Primary Diphtheritic Otitis Media and Mastoiditis

G. Revathi Reader, Division of Bacteriology, Dept of Microbiology,
Arun Goyal Senior Lecturer, Dept of Otolaryngology,
UCMS & GTB Hospital, Delhi-95

Abstract

Diphtheritic infection of the ear is very rare. We report here a case of Primary Diphtheritic Otitis Media with a brief review of the literature.

Despite the availability of an excellent immunization agent, a large proportion of the world population is inadequately immunized to the exotoxin of *Corynebacterium diphtheriae*, so that diphtheria continues to be a problem in the under-privileged communities of the world.

In addition to the usual pharyngeal presentation, several atypical forms of diphtheria have been described such as laryngeal, nasal, cutaneous, conjunctival and genital forms. We are herewith describing a case of aural diphtheria which prompted us to review the medical literature on this topic.

Case Report

A 25 year old woman reported to the E. N. T. outpatient department complaining of a discharge from the left ear associated with decreased ability of hearing in the same ear for last 8 months. She denied history of previous episodes of ear infections and rest of the past history was non-contributory. Examination of the left ear, showed copious purulent discharge in the external canal. Cleaning out of the ear canal revealed a posterior marginal perforation of the tympanic membrane. Tenderness was detected on the left mastoid process. Nose, throat and the other ear were normal. The patient was afebrile and the general examination did not reveal anything abnormal. Mastoid exploration was planned and a preoperative ear swab was

sent for bacteriological culture, which gave us a surprise by growing *C. diphtheriae* biotype *mitis* in pure culture. Subsequent to this, swabs for culture were collected from left and right ears, posterior pharyngeal wall and tonsils, both nares and conjunctivae of the patient. The specimen from the left ear grew the same pathogen in pure culture while rest of the specimen did not grow any pathogenic bacteria. Throat cultures from 5 close family members did not yield any pathogenic bacteria.

The patient had begun receiving an antibiotic combination of ampicillin and gentamicin since the day of admission, which was continued without any change after receipt of the culture results. Under general anesthesia, left mastoidectomy with tympanoplasty was performed. Mastoid was found to full of necrotic tissue. Incus was also necrosed. An intra-operative specimen was collected for culture, which grew *C. diphtheriae* biotype *mitis* with the same antibiogram as that of the earlier isolate from the ear swab.

The patient made an uneventful recovery after surgery. Antibiotics were stopped after 2 weeks and the patient was discharged. The patient has remained totally free of problem during follow up and her ear has healed very well.

Microbiology

By standard bacteriological methods like colony morphology, gram staining, Albert's staining,

catalase test, nitrate test and rapid pyrazinamidase test, *C. Diphtheriae* biotype *mitis* was isolated from the ear swab. By stoke's disk diffusion technique the 'isolate' was found susceptible to penicillin, septran, gentamicin, cephalixin, ciprofloxacin and vancomycin and resistant to tetracycline and erythromycin. Toxigenicity testing performed in rabbit on the fourth day of culture isolation gave negative results even after one week of follow up.

Discussion

Diphtheritic otitis media is said to be primary if the following criteria are met with :

1. The middle ear is the site of major pathology.
2. A positive culture for *C. diphtheriae* is obtained from the ear discharge.
3. Nasopharyngeal culture are negative for *C. diphtheriae*.

In contrast to this, in secondary diphtheritic otitis media the ear is involved as a complication of preexisting nasopharyngeal diphtheria and obviously positive cultures are obtained from the ear and nasopharynx. A third variety of diphtheritic otitis media is described where *C. diphtheriae* is a superimposed infection upon an existing otitis media due to the usual respiratory pathogens like, Streptococci, pneumococci or Haemophilus influenzae.

Primary diphtheritic otitis media is thought to be very rare. In a study of 1433 cases of bacteriologically proved diphtheria by Naiditch Bower (1954) primary diphtheritic otitis media was seen in only five patients (.03% of all clinical types of diphtheria).

