Epidemic keratoconjunctivitis: A review of current concepts in management

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Abstract    Epidemic keratoconjunctivitis (EKC) is an ocular surface infection caused by adenovirus. To date, there are no approved topical antiadenoviral therapeutics to treat EKC. Recent research reveals that treatment with topical corticosteroids for symptomatic relief of EKC enhances adenovirus replication and delays cell shedding from the ocular surface which delays adenovirus elimination. The current management of EKC largely revolves around accurate diagnosis of the condition and implementation of disinfection protocol to prevent its spread. Development of an effective antiviral treatment that addresses inflammation and does not prolong viral shedding would provide significant benefit. The literature reports on a variety of therapeutics that could potentially satisfy this deficiency. Topical ganciclovir and povidone-iodine combination drops have shown the most recent potential, but both therapeutics need to be investigated in larger scale studies. Until an antiadenoviral option is produced, the treatment of EKC should maintain a judicious case by case approach aiming to contain its dissemination and prevent visual consequences.

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Queratoconjuntivitis epidémica: revisión de los conceptos actuales de tratamiento

Resumen    La queratoconjuntivitis epidémica (QCE) consiste en una infección de la superficie ocular causada por adenovirus. Hasta la fecha no existen terapias antiadenovíricas aprobadas para tratar la QCE. Las investigaciones recientes revelan que el tratamiento con corticosteroides tópicos para un alivio sintomático de la QCE aumenta la replicación del adenovirus y retrasa la descamación de células en la superficie ocular, retardando la eliminación del virus. El tratamiento actual de la QCE gira alrededor del diagnóstico preciso sobre la condición clínica y la introducción de un protocolo de desinfección que impida su diseminación. El desarrollo de un tratamiento antivírico eficaz que trate la inflamación y no retraso la eliminación virica supondría un beneficio considerable. La literatura reporta gran variedad de terapias que podrían satisfacer potencialmente esta deficiencia. La aplicación de gotas tópicas con una combinación de ganciclovir y iodina-povidona ha demostrado recientemente su potencial, aunque ambas terapias precisan investigarse mediante estudios a gran escala. Hasta...
Adenoviral EKC

The Specific A

This
The 1,12
The A (see
It
The Frequent
Viral
However,

The

A commonly
stratified
therapeutic

that

with
a clinical
diagnosis
of
infectious
conjunctivitis,

while

various
studies
have

demonstrated
a prevalence
of
between
15% and
70%
of
all
conjunctivitis
worldwide.1,3

More
than
50
different
adenovirus
serotypes
have
been
identified
and
divided
into
six
distinct
subgroups.1,4,5
Specific
adenovirus
serotypes
are

associated
with
different
ocular
infections.1,2

The
most
common
types
of
adenoviral
conjunctivitis
include
EKC, pharyngoconjunctival
fever
and
nonspecific
follicular
conjunctivitis
(simple
adenoviral
conjunctivitis).1,6
EKC
is
commonly
associated
with
adenovirus
serotypes
8, 19
and
37.1,4,6,8
EKC
is
considered
a
more
serious
form
of
adenoviral
keratoconjunctivitis
because
of
the
adverse
consequences

it
may
have

on
visual
acuity.

Due
to
the
epidemic
nature
of
EKC, outbreaks
have

been

studied
in
hospitals
and
health-care
settings.9-11
EKC
may
occur
in
crowded
car
conditions

and
places
where
people

come
into
contact
with
one
another,
such
as

schools
and
medical
practices.1,9
Transmission
of
the

virus
occurs
by
direct
contact
through
ocular
and
respiratory
secretions

or

by

indirect
contact
with
contaminated
instruments

or

solutions.1,9
Viral
particles
have
been
shown
to
be
infectious
on
nonsurgical
surfaces

for

upwards
of
a
month
and

there
is
evidence
that
transmission
may
occur
through
inanimate

vectors,
such
as
door
handles
and
tonometer
heads.1,9

The
dilemma
with
a
virus
such
as
EKC
is

that

patients

who

have
contracted
the
disease
are
asymptomatic
during
the
incubation
period
and
may
inadvertently
spread
the

