. The aim of our study was to evaluate the clinical peculiarities, management and outcome of acute epiglottitis in children.

Patients and methods. Case histories of 37 children aged 6 months to 11 years, not vaccinated against Hib, who had been discharged with diagnosis of epiglottitis from Vilnius University Children's Hospital in 1990–2004 were analysed retrospectively.

Results. 23 children (62.2%) were aged 2–7 years. The primary diagnosis of epiglottitis was made only in 10 (27%) cases. 29 patients (78.4%) were admitted to the hospital on the first day of illness and 18 of them within 6 hours since the beginning of illness. All children appeared toxic and had fever. Other common symptoms were: dyspnoea (97.2%), dysphonia (97.2%), dysphagia (88%), drooling (72%), upright sitting position (86.4%). The white blood cell count varied from 4.8 to 39.8 × 10^9/l (mean 17.8 ± 8.8). In 8 patients (21.6%) an artificial airway was made. All the children were treated with parenteral antibiotics. Antibacterial treatment commenced at an early stage reduced the duration of the patients' fever by a day and a half on average. There were no deaths due to epiglottitis.

Conclusions. Physicians need to be wary of the possibility of epiglottitis in a toxic-appearing child with fever, upright sitting position and presenting "4D" symptoms. With a timely and appropriate intervention full recovery is expected.

Key words: acute epiglottitis, children, management, outcome

BACKGROUND

Epiglottitis is a relatively rare but serious, potentially life-threatening infection. The causative agent of epiglottitis is usually *Haemophilus influenzae b* (Hib), although other organisms including *Streptococcus pneumoniae,* group A, B, C, and G *Streptococci*, *Staphylococcus aureus*, *Candida* spp. can also cause inflammation in the epiglottis. Since the introduction of the Hib vaccine, in many Western countries the incidence of paediatric epiglottitis has decreased markedly (1). In a Swedish study, in children under five years of age, the annual incidence decreased from 20.9 in 1987 to 0.9 in 1996 (2). Moreover, full Hib vaccination does not always preclude the occurrence of invasive Hib disease, and this possibility should be entertained in vaccinated child if the clinical picture is suggestive (3–6). In 2004, Hib vaccination was introduced in the general vaccination program in Lithuania, whereas from 1998 to 2003 only 5% of infants were immunized with Hib vaccine. It is not always easy to diagnose acute epiglottitis because many of the signs and symptoms are non-specific and occur in common viral conditions of the upper respiratory tract.

The aim of our study was to evaluate the clinical peculiarities, management and outcome of acute epiglottitis in children.

PATIENTS AND METHODS

A retrospective review of hospital records was performed for patients who had been discharged with the diagnosis of epiglottitis from Vilnius University Children's Hospital in 1990–2004. Details of the patients' age, sex, clinical presentation, laboratory data, management and outcome were obtained. The criteria of acute epiglottitis were fever, toxicity, dyspnoea or difficulties in swallowing saliva or water, dysphonia,

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and the red and swollen epiglottis observed during laryngoscopy.

The descriptive values were expressed as means, medians and standard deviations or percentage. The two-sided Wilcoxon test for independent samples was used to compare the groups. The p values less than 0.05 were considered statistically significant.

RESULTS

Thirty-seven cases of acute epiglottitis were identified during a 15-year period. Eighteen children (48.6%) were treated in 2000–2004. The seasonal incidence of epiglottitis was as follows: spring (6), summer (4), fall (16), and winter (11). The age of the patients varied from 6 months to 11 years (mean 5.0 ± 2.9; median 4 yrs). Six children (16.2%) were less than two years of age; only one child was 6 months of age. Most of the children (62.2%) were from 2 to 7 years old (Table). There were 22 males (59.5%) and 15 females (40.5%) ($p > 0.05$). None of the children with epiglottitis was vaccinated against Hib.

Only ten (27%) of the 37 patients were referred to the hospital on suspicion of acute epiglottitis. Referral diagnosis for 21 patients (56.8%) was obstructive laryngitis, for 4 patients laryngotracheitis, 1 tonsillitis, and 1 a foreign body; 29 children (78.4%) were admitted to the hospital on the first day of illness and 18 of them within 6 hours, and 8 children (21.6%) 2–5 days after the onset of the disease. All the children were directly transferred in the Paediatric Intensive Care Unit (PICU).

