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Acute Epiglottitis: Challenge of a Rarely Recognized Emergency

J. D. ANDREW,* M.B., CH.B., M.R.C.P.ED., D.C.H.; O. P. TANDON,† M.B., B.S., D.C.H.

D. C. TURK,‡ D.M., M.R.C.P., M.C.PATH.

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Summary: Acute epiglottitis is a fulminating infection of young children, requiring urgent and specific treatment. Most cases are caused by infection with *Haemophilus influenzae* type b. Only a few cases, nearly all of them fatal, have been reported from Britain, but probably many others go unrecognized. Of four cases seen by us in the past six years three survived, having responded rapidly and completely to treatment. This consisted chiefly of measures to deal with respiratory tract obstruction and parenteral administration of antibiotics. There is need for a widespread awareness of the existence, presenting features, and extreme urgency for treatment of this disease.

Introduction

"Acute epiglottitis is a serious and often fatal condition that, although infrequently recognized, lends itself to accurate bedside diagnosis with consequent institution of specific life-saving therapy. Its recognition and management should become familiar to all concerned with the care of sick children" (Berenberg and Kevy, 1958). This condition was clearly defined and distinguished from laryngotracheitis, diphtheritic or presumptively virus croup, and other acute respiratory tract infections by Sinclair (1941), Alexander, Ellis, and Leidy (1942), Du Bois and Aldrich (1943), Miller (1948), and Rabe (1948) on the basis of their experience in different parts of the U.S.A.; but even in that country as recently as 1958 Berenberg and Kevy had to report that only one of their 42 cases was correctly diagnosed before reaching hospital. The condition occurs mainly in children aged 2 to 7 years, but sometimes also in infants, older children, or even adults.

Characteristically, a previously healthy child develops a sore throat and increasing dyspnoea, and then within a few hours of onset becomes so severely ill that the terms "shock," "prostration," and "collapse" have been used by different authors to

describe the general condition. Examination of the respiratory tract shows pharyngitis and laryngitis with supraglottic oedema, but the pathognomonic feature, which may be missed unless the tongue is depressed or pulled forward, is a swollen red epiglottis that "bears a striking resemblance to a bright red cherry obstructing the pharynx at the base of the tongue" (Berenberg and Kevy, 1958). Urgent tracheostomy or other measures to maintain an airway are usually necessary, and the infection requires prompt and adequate treatment. Chloramphenicol or ampicillin should be used for this, since it is generally accepted that the condition is due to capsulated type b strains of *Haemophilus influenzae*. Even Berenberg and Kevy (1958) and Vetto (1960), who suggested on rather inadequate bacteriological evidence that other bacteria are responsible for some cases, agreed that type b *H. influenzae* is the commonest cause.

The reports mentioned so far all came from the U.S.A. The British literature on this disease is scanty, but there are good reasons for believing that this is a result of its infrequent recognition rather than of its rarity. The boy reported by De Navasquez (1942) as having died in London of "acute laryngitis and septicaemia due to *H. influenzae* type b" was presumably a victim of the condition that we are discussing, though the state of his epiglottis was not mentioned in the report.

No further relevant British papers appeared until Camps and Jones (Camps, 1953; Jones and Camps, 1957; Jones, 1958) described a total of 33 cases of epiglottitis seen by them in a period of 14 years. *H. influenzae* type b was incriminated in all cases in which adequate bacteriological investigation was carried out. Four patients were successfully treated, but the other 29, including the only adult, died. Jones and Camps (1957) described the fact that 26 of their first 29 cases had come to coroners' post-mortem examinations as "a challenge to the general practitioner, the paediatrician, and the laryngologist"; and a further challenge is provided by the fact that these two men who became interested in this condition were able to recognize so many cases in the course of their routine work. But these challenges have not been taken up. A few more deaths from epiglottitis have been reported in this country recently (Johnstone and Lawy, 1967; Gardner, Turk, Aherne, Bird, Holdaway, and Court, 1967; Crome, Erdohazi, and Lawson, 1968), but no more survivors. The experience of Camps

* Children's Department, Bishop Auckland General Hospital, Co. Durham.

† Children's Department, Royal Victoria Infirmary, Newcastle upon Tyne.

‡ Microbiology Department, Medical School and Royal Victoria Infirmary, Newcastle upon Tyne.

and Jones strongly suggests that this disease may well be responsible for a substantial number of unexplained but avoidable deaths of children in Britain.

We have seen four cases of epiglottitis in the past six years, and have been able to confirm that *H. influenzae* type b was responsible for at least two of them. One of these has already been reported (Gardner *et al.*, 1967). The patient, a 21-month-old boy, was moribund before he reached hospital, and the diagnosis of epiglottitis was made only at necropsy. Case summaries for the other three patients are given below. In each case the diagnosis of epiglottitis was made soon after the child reached hospital, and all three responded well to treatment. In no case was there a history of relevant preceding illness affecting the patient or any member of the family.

