

Complications of adenotonsillectomy: A case report of meningitis due to dual infection with nontypeable *Haemophilus influenzae* and *Streptococcus pneumoniae*, and a prospective study of the rate of postoperative bacteremia

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Case report Bacterial meningitis is a rare complication of adenotonsillectomy. We present a case of meningitis due to nontypeable *Haemophilus influenzae* and *Streptococcus pneumoniae* after adenotonsillectomy. Pulsed-field gel electrophoresis patterns indicated that the oral cavity was the source of *H. influenzae* and *S. pneumoniae* isolated from the cerebrospinal fluid.

Blood culture study As bacteremia is thought to be one of the etiologies of meningitis, we prospectively investigated the rate of bacteremia as a complication of adenotonsillectomy. Of the 46 patients included in the study, mean age of five years old, 11 (24%) had positive blood cultures during the operation. *H. influenzae* was the commonest organism grown (seven cultures), three of seven produced β -lactamase, followed by *S. pneumoniae* (one culture), *H. parainfluenzae* (one culture), *Peptostreptococcus micros* (one culture), and *Veillonella* spp. (one culture). The bacteria were composed of tonsil or adenoid surface cultures in eight of 11 patients (73%).

Conclusions We present a rare case of meningitis complicating a adenotonsillectomy procedure, in a three years old boy. Meningitis is a rare complication of adenotonsillectomy, but bacteremia which may lead to meningitis occurs frequently, as the results.

Introduction

Adenotonsillectomy is one of the most commonly performed procedures in children who with recurrent tonsillopharyngitis, recurrent otitis media, persistent otitis media with effusion, nasal obstruction, and sleep apnea. The most common associated morbidities are nausea, vomiting, hemorrhage, pain, infection, and dehydration. However, serious infections including meningitis are rarely reported after adenotonsillectomy.

We present a case of meningitis due to dual infection with nontypeable *Haemophilus influenzae* and *Streptococcus pneumoniae*, complicating an adenotonsillectomy procedure in a three-year-old boy. To the best of our knowledge, this is the first case of simultaneous mixed meningitis after adenotonsillectomy.

Bacteremia is considered one of the etiologies of meningitis. Among children with occult bacteremia, meningitis develops in three to six percent who are not treated with antibiotics at the time of initial evaluation¹⁾. We prospectively investigated the rate of bacteremia as a complication of adenotonsillectomy and identified the organisms causing bacteremia.

Case Report

The patient was a three-year-old boy, weighing 16 kg, who underwent adenotonsillectomy for obstructive symptoms with sleep apnea. Adenotonsillectomy was performed under general anesthesia with tracheal intubation. Retropharyngeal injection of lidocaine hydrochloride with epinephrine was used during the procedure. The patient had good anesthesia tolerance and no intraoperative problems. Swab cultures were taken from the resected tonsils and adenoid with sterile cotton.

Postoperatively, the patient was transferred to the otolaryngology ward and received routine treatment with intravenous ampicillin/cloxacillin (74 mg/kg/day every 8 h) starting at 30 min after the operation. That evening he was noted to be lethargic and febrile, and the following day, the fever remained and he vomited in the morning. The wound was clean with little bleeding. Thirty-five hours after the operation, he developed generalized convulsions with loss of consciousness and nuchal rigidity. He was accordingly transferred to the pediatric ward.