Table. **Distribution of children with epiglottitis by age**

Patients' age (yrs)	Number of patients	%
<2	6	16.2
2–3	8	21.6
4–5	8	21.6
6–7	7	18.9
8–9	5	13.5
10–11	3	8.1
All patients	37	100

The clinical presentation of epiglottitis is shown in Figure. All the children had fever and appeared toxic. The highest temperature of 16 patients (43.3%) was 39.1 °C and more, that of 10 (27%) – 38.1–39 °C, and that of 11 (29.7%) – 37.1–38 °C. The duration of fever varied from 1 to 7 days (mean 2.2 ± 1.5, median 2). The children who were taken to the hospital on the first day of illness and were treated with antibiotics from the start had a fever from 1 to 5 days (mean 1.8 ± 1.0, median 2), and those hospitalized on the 2nd–5th day of illness had a fever from 1 to 7 days (mean 3.5 ± 2.2, median 3.5). The difference was statistically significant ($p = 0.016$). The most frequent symptoms were inspiratory dyspnoea (97.2%), a change of voice (97.2%), dysphagia (88%), drooling (72%), and upright sitting position (86.4%). Cough was observed in 12 patients (32.4%). Seven children (18.9%) were admitted to the hospital with stridor.

Analysis of the incidence of clinical symptoms of six children under 2 showed that it did not differ from that of the older children.

The white blood cell (WBC) count varied from 4.8 to 39.8 × 10^9/l (mean 17.8 ± 8.8, median 16.8). WBC count was 4.8–10 × 10^9/l in 8 patients (21.6%), 10–15 × 10^9/l in 5 (13.5%), 15–20 × 10^9/l in 9 (24.3%), and 20–39.8 × 10^9/l in 15 patients (40.6%). The mean WBC count of the children who were taken to the hospital on the first day of illness was 18.6 ± 8.7 (median 18.2) and of those hospitalized on the

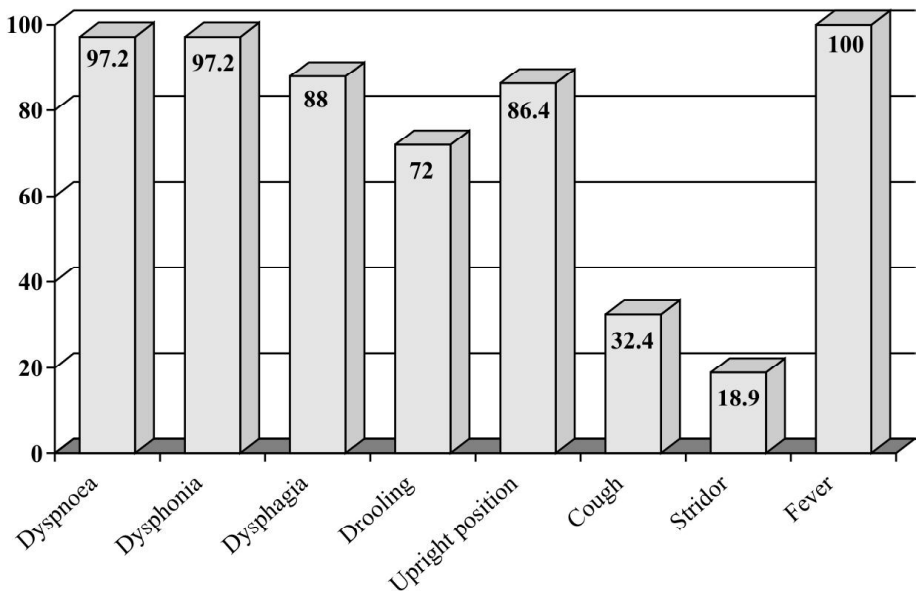

Figure. Clinical presentation (%) of epiglottitis in children

2nd–5th day of illness 14.5 ± 8.8 (median 14.5) ($p > 0.05$).

Blood culture was taken from six patients, and in two cases it was positive (*H. influenzae* b). Pharynx cultures were taken for 13 children. Different microorganisms were grown in 10 of them (4 *S.aureus*, 3 *Streptococcus* spp., 2 *M.catharralis*, and 1 *Candida*). Viral culture, serological tests for children were not conducted as the diagnosis of obstructive laryngitis in PICU was changed into epiglottitis. Chests were X-rayed in 19 patients, and only in a single case segmental pneumonia was diagnosed.