Case 1

A 5-year-old girl, the older of two daughters of a coal miner, was admitted to the Royal Victoria Infirmary in November 1962. Nine hours earlier she had complained of a sore throat. Later she became drowsy, vomited a little mucoid material, became blue in the face, and was taken to her family doctor's house and then immediately to the hospital. On admission she was dyspnoeic, with pharyngeal gurgling and respiratory stridor. Her epiglottitis was seen to be swollen and red, but the pathognomonic significance of this was not realized at first. She was placed in a humid atmosphere and her throat was sprayed with hydrocortisone. After half an hour the nature of her illness was recognized. At this stage respiratory obstruction suddenly became complete. It was temporarily relieved by insertion of an endotracheal tube. Tracheostomy was performed three-quarters of an hour later. She received intravenous tetracycline and sedatives and was maintained in a humid atmosphere in an oxygen tent, with rapid improvement. The tracheostomy tube was removed after 60 hours. She went home in good health one week after admission.

Her blood picture on admission showed a moderate anaemia and 21,000 polymorphs per cu. mm. No apparently relevant bacteria were isolated from throat and cough swabs. Blood culture was not carried out. Antibody determinations by the method of Turk and Green (1964) showed a rise of antibody titre for *H. influenzae* type b capsular antigen from less than 4 in a serum sample collected from the patient on admission to 256 in one collected seven weeks later, with no change in the titres for the other five types of capsulated *H. influenzae*.

Case 2

Another 5-year-old girl, the youngest of three children of a sales-manager, was admitted to Bishop Auckland General Hospital in November 1967. She had complained of shivering and soreness of the mouth and throat 11 hours earlier, and during the next seven hours had become breathless, restless, and distressed. She was referred to the hospital with a diagnosis of laryngotracheitis. Two hours after admission she was noted to have oedema of the neck and a markedly swollen red epiglottitis, and the diagnosis of epiglottitis was made. As in the previous case, respiratory obstruction suddenly became complete at this stage. It was relieved by using a laryngoscope to displace the epiglottitis forwards, and marked oedema of the larynx could then be seen. Attempts at intubation were unsuccessful, and it was necessary to keep the laryngoscope in place for about two hours. Meanwhile the child was in an oxygen tent with a high humidity level, and received intramuscular streptomycin and chloramphenicol, hydrocortisone, and sedatives. Tracheostomy was considered at first but was made unnecessary by her rapid response to these other measures. Thirty hours after admission she was sitting up and talking but was still hoarse, with some reddening and swelling of the pharynx and epiglottitis, and so she was kept in the humid oxygen tent for a further day. She went home in good health nine days after admission.

Her blood picture on admission showed 25,000 polymorphs per cu. mm. A chest radiograph showed some left lower lobe consolidation. Nose and throat swabs were collected on admission but were then mislaid, and there was an excessive delay before they reached the laboratory; no relevant bacteria were grown. Blood culture was

not carried out. Blood samples for antibody determinations were collected from the patient and both parents four months after her illness; no abnormal levels of antibodies for any of the capsulated *H. influenzae* types were found.

Case 3

A 3-year-old boy, the elder of two sons of a research scientist, was admitted to the Royal Victoria Infirmary in February 1968. Apart from nasal discharge for a few days he had been well until nine hours before admission, when he was noticed to be feverish and restless. Four hours later he was having difficulty in clearing white mucus from his throat and mouth, and after a further two hours he suddenly became dyspnoeic, with stridor. His family doctor was called, diagnosed croup, and immediately arranged his admission to hospital. On admission he was a seriously ill child and was noted to have large congested tonsils, large tender tonsillar lymph nodes, a swollen red epiglottitis, inspiratory stridor, and suprasternal and intercostal recession on inspiration. Epiglottitis was diagnosed. He was placed in a humid oxygen tent and was given ampicillin intramuscularly at once and for the first three days and orally for a further three days. For two hours after his admission it appeared possible that he would need tracheostomy, but from that time he improved rapidly. He was kept in the humid tent for six days, as his epiglottitis was still enlarged and red and his voice was hoarse. He went home in good health nine days after admission, but his epiglottitis was still enlarged 10 days later.