virus.9
This
is
how

eye
doctors
can

unbeknownst
act
as

vectors
and

contribute
to
the

spread
of
EKC
from

patient
to
patient.9
The

current
literature

demonstrates
that

evidence-based
medicine
has
yet
to
provide
a

sufficient

therapeutic
treatment
for
EKC.
9
The

fact
remains

that

EKC
is
highly
contagious.9,12

Discussion

EKC
is

an
ocular
surface
infection
associated
with
a
marked
inflammatory
reaction,

and
symptoms
of
redness,

irritation,
tearing,
blurry
vision
and
sensitivity
to
light.4
Clinical

signs

include

eyelid
edema,
follicular
conjunctivitis,

conjunctival
dema
and
hyperemia,
epithelial
keratitis
and

often
preauricular
lymphadenopathy.6
The

onset
of
EKC
may
seem
rapid

to
the
patient,

but
in
reality,
there
is
an
incubation
period

of
about
one
week
before
the
clinical

symptoms
present.12
The
second
eye
is
often
affected
days
later
to

a
much
lesser
degree.13
The

period
of
communicability

is

from
late
in
the
incubation

phase
up
to
14
days
after
the

onset
of
the
disease.14
This
acute
phase
of
EKC
is
marked

by
a
severe
conjunctivitis
and
lasts
from
two
to
four
weeks.14

After
the
conjunctivitis
appears,

there
is
a
period
of
viral

shedding
where
the

self-limiting
virus
is
gradually
cleared

from
its
host.12
However,
before
the
virus

is

completely

shed,

the

inflammatory
reaction
of
the
conjunctiva
can

become
so
intense
that
it
results
in
a
subepithelial

membrane

and

potentially

permanent
symblepharon
formation
or
punctal

occlusion.5,12

The

symptoms
and
duration
of
EKC
can

vary
widely;
however,

it

is

distinguished
from
other
adenoviral
infections

when

the

cornea
becomes
affected
by
the
development
of
multifocal
subepithelial
infiltrates
(SEIs)6
(see
Fig.
1).
The

hallmark
of
the

second,
chronic
phase
of
EKC
is
the
corneal

involvement.14
The

patient’s

presentation
of

multifocal
subepithelial

corneal
infiltrates
(SEI)
supports
the
diagnosis
of
EKC,

as
the

presence
of
SEIs
are

considered
pathognomonic
for
the
diagnosis
of
EKC.6
These
infiltrates
are
typically
observed
within
seven
to
days
after
the

onset
of
the

initial
signs
of
infection.6
It
is
possible
for

the

infiltrates
to
persist
for
extended
periods
of
time
ranging
from
months
to
years,
and
their
presence
can
also
cause
reduced
visual
acuity.6,12
A
study
by

Butt
and
Chodosh
found
that
25.9%
of
patients
demonstrated
chronic
corneal
inflammation
with
symptomatic
SEIs
for
more
than
45
days
from
the

first
examination.4

Accurate
diagnosis
of
EKC
upon
presentation
is

essential.1,12
Misdiagnosis
can
lead
to
inaccurate
patient

expectations
for
resolution,
as
well
as
a
lack
of
patient

education
on
appropriate
disinfection
precautions.

Preventing
the

spread
of
EKC
may
be
the

most
proactive
way
of
treating
it.1
This
largely
depends
on
the

eye
care
practitioner
making
the
correct
diagnosis
and
instituting
the

appropriate

treatment
before
the
patient
leaves
the

provider’s
office.1,12
The

patient
should
be
aware
that

EKC
is
easily
transmitted
by
contact
with
an
inert
surface,
such
as
a
doors
handle,
and
to
avoid
rubbing
eyes
and
then

touching
anything.9
Frequent
hand
washing

should
be
implemented
and
infected
patients
should
not
share
towels
or
cosmetics.13
Contact

lens
wearers
should
be
told
to
throw
away
their

disposable
lenses
and
use
a
new

paring

Figure 1 Subepithelial infiltrates associated with EKC.
Table 1  Universal protection control procedures.16