Seven patients (18.9%) underwent orotracheal intubation. The duration of the intubation was 9–36 hours. One child underwent tracheostomy in an effort to intubate. This 14-month-old patient was hospitalized on the first day of illness. He appeared to be toxic, was running a temperature of 38.5 °C, and exhibited dyspnoea, drooling, dysphagia; his WBC count was 15.2×10^9/l with neutrophilias, and the blood culture was negative.

86 percent of the patients were given corticosteroids. 81.1% were treated with repeated racemic epinephrine inhalations, but did not show any response.

All the children were treated with parenteral antibiotics: ampicillin (5 patients), second- or third-generation cephalosporin (21 patients) or their combination (7 patients), and other antibiotics (4 patients).

There were no deaths due to acute epiglottitis.

DISCUSSION

At Vilnius University Children's Hospital, 37 cases of acute epiglottitis were diagnosed and treated in 1990–2004. Our study, like numerous studies by other authors (3, 6–10), showed that epiglottitis is mainly seen in children aged 2–7 years and is more common among boys than girls. The data regarding the seasonal incidence of epiglottitis vary. Some authors (10) have found a higher incidence of the disease during warmer months. However, occurrence of Hib epiglottitis is also described in winter (11). In our study, most of the patients contracted the disease during the colder season. None of them had been vaccinated with Hib vaccine.

Most of the children were taken to the hospital on the first day of illness, but only one fourth of them had been diagnosed with epiglottitis. The initial diagnosis in most cases was obstructive laryngitis.

Acute epiglottitis is relatively rare, therefore it may present a problem to the physician who sees children with an upper respiratory tract infection but does not think of epiglottitis. According to the data from Poland (7), only 20 (3.1%) out of 632 children with croup syndrome were diagnosed with epiglottitis. Moreover, a more severe course was observed in children with epiglottitis than in those with subglottic laryngitis or laryngotracheobronchitis. Therefore epiglottitis first of all needs to be differentiated from obstructive viral laryngitis. That's why clinical symptoms of viral laryngitis should be borne in mind.

Patients with viral laryngitis typically present a several days' history of upper respiratory symptoms progressing to the characteristic barking cough, hoarseness, stridor, and low-grade fever. In contrast, in patients with acute epiglottitis the symptoms usually progress rapidly, the child appears toxic, his temperature is higher, the voice may sound muffled, the speech is limited. The patients often exhibit drooling because they cannot swallow. An upright sitting position with the chin up and mouth open is often observed (12). Mayo-Smith et al. (8) of 134 children with acute epiglottitis observed muffled or hoarse voice in 79%, drooling in 38%, difficulty in swallowing in 26%, difficulty in breathing in 80%, fever in 57%, cough in 30%, and stridor in 80% of cases.

Literature data on the specific clinical symptoms of epiglottitis in children under 2 are contradictory. Brilli et al. (13) proposed that features of epiglottitis are often similar to those of viral croup, i. e. a history of upper respiratory tract infection, prominent "croupy" cough, absence or a low grade of fever. A study conducted by Losek et al. (14) showed that the signs and symptoms in children under 2 are similar to those in older children. These results correspond with ours.

Blackstock et al. (15) described the "4D" symptoms (dyspnoea, dysphonia, dysphagia, drooling) of epiglottitis. Our data showed that dyspnoea and dysphonia were very frequent (in some 97% of cases) in children with epiglottitis. Dysphagia may be present, but drooling sometimes can be absent or else remains unheeded by the physician. Thus, it can be said that the "4D" symptoms are of great importance in the case of a toxic-appearing child with a fever, as they make it possible to suspect acute epiglottitis at an early stage and to start adequate treatment.

Laboratory findings are non-specific, although an elevated WBC count with neutrophilia may be present (8, 9, 15, 16). The results of our study showed that WBC count varied from 15×10^9/l to 39.8×10^9/l in 64.9% of cases. Also, the WBC count of the patients taken to the hospital on the first day of illness was higher than of those hospitalised later, but the difference was not statistically significant. WBC count was strongly associated with the risk of airway compromise (8).