His blood picture on admission showed 21,000 polymorphs per cu. mm. *H. influenzae* type b was grown from nose and throat swabs and from blood culture on admission, from swabs of the epiglottitis throughout his time in hospital and 10 days after his discharge, and from nose and throat swabs three months later. Nose and throat swabs were collected from his parents and brother two days after his admission and also three months later, but no capsulated haemophilus were isolated. Blood collected from the mother two days after his admission had a somewhat raised titre of antibodies for *H. influenzae* type b (32; we regard 16 as the upper limit of normal), but no such antibodies were detected in blood collected from the father at the same time. No blood samples were collected from the two boys.

Virological Investigations

The virological investigations are included by courtesy of Dr. P. S. Gardner. Admission throat swabs and acute and convalescent serum samples from Cases 1 and 3 were examined by the techniques described by Andrew and Gardner (1963) for evidence of virus infection. No such evidence was found. In particular, there was no evidence of infection with respiratory syncytial virus, the other potential pathogen, besides *H. influenzae* type b, which was isolated in the fatal case mentioned above (Gardner *et al.*, 1967).

Discussion

It seems certain that without appropriate treatment each of these three children would have died within 13 hours or less of the first signs of illness, and in each case several of those hours had passed before it became clear that the illness was serious. They survived because their parents were observant and quick to seek help, because their family doctors wasted no time in arranging admission to hospital, and because their illness was recognized and appropriate measures were taken soon after they reached hospital. It is all too easy to see how less fortunate children with this disease could die from unidentified acute respiratory infections; and it is literally of vital importance that family doctors and paediatricians should be aware of the existence, features, and treatment of epiglottitis.

Aetiology

Upper respiratory tract swabs have serious limitations as sources of information for the diagnosis of epiglottitis. Isola-

tion of *H. influenzae* from such specimens is meaningful only if the strain isolated is of type b, since non-capsulated strains are commonly present and may be numerous in the upper respiratory tracts of healthy people, and capsulated strains of types other than b have not been shown to cause epiglottitis (Turk and May, 1967; Turk, 1967). On the other hand, Sinclair (1941), Alexander *et al.* (1942), and others have found that swabs of the nose, of the throat, and even of the surface of the epiglottis itself may fail to yield *H. influenzae* type b in cases in which it is present in the blood—and inside the epiglottis (Jones and Camps, 1957)—and is the undoubted cause of the epiglottitis.

Blood culture before the patient has received any antibiotics is thus the most useful bacteriological investigation. It was carried out in one of our patients (Case 3), with conclusive results, but it happened that in this case the causative role of *H. influenzae* type b was already clear from swab cultures. The serological findings in Case 1 indicate that the same organism was responsible. We have no evidence of the cause in Case 2. The absence of a raised level of antibodies for *H. influenzae* type b in the child's blood four months after her illness does not rule out this organism as the cause. There are other ways of explaining this finding, one of them being that the combination of streptomycin and chloramphenicol eradicated the infecting organism before it had been present long enough to cause an antibody rise.

Incidence

Like haemophilus meningitis, which is the commonest disease caused by *H. influenzae* type b, epiglottitis occurs sporadically and case-to-case spread is rarely demonstrated, though not unknown (Good, Fousek, Grossman, and Boisvert, 1943). But haemophilus meningitis commonly affects the youngest child in a family, and many of its victims are under 1 year old, whereas epiglottitis tends to occur in somewhat older children, as indicated in our small series. However, both conditions may be present in the same child, as in two of Jones and Camps's patients and in a 2-year-old girl who died in Carlisle in December 1967 (personal communication, Dr. F. M. Elderkin). Nasopharyngeal carriage of *H. influenzae* type b or serological evidence of recent carriage are common findings in the families of children with haemophilus meningitis (Good *et al.*, 1943; Turk, 1963 and unpublished findings; Turk and May, 1967), but our limited studies of the families of two of our patients give no clear indication of a similar situation in relation to epiglottitis.

Treatment

Alexander *et al.* (1942) advised tracheotomy before a child with epiglottitis becomes desperately ill, rather than waiting in the hope that this is one of the mild cases that will not need it. However, with modern antibiotic treatment the period of serious illness can be very short, as shown by our patients, and recovery can be almost as dramatically rapid as onset of the disease. A humid atmosphere and temporary mechanical means of keeping a clear airway may be sufficient to carry the patient through the critical period. It has been suggested that laryngoscopy may introduce additional hazards (Jones and Camps, 1957).

Antibiotic treatment of haemophilus infections has been reviewed by Turk and May (1967). The failure of ampicillin to eradicate the haemophilus from the upper respiratory tract of our third patient may well have been due to failure of the antibiotic to penetrate the mucosa once inflammation has subsided, just as it fails to reach the sputum once bronchial inflammation subsides (May and Delves, 1965). The failure of this drug to eradicate an apparently sensitive strain of *H. influenzae* type b from the cerebrospinal fluid of a child with meningitis has recently been reported (Greene, 1968).

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