<table>
<thead>
<tr>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Employ proper hand washing technique before and after every patient.</td>
</tr>
<tr>
<td>(2) Use disposable medical gloves as a barrier precaution when in contact</td>
</tr>
<tr>
<td>with any potentially infectious material.</td>
</tr>
<tr>
<td>(3) Use gowns and masks as barrier precautions with the possibility of</td>
</tr>
<tr>
<td>blood splatter, and masks if an airborne pathogen is suspected.</td>
</tr>
<tr>
<td>(4) Protective eyewear is recommended when contaminated fluids or blood</td>
</tr>
<tr>
<td>could splash into the examiner’s eyes.</td>
</tr>
<tr>
<td>(5) Minimize contact with infected tissue through ‘’no touch’’ techniques</td>
</tr>
<tr>
<td>such as finger cots, cotton-tipped applicators or other instrumentation.</td>
</tr>
<tr>
<td>(6) Dispose of sharps instruments in appropriate waste containers.</td>
</tr>
<tr>
<td>(7) Instrument disinfection is necessary for all instruments that come in</td>
</tr>
<tr>
<td>contact with the ocular adnexa, including the cornea and tears.</td>
</tr>
<tr>
<td>(8) Instrument sterilization is necessary for all instruments that come</td>
</tr>
<tr>
<td>into contact with the vascular system.</td>
</tr>
<tr>
<td>(9) Follow contact lens disinfection procedures recommended by the CDC.</td>
</tr>
<tr>
<td>(10) Dispose of infectious waste according to federal, state and local</td>
</tr>
<tr>
<td>guidelines.</td>
</tr>
</tbody>
</table>

only after the infection has cleared.15 The patient should be educated that the contagious period for EKC may last upward of 14 days from when the symptoms began and caution should be exercised if returning to school or work before that time.13 Kaufman recommends that health care providers who contract adeno-viral conjunctivitis spend two weeks isolated from patient care in order to prevent the spread of the disease.12

Due to its highly contagious nature, an outbreak of EKC in a doctor’s office can have a snowball effect, quickly spreading from one patient to the next.12 A proper diagnosis is necessary to implement extra precautions with disinfection procedures and decrease patient morbidity.1,12 Table 1 highlights basic protection control procedures that should be implemented on a regular basis to prevent any disease transmission, including EKC, in the medical provider’s office.16 When available, single-use disposable devices should be employed to assist in the examination of the patient.15 This includes disposable medical gloves, disposable droppers, cotton-tipped applicators and disposable tonometer prism or shields that can all be discarded immediately after use.13 A tonopen with a sterile, disposable tip cover would be a practical tool to use upon presentation of any potentially contagious conjunctivitis patient.15 In the case of suspected or known presence of adenovirus, emphasis can also be placed on proper disinfection of the exam room and any instruments that came into contact with the patient.15 Lakaksis et al. recommend cleaning all large surfaces in an optometric practice with isopropyl alcohol tissues, 30% alcohol solution or sodium hypochlorite solution (obtained with a 1:5 dilution of 5% household bleach).15 With the increasingly common use of electronic health records in today’s practice, it is also recommended to wipe computer keyboards with alcohol each day.15

Figure 2  Removal of pseudomembrane secondary to EKC.