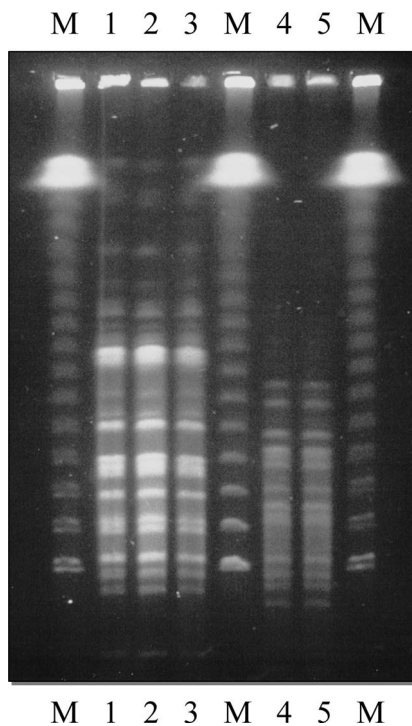
Laboratory tests showed leukocytosis ($16,400/\text{mm}^3$) with neutrophilia (95%) and elevated C-reactive protein 15.2 mg/dL. Examination of the cerebrospinal fluid (CSF) showed a leukocyte concentration of $1700/\mu\text{L}$ with 85% neutrophils, increased protein (557 mg/dL) and undetectable glucose (plasma glucose: 159 mg/dL). Initial Gram stain of the CSF was negative. The CSF culture grew both nontypeable *H. influenzae* and *S. pneumoniae*. The minimum inhibitory concentration (MIC) against *H. influenzae* was $0.25 \mu\text{g/mL}$ for ampicillin (ABPC) and $\leq 0.03 \mu\text{g/mL}$ for

cefotaxime (CTX). The MIC against *S. pneumoniae* was 1.0 µg/mL for penicillin G and 0.25 µg/mL for CTX. Blood cultures grew no organisms. However, cultures of the resected tonsil swab grew *H. influenzae*, *Neisseria* sp., and α -hemolytic streptococci, while cultures of the resected adenoid grew these organisms plus *S. pneumoniae*. Restriction fragment length polymorphism (RFLP) analysis for bacterial isolates using pulsed-field gel electrophoresis (PFGE) was performed as previously reported^{2,3}. *Sma*I restriction enzyme was used for the analysis. PFGE patterns were the same for *H. influenzae* isolated from the CSF, tonsil, and adenoid. They were also the same for *S. pneumoniae* isolated from the CSF and adenoid (Fig. 1).

Immunoglobulin concentrations were as follows: IgG 715 mg/dL, IgA 67 mg/dL, IgM 94 mg/dL, C3 135 mg/dL, C4 29 mg/dL, and CH50 37.2 U/mL. IgG subclass levels were normal. Cytometry of lymphocyte subpopulations in the peripheral blood showed: CD2 67%, CD20 20%, CD4 36%, CD8 18%, CD3 57%, and CD4/CD8 ratio 2.0. Neutrophil phagocytosis function and sterilizing function were normal. Computed tomography showed no evidence of a skull base defect.

The patient was treated with a combination of ceftriaxone (CTRX, 100 mg/kg/day), panipenem/betamipron (120 mg/kg/day), and dexamethasone. After the bacterial pathogens were isolated, antimicrobial therapy was changed to CTRX alone. This led to a significant improvement in the patient's condition and laboratory findings. The child was treated with 10 days of intravenous antibiotics and recovered without hearing loss or neurologic sequelae. He was discharged on the twentieth post-operative day.

Fig. 1. Pulsed-field gel electrophoresis (PFGE) patterns of *Haemophilus influenzae* and *Streptococcus pneumoniae* chromosomal DNA isolated from the patient, digested with *Sma*I restriction enzyme.



1-3: *H. influenzae* isolated from 1) tonsil, 2) adenoid and 3) cerebrospinal fluid.
 4-5: *S. pneumoniae* isolated from 4) adenoid and 5) cerebrospinal fluid.
 Lane M contained a molecular size marker (48.5-kb lambda DNA ladder).
 PFGE patterns of *H. influenzae* isolated from the cerebrospinal fluid, tonsil, and adenoid were identical. PFGE patterns of *S. pneumoniae* from the cerebrospinal fluid and adenoid were also identical.

Material and methods

We performed a prospective study of 46 patients who were undergoing adenotonsillectomy at the department of otolaryngology of Chiba Kaihin Municipal Hospital between November 2001 and December 2002. Their age ranged from two to 13 years with a mean age of five years. None had cardiovascular risk factors. Informed consent was obtained from the parents. The operation was performed under general anesthesia with tracheal intubation, and after induction of anesthesia, retropharyngeal injection of lidocaine hydrochloride with epinephrine was performed. First, the adenoids were excised, and this was followed by tonsillectomy. Blood samples were collected from a peripheral vein when the first tonsil had been removed. Half of the blood sample was inoculated into an aerobic blood culture bottle (BacT/ALERT[®] FA, bioMérieux Inc, USA) and the other half into an anaerobic blood culture bottle (BacT/ALERT[®] FN).

