

OUTBREAKS OF EPIDEMIC KERATO-CONJUNCTIVITIS IN TWO HOSPITAL WARDS

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SUMMARY

The authors analyzed two hospital outbreaks of epidemic keratoconjunctivitis (EKC), one at the Department of Ophthalmology (30 cases) and another one at the Department of Premature Newborns (22 cases). In both outbreaks, EKC was diagnosed in inpatients (16 and 6 respectively), outpatients (5 and 3 respectively), healthcare workers (HCWs) (3 and 5 respectively), and relatives of EKC patients (6 and 8 respectively). Implemented infection control measures included isolation precautions, improved disinfection and hand-washing of both hospital and outpatient department personnel. Shortly after implementation of control measures the rate of infection transmission started to decrease significantly.

Key words: epidemic keratoconjunctivitis, hospital outbreak, control measures

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INTRODUCTION

Epidemic keratoconjunctivitis, an acute adenoviral infection, was first described in Austria in 1889 (1). It is typically a bilateral infection that appears sporadically or in outbreaks from a common source, which may be besides others due to a visit to the ophthalmologist or swimming pool (2). The most common causative agents of the disease are adenoviral types 8, 19, and 37. Symptoms of the diseases usually include severe and painful conjunctivitis lasting several weeks, followed by corneal infiltration, often impairing vision for months and sometimes years (3). EKC in the community is most common during the summer season. Admission of infected patients into the hospital creates favorable conditions and opportunity for the infection to spread.

Adenoviruses are small, non-envelope viruses that are relatively resistant to various physical and chemical influences, including ether and lipid solvents. They have the ability to survive in dust and dryness. Their inactivation by heat is very slow (4), which demonstrates the need for the proper selection of disinfectants for ophthalmological tools and correct hand-disinfection. Negligence in either area may lead to an epidemic outbreak.

METHODS

The authors performed an epidemiological investigation in order to analyse the causes of epidemic outbreaks, implement control measures and observe the efficacy of these measures. Infection control team was invited when the outbreaks reached epidemic proportions. Diagnosis was established based on clinical symptoms of the disease (e.g. lacrimal swelling, mucoid discharge and conjunctival redness), and confirmed by laboratory identifi-

cation of the causative agent through virus isolation and PCR in conjunctival swab samples.

RESULTS

Two outbreaks of EKC were recorded – one at the Department of Ophthalmology in 1992 and the second at the Department of Premature Newborns in 2002. The most frequent symptoms included conjunctival redness, swelling, foreign-body sensation, pain or discomfort in the eye, photophobia, discharge from the eye, and, in some cases, blurred vision. The first outbreak was caused by adenovirus type 8, which was confirmed by virus isolation and the second one by PCR.

The outbreak in the Ophthalmology Department lasted for 30 days during which 30 individuals were infected – 16 hospitalised patients, 5 outpatients, 3 health-care workers and 6 EKC patient relatives. This outbreak was preceded by a community outbreak of EKC caused by the same type of adenovirus. The epidemiological investigation revealed that the nosocomial spread of infection occurred through contact with tonometry due to inadequate ether disinfection. Infection was transmitted by lenses used for laser therapy of retinopathy at the Outpatient Department of Ophthalmology; infection had subsequently spread back to the community. Contaminated panfundoscopy lenses were used for both inpatients and outpatients. Disinfection of lenses to eliminate resistant adenoviruses was considered inadequate by the infection control team. Use of contaminated eye solutions, ointments and small instruments (e.g. brow scissors) was identified as an additional significant risk factor for infection transmission. Another important issue was inadequate screening and isolation of patients upon their admission to hospital.

During the second outbreak in 2002, which lasted 45 days, 22 individuals were infected – 6 premature newborns, 5 healthcare workers (1 ophthalmologist examining newborns, 4 nurses from Department of Premature Newborns), 3 patients from the Outpatient Department of Ophthalmology and 8 EKC patient relatives. Infection was transmitted from another hospital and was traced to an ophthalmologist from the Eye Care Centre of the Teaching Hospital, where one of the newborns had undergone a retinoscopic examination. Adenoviruses were transmitted via the hands of healthcare workers and instruments for eyelid fixation during the retinoscopy procedure in newborns. Disinfection of these instruments, as well as that of the ophthalmoscope, was inadequate. The importance of hand hygiene was demonstrated by the fact that outpatients treated by the infected ophthalmologist became infected without direct contact with affected newborns.

In the first phase of both outbreaks, hospital patients were infected initially, shortly followed by the infection of healthcare workers and outpatients. In the final stages, intra-family transmissions were observed. Transmission of the virus within the family occurred in 36% of cases in the Department of Premature Newborns and in 20% of cases in the Department of Ophthalmology.

Shortly after implementation of control measures, the rate of infection transmission started to decrease significantly in both outbreaks (Fig. 1, 2).

In both outbreaks, 2% glutaraldehyde was used followed by careful rinse with “aqua pro injectione” as an adequate disinfectant for ophthalmological instruments.

DISCUSSION

Cases of community-acquired EKC were seen in the month before the nosocomial outbreak (3) and should have led to increased vigilance. Observed risk factors were similar to those seen in many other nosocomial outbreaks discussed in the medical literature. These included inadequate disinfection of tonometry (contact and pneumo) (5–7), diagnostic lenses applied directly to the eye (8), and dropper bottles (9), as well as inadequate hand-washing and hand-antiseptis. Inconsistent use of gloves (10), multiple clinical visits (3, 11), and contact with infected physicians (3, 12, 13) were additional risk factors.