Acute epiglottitis is a bacteraemic illness in the vast majority of cases and is almost always caused by *H. influenzeae b* in young children. According to the literature data (3, 7–9, 14, 17), the isolation rate of *H. influenzae b* from blood from patients with epiglottitis varied from 5% to 95.2%. In our study, *H. influenzae b* grew for 2 children out of 6 taken blood samples. Throat swabs are generally less valuable in providing a microbiological diagnosis of acute epiglottitis, but the act of taking the swab may precipitate acute respiratory

obstruction and should only be undertaken if the child can be rapidly intubated. Although no important differences were found in the clinical characteristics of epiglottitis based on the causative bacterial organism (18), identifying the causative agent would be of great importance in adjusting antibacterial treatment. Some authors have reported that in certain countries a large number of *H. influenzae b* isolates are ampicillin-resistant (9, 10, 17, 19). According to the 2002–2005 data of the Microbiology Laboratory (Head G. Bernatoniene) of Vilnius University Children's Hospital, the occurrence of ampicillin-resistant *H. influenzae b* is 14.2%.

The most important treatment of epiglottitis is antibacterial. Our data have shown that antibacterial treatment commenced at an early stage can reduce the duration of the patient's fever by a day and a half on average.

In eight of our patients (21.6%), an artificial airway was made. A review of the literature (7–9, 16, 17) revealed that the intubation or tracheostomy rate of paediatric epiglottitis was from 15% to 90.5%. Of late, more often than not intubation is applied.

The mortality rate from acute epiglottitis in paediatric patients decreased from 6.1% to 0.9% (20). The data of our study, just like data of other authors (6, 7, 16, 19), showed a good outcome of acute epiglottitis.

CONCLUSIONS

It should be borne in mind that acute epiglottitis is a serious infection in children and its diagnosis is not always easy. Physicians, especially general practitioners and pediatricians, need to be wary of the possibility of epiglottitis in a toxic-appearing child with fever, upright sitting position and exhibiting "4D" symptoms. The first priority in the treatment of epiglottitis is ensuring enough air. Parenteral antibiotics should be started immediately and should cover *H. influenzae b* and other bacteria. With a timely and appropriate intervention, full recovery is expected.

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ŪMUS VAIKŲ EPIGLOTITAS: DIAGNOSTIKOS IR GYDYMO PATIRTIS LIETUVOJE

Įvadas. Ūmus epiglotitas – reta, bet labai sunki vaikų kvėpavimo takų infekcija. Dažniausias epiglotito sukėlėjas yra *H. influenzae b*. Darbo tikslas buvo nustatyti ūmaus vaikų epiglotito klinikos, gydymo ir baigties ypatumus.

Pacientai ir metodai. Išanalizuotos trisdešimt septynių nuo 6 mėn. iki 11 metų neskiepytų nuo Hib vaikų, kurie buvo gydyti 1990–2004 m. Vilniaus universiteto Vaikų ligoninėje dėl ūmaus epiglotito, ligos istorijos.

Rezultatai. 23 vaikų (62,2 proc.) amžius buvo 2–7 metai. Tik 10 (27 proc.) vaikų į ligoninę buvo nukreipti dėl epiglotito. 29 pacientai (78,4 proc.) į ligoninę kreipėsi pirmąją parą, iš jų net 18 – per pirmąsias 6 valandas. Visi vaikai buvo intoksikuoti ir karščiavo. Inspiracinis dusulys buvo 97,2 proc., disfonija – 97,2 proc., disfagija – 88 proc., seilėtekis – 72 proc., priverstinė kūno padėtis – 86,4 proc. ligonių. Leukocitų skaičius kraujyje svyravo nuo 4,8 iki 39,8 × 10^9/l (vidurkis 17,8 ± 8,8).

Visi vaikai buvo gydyti antibiotikais. Septyni vaikai buvo intubuoti, vienam atlikta tracheostomija. Ankstyvas antibakterinis gydymas sutrumpino karščiavimo trukmę vidutiniškai 1,5 dienos. Visi vaikai pasveiko.

Išvados. Gydytojas turėtų įtarti epiglotitą, jei vaikas intoksikuotas, karščiuoja, jo kūno padėtis yra priverstinė, dūsta, blogai ryja, jam teka seilės, yra pakitęs balsas. Ankstyva diagnostika ir gydymas gali užtikrinti visišką ligonio pasveikimą.

Raktažodžiai: ūmus epiglotitas, vaikai, gydymas, ligos baigtis