All patients received no antibiotics before the operation and received ampicillin/sulbactam sodium immediately after the samples were taken. Blood samples were incubated within the BacT/ALERT[®] 3D system (bioMérieux) and continuously monitored. Swabs were taken from the resected tonsil and adenoid with sterile cotton. All of the samples were placed in sterile containers and taken to the microbiology laboratory immediately. They were inoculated onto media appropriate for the growth of aerobic and anaerobic bacteria and incubated. Bacteria from the samples were identified by standard laboratory methods, and incubation was terminated after seven days if no growth was found.

Results

Table 1 summarizes the bacteriology results of the positive blood cultures. Bacterial production was observed in eleven of 46 patients (24%). *H. influenzae* was the most common organism grown (seven cultures); three of these seven isolated strains produced β -lactamase. In eight of the eleven patients with positive results (73%), bacteria identified in blood were also grown from ton-

sil or adenoid surface cultures. Of all 46 patients, eighteen had a fever after operation, and four of these had bacteremia. There was no relationship between positive blood culture and fever. No patients developed severe complications and all were discharged without sequelae.

Table 1. Bacteriology of 11 positive blood cultures.

<i>Haemophilus influenzae</i>	7
<i>Haemophilus parainfluenzae</i>	1
<i>Peptostreptococcus micros</i>	1
<i>Streptococcus pneumoniae</i>	1
<i>Veillonella</i> spp.	1

Discussion

A review of the literature identified from a

computerized search revealed 18 reports of meningitis after tonsillectomy or adenoidectomy^{3~19}. Considering the number of these operations performed worldwide, meningitis appears to be a relatively rare complication.

To the best of our knowledge, the present case is the first of simultaneous mixed meningitis after adenotonsillectomy. PFGE indicated that the oral cavity was the source of both *H. influenzae* and *S. pneumoniae* isolated from the CSF. Meningitis developed in this patient despite prophylactic intravenous antibiotic treatment after the operation. It is possible that bacterial dissemination started before the antibiotics were administered, or that the ABPC/cloxacillin given was insufficient for meningitis treatment. This antibiotic treatment could explain why the initial Gram stain of the CSF was negative and the blood cultures failed to grow any bacteria.

Our prospective study demonstrated the high prevalence of bacteremia in patients after adenotonsillectomy; results were similar to those of previous studies of tonsillectomy, which have found bacteremia in 22 to 40% of patients^{20~22}. In the present study, bacteremia was caused by bacteria from the tonsil or adenoid surface in eight of 11 patients (73%). Since the wounds remain open during the operation, adenotonsillectomy may lead to bacteremia as bacteria can spread hematogenously through within tissues and mucous membranes. Further, some have suggested that traction on the tonsil before dissection might facilitate microbial entry²⁰. In any case, the high prevalence of bacteremia associated with tonsillectomy and adenoidectomy may be one of the reasons that meningitis can occur as a complication.

ISAACSON *et al.*¹³), encountered two cases of meningitis after adenoidectomy, and they explored another potential explanation of these unusual complications. Presenting the anatomic network of veins of the nasopharyngeal submucosa and surrounding structures, they hypothesized that retrograde venous flow of bacteria during rapid injection of lidocaine and epinephrine is the most likely mechanism. This route of infection remains controversial, but it is interesting that in the present case, we used injection of vasoconstrictors to decrease bleeding and improve visualization. Hence this might be another explanation for this rare complication.

Meningitis is a rare but life-threatening systemic complication of adenotonsillectomy, and its successful management depends on early clinical suspicion. Hence surgeons should recognize this potential complication, since bacteremia occurs frequently after adenotonsillectomy, and this may lead to meningitis.

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