Infection control program implemented by the infection control

team resulted in the reduced spread of infection. Based on our experiences and multiple published papers (8, 11–14) we can conclude that the early implementation of control measures is a key element in limiting the spread of adenoviral infections and the number of affected patients. The first control measures should be implemented by the ward personnel before the arrival of the infection control team. Since adenoviruses are rather resistant to ether and lipidic diluents, low pH, and the influence of the external environment (15, 16), another crucial point is the use of adequate virucidal disinfection solutions (3, 4, 16, 17).

All instruments that come into direct contact with mucous membranes are classified by the APICE (Association for Professionals in Infection Control and Epidemiology) as semi-critical items. These items must be free of all microorganisms, with the exception of bacterial spores that may be present in small numbers. Semi-critical items generally require high-level disinfection with glutaraldehyde, stabilized hydrogen peroxide, chloride, and peracetic acid, dependable high-level disinfection solutions. Despite the fact that high-level disinfection with liquid chemical solutions can provide patient-safe devices (4), heat sterilization is the preferred method for processing heat-stable medical instruments, since it provides the widest margin of safety. The Centers for Disease Control and Prevention recommend that the instruments be wiped clean and disinfected for 5 to 10 minutes with 3% hydrogen peroxide, 500 parts per million (ppm) chloride, 70% ethyl alcohol, or 70% isopropyl alcohol. Following disinfection, the devices should be thoroughly rinsed in tap water and dried before use. These disinfectants and exposure times are adequate to eliminate all microorganisms relevant for ophthalmology (4). Guidelines in the Czech Republic recommend use of peracetic acid, 2% glutaraldehyde, or alcohol (17).

As with many types of nosocomial infections, person-to-person transmission of adenoviruses occurs primarily through hands of medical personnel and/or other individuals in direct contact with patients. This demonstrates that hand-washing is the most effective measure for preventing transmission of various kinds of microorganisms. When contact with infected secretions is expected (e.g. in patients with inflamed conjunctivae or during an outbreak of EKC), healthcare personnel should routinely wear fresh gloves and wash their hands after each contact with patient or eye secretions (3, 8, 10, 18).

Thorough hand-washing after all patient contacts, followed

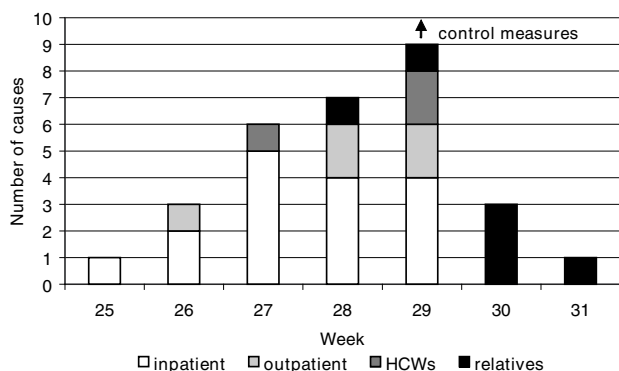


Fig. 1. Onset of signs of EKC in 30 individuals (Department of Ophthalmology).

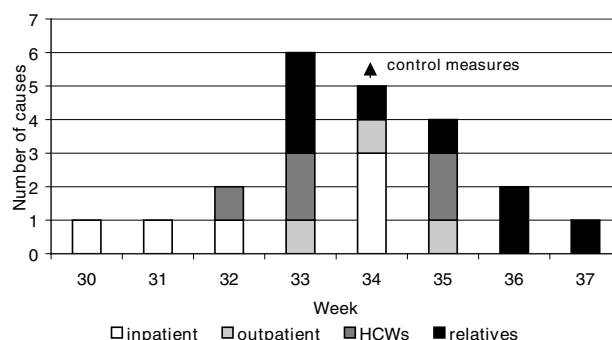


Fig. 2. Onset of signs of EKC in 22 individuals (Department of Premature Newborns).

by application of 3 ml of alcohol-based solution for 30 seconds to the hands appeared to be effective in removing adenoviruses from contaminated fingertips in the two mentioned outbreaks. It is also necessary to abide infection control measures not only in hospital wards but also in outpatient departments.

Instructing patients on how to reduce the risk of secondary transmission at home, such as hand washing, avoiding touching their eyes, and not sharing items such as towels, sunglasses or pillowcases also proved to be an important issue. Intra-family transmission observed in both mentioned outbreaks was comparable to data (22%, 13%, and 20%) published by other authors (19, 20, 21). Parents of children suffering from EKC should also be properly educated in control measures.

Ophthalmologists and nurses with EKC appear to be an important source of transmission of infection to patients and should therefore be furloughed for 14 days.

In conclusion, the authors recommend following control measures in case of nosocomial outbreak of epidemic keratoconjunctivitis:

- screening and isolation of patients,
- disinfection of instruments, including auxiliary instruments (e.g. eyelid speculums, hooks) with virucidal disinfectants capable to inactivate adenoviruses,
- hand-washing and hand-antiseptics of hospital staff and infected patients using virucidal disinfectants,
- strict adherence to barrier nursing precautions,
- furlough of infected staff,
- a plan for triage in hospital and outpatient departments,
- use of single-unitdose eye solutions and ointments,
- informing GPs and outpatient ophthalmologists about the epidemiological situation,
- instructing patients and their relatives,
- instructing healthcare workers.

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