A detailed description of cases of primary diphtheritic otitis media was given as long back as in 1925 by Drury. Downes (1959) gave an excellent account of the cases of primary diphtheritic otitis media reported in literature till 1959. A total of 23 cases were reported. Many cases of primary diphtheritic otitis media can not be differentiated from suppurative otitis media due to other usual pathogens as a typical diphtheritic membrane can be found in the ear

of only about 25% of cases. Therefore, specific diagnosis is possible only with the help of bacteriological culture of the exudate. Penicillin is the drug of choice but as antibiotics have no antitoxic properties, a clinical evidence of toxicity or a positive toxigenicity test will warrant administration of diphtheria anti-toxin 10,000 to 80,000 units depending on the clinical condition, in addition to parenteral penicillin therapy. Complications of primary diphtheritic otitis media are frequent and include destruction of tympanic membrane and ossicles, invasive infection of the contiguous structures leading to necrosis of the mastoid process temporal bone and labyrinth (Bluestone & Klein 1995).

13 cases of otitis media due to *C. diphtheriae* were among 3916 cases reported to centres for Diseases control of the USA Public health Services between 1959 to 1970 (Brooks et al 1974).

In our case all the criteria of primary diphtheritic otitis media were seen. The nasopharyngeal cultures were negative for *C. diphtheriae* while aural swab gave a positive culture. *C. diphtheriae* as a primary etiology of otitis in this case as also confirmed by its isolation in pure culture from the intraoperative specimen.

It has been shown by several studies that the patients who had primary diphtheritic otitis media due to non-toxicogenic strains also suffered severe pyogenic complications. Toxicogenic and non-toxicogenic strains of *C. diphtheriae* are equally capable of causing primary diphtheritic otitis media leading to an equal proportion of pyogenic complications. Hence, it was not surprising that the strain isolated from our case was non-toxicogenic. Besides, non-toxicogenic strains are well known to cause atypical forms of diphtheria (Dixon & Thorsteinson 1969). In our own experience non-toxicogenic *C. diphtheriae* have been isolated from burn wounds, semen, postoperative wounds and chronic osteomyelitis in addition to the typical cases of pharyngeal diphtheria. Non-toxicogenic strains of *C. diphtheriae* are known to cause sore throat (Jephcott et al 1975), as well as

typical diphtheria itself (Jellard 1972). It was concluded by several workers that the invasive properties of *C diphtheriae* remain independent of toxin production by the strain and toxoid immunization of the host. Proper immunization of the host may protect against the effects of the exo-toxin but the invasive properties of the organism remain intact. Antitoxic immunity affects neither the occurrence nor the severity of illness caused by non-toxicogenic strains (Bennett et al 1975).

In the present case, we did not consider administration of diphtheria anti-toxin since the patient gave a long history of ear discharge and clinically she did not show any toxicity or febrile symptoms. The subsequent toxigenicity test results also obviated the necessity of anti-toxin therapy or isolation of the patient.

The present case emphasises the importance of sending of an ear swab for bacteriological culture in every case of ear discharge.

References

1. Bennett JV, Brooks GF, Feldman RA (1975) : Non-toxicogenic *C. Diphtheriae*. *Journal of Infectious Diseases* , 131 : 497 -501.
2. Bluestone CD, Klein JO (1995) : *Otitis Media in infants and Children* , 2nd edition, WB Saunders company, Pg : 65
3. Brooks GF, Bennett JV, Feldman RA (1974) : *Diphtheria in the United States, 1959-1970*. *Journal of Infectious Diseases*, 129 : 172-179.
4. Dixon JMS, Thorsteinson S (1969) : *Diphtheria bacilli isolated in Alberta in 1967 from throat, nose, ear and skin* . *Canadian medical Association Journal*, 101 : 204.
5. Downes John J (1959) : *Primary diphtheritic otitis media. Review of literature and report of a case*. *Archives of Otolaryngology* , 70 : 27-31.
6. Drury DW (1925) : *Diphtheria of the ear*. *Archives of Otolaryngology*, 1 : 221-230.
7. Jellard CW (1972) : *Diphtheritic infection in North West Canada* *Journal of Hygiene (Cambridge)*, 70 : 503-508.
8. Jephcott AE, Gillespie EH, Davenport C (1975) : *Non-toxicogenic C. diphtheriae in a boarding school*. *Lancet* , 1 : 1026-1031.
9. Naiditch MJ and Bower AG (1954) : *Diphtheria*. *American Journal of Medicine* 17 : 229-245.