CASE REPORT

Sexually transmitted diphtheria

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ABSTRACT

Diphtheria is caused by diphtheria toxin-producing *Corynebacterium* species. While classical respiratory diphtheria is transmitted by droplets, cutaneous diphtheria often results from minor trauma. This report concerns the first case of sexually transmitted diphtheria in a patient with non-gonococcal urethritis after orogenital contact.

Diphtheria and diphtheria-like illness is caused by *Corynebacterium* species harbouring the diphtheria toxin-encoding *tox* gene. Diphtheria is a WHO-notifiable disease and alerts both clinicians and public health authorities. Infections caused by toxigenic *Corynebacterium diphtheriae* are now extremely rare in industrialised countries and are mostly associated with travel or contact with a person from an endemic area such as India, Indonesia, Brazil or the newly independent states of the former Soviet Union.[1] Respiratory diphtheria is usually transmitted by droplets, whereas cutaneous diphtheria often results from minor trauma and frequently shows co-infection with other bacteria such as staphylococci and streptococci. Here, we report the first case of sexually transmitted diphtheria in a patient with non-gonococcal urethritis after orogenital contact.

CASE REPORT

In September 2011, a 40-year-old man attended a urologist with an 8-day history of urethritis presenting with alguria, dysuria and anamnestically with a light yellow discharge. In addition, the presence of a tiny preputial wound was reported. Initial sexually transmitted disease work-up included enzyme immunoassay (EIA) tests (Virion, Würzburg, Germany) for herpes simplex virus (HSV) 1 and 2 yielding positive results (HSV-1 IgG 103 U/ml, HSV- 2 IgG 97 U/ml, HSV-1+2 IgA >500 U/ml), syphilis serology tests suggesting past infection (IgG EIA 165 RE/ml, positive IgG blot; IgM EIA and Venereal Disease Research Laboratory test negative) and *Neisseria gonorrhoeae* and chlamydia PCR with negative results (Roche, Mannheim, Germany). The mycoplasma IST 2 test (bioMérieux, Nürtingen, Germany) yielded positive results for *Mycoplasma hominis* and *Ureaplasma* spp. In addition, HIV testing was offered. Genital vesicular lesions suspicious of herpes genitalis were treated with acyclovir. On a second visit 3 days later, due to his persistent urethritis symptoms a urethral swab for bacterial culture was performed and doxycyclin was prescribed. The swab was inoculated on Columbia III agar, MacConkey agar, Chocolate-GO agar (all Becton Dickinson, Heidelberg, Germany) and on *Gardnerella vaginalis*-selective agar (Heipha, Eppelheim, Germany) resulting in the growth of a mixed culture of *G vaginalis*, *Prevotella* spp., α-haemolytic streptococci and toxigenic *C diphtheriae* biovar *mitis*, which was identified by biochemical differentiation (API Coryne code 1010324) and matrix-assisted laser desorption/ionisation time-of-flight mass spectrometry (MALDI Biotyper; Bruker Daltonics, Bremen, Germany).[2] Toxigenicity was verified by real-time PCR[3] and a modified Elek test. Multilocus sequence typing based on seven housekeeping loci[4] revealed sequence type 212, which is so far found only once in the respective database (http://pubmlst.org/cdiphtheriae/) and to date cannot be found in the published literature.[5] Antimicrobial drug susceptibility testing of the isolate was performed on Mueller–Hinton blood agar (supplemented with 5% sheep blood) by using the Etest system after overnight incubation at 37°C and in 5% carbon dioxide. In the absence of standardised breakpoints for *C diphtheriae*, susceptibility was determined by using the Clinical Laboratory Standards Institute criteria for broth microbouillon dilution susceptibility testing for *Corynebacterium* spp.[6] Antibiosis was switched to oral penicillin. Nasal and pharyngeal swabs taken before penicillin therapy showed no *C diphtheriae*. As the patient's condition was stable at any time without any systemic symptoms and no severe complications were observed, no diphtheria antitoxin was given. No skin swab was taken. The patient recovered quickly. Three urethral control swabs after 10 days of penicillin no longer grew *C diphtheriae*.

As diphtheria is a notifiable disease, further investigations were performed by the local health department. The patient originally came from a high-endemicity region of the former Soviet Union,[1] but lived for a long time in Germany. There was no history of recent travel abroad. The patient reported having had oral sex with a male sex worker 5 days before his symptoms started. Unfortunately, no further details of the sex worker could be obtained. The patient's vaccination status against diphtheria is unknown and he refused further vaccination. As there were no signs of pharyngeal or nasal carriage, isolation of the patient was not initiated. The patient was advised to abstain from unsafe sexual practices until a negative uretheral control swab after completion of a 10-day course of penicillin was obtained.

DISCUSSION

Orogenital sex is an established route of transmission for several classic sexually transmitted

Key messages

- Bacteria from the oral cavity and the respiratory tract can be transmitted by orogenital contact.
- Non-genital pathogens can be associated with non-gonococcal urethritis.
- Toxigenic *C diphtheriae* isolated from unusual non-respiratory sites may result in unusual manifestations of diphtheria-like disease and prompt subsequent public health actions.
- Screening for classic sexually transmitted infections only might miss rare pathogens; especially in atypical or non-responsive cases, general microbiological tests (eg, bacterial culture on blood agar) should be considered.

infections including syphilis, gonorrhoea or chlamydial infections.[7] Besides that, several reports on male urethritis after fellatio, which were caused by facultative oral or respiratory pathogens such as *Streptococcus pneumoniae*,[8] *Neisseria meningitidis*, *Moraxella catarrhalis* and *Haemophilus influenzae* have been published suggesting transmission from the oral to the penile partner.[7]

Importantly, by screening only for gonococci or other sexually transmitted disease-associated bacteria, toxigenic *C diphtheriae* would probably have been missed. The coryneform colonies were first seen on the Columbia III blood agar plate; the large amount of identical greyish colonies prompted species identification by the rapid, reliable and robust matrix-assisted laser desorption/ionisation time-of-flight mass spectrometry method.[2]

To our knowledge, this is the first report of urethritis involving toxigenic *C diphtheriae*. Moreover, the likely transmission by oral sex in our case illustrates a novel and very unusual mode of infection in the old disease diphtheria.

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