There are no universal guidelines for optometrists in regard to decontamination of ophthalmic instruments.15 The Centers for Disease Control (CDC) has published an extensive document entitled Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008 which describes evidence-based recommendations for cleaning, disinfection and sterilization of medical devices.17 Maximum effectiveness for infection control is dependent on cleaning as the initial step.17 Cleaning is defined as removing all visible organic and inorganic material from an object or surface.17 Instruments that have come in contact with mucous membrane tissue or non-intact skin are classified by the CDC as “semicritical items” which at minimum require high-level disinfection using chemical disinfectants.17 The CDC recommends that tonometer tips are wiped clean and disinfected for 5–10 min with either 3% hydrogen peroxide, 5000 ppm chlorine, 70% ethyl alcohol or 70% isopropyl alcohol, then thoroughly rinsed in tap water and air dried before use.17 The CDC guidelines document recognizes that there is some evidence that 3% hydrogen peroxide and 70% isopropyl alcohol may not be effective against EKC-causing adenovirus.17 In contrast, one study showed that adenovirus 8 is effectively eliminated from tonometer tips with a disinfectant wipe containing isopropyl alcohol, hydrogen peroxide or iodophor.18 The same study also demonstrated that no virus was recovered from Goldmann tonometer tips following a 5-min soak in the same disinfectants that composed the wipes.18 This contradiction may exist secondary to the studies being performed in a controlled laboratory setting and further studies are needed for a clear recommendation.17 The FDA requests the manufacturers of medical devices to include at least one validated cleaning and disinfection or sterilization protocol in labeling of their devices.17 Therefore, it has been suggested to refer to the manufacturer’s recommendations for protocol on disinfection or sterilization of ophthalmic instruments.19 Haag Streit details a step-by-step process for disinfecting tonometer tips on its website and Volk Optical Inc. has a very extensive “Cleaning & Care Guide” on its website that provides cleaning, disinfection and sterilization methods for its various lenses.19,20 The CDC classifies “critical items” as those that confer a high risk for infection such as objects that enter sterile tissue or the vascular system.17 These objects must undergo sterilization which is accomplished with steam, or heat-sensitive objects may be treated with approved chemical sterilants.17 Sterilization is recommended for any instruments that may have come in contact with blood, as is possible with pseudomembrane removal in an EKC patient17 (see Fig. 2). These instruments should be properly cleaned and disinfected first.
then wrapped in peel pouches and sterilized by the eye care provider in office using a tabletop steam autoclave unit.16

The clinical diagnosis of an adenovirus infection is typically made based on the history and presenting signs and symptoms.3 In reality, it may initially be difficult to clinically distinguish some viral conjunctivitis from bacterial conjunctivitis.1,3 The traditional gold standard for diagnosis of EKC or any adenovirus conjunctivitis has been cell culture in combination with immunofluorescence staining (CC-IFA).1,3 Other laboratory diagnostic methods used to identify adenoviral infections include serologic methods, antigen detection and polymerase chain reaction (PCR).1,3 Some consider PCR the new gold standard for diagnosis because it is very specific and has proven to be more sensitive than CC-IFA.1,3 To date these methods are the most accurate way to confirm the cause of conjunctivitis; however, many doctors’ offices lack direct access to diagnostic lab procedures.1 Both the prohibitive cost and time delay in referring a patient out for laboratory diagnostic testing and then waiting to receive the outcome, present a diagnostic challenge to physicians.3 The result of this dilemma is that diagnostic and treatment decisions are made based upon presenting signs and symptoms, along with previous clinical experience.3 Thus, a disease with a presumed etiology may risk being inadvertently mistreated.

There is recognition of the potential benefit of a rapid accurate diagnostic test to help identify patients presenting with adenoviral infection.9 Cheung’s study found that standard viral culture techniques are not satisfactory due to the time it takes for the viral culture swabs to produce a result.9 Rapid diagnosis of infection has improved with non-culture-based techniques.3 Sambursky et al. report the introduction of the Rapid Pathogen Screening (RPS) Adeno Detector which is described as “a rapid point-of-care diagnostic test for the visual, qualitative in vitro detection of adenoviral antigens directly from human eye fluid.”11 Clinical research suggests that a sensitivity of 88% and specificity of 91% in comparison to CC-IFA makes the RPS Adeno Detector useful for in-office detection of adenoviral conjunctivitis.3 The RPS Adeno Detector works with a direct sample and no extraction or dilution step is required.3 A “Point of Care” device such as the RPS Adeno Detector with immediate and easy-to-read results may prove useful in determining proper diagnosis of in-office patients whose cases are not already evident.21

Despite the fact that EKC is a self-limiting disease, most affected individuals seek and receive treatment as a result of the severity of their symptoms.7 The treatment of EKC often includes palliative treatment, such as cool compresses and artificial tears.6 In various instances, EKC treatment has also consisted of topical antibiotics, topical nonsteroidal anti-inflammatory drugs (NSAIDS) and topical corticosteroids.4,6 Supportive therapy is an obvious choice for treatment because there are currently no approved, effective anti-adenoviral therapies.5,7,8 However, one study showed that 36% of eye care practitioners surveyed prescribed topical corticosteroids to treat EKC.12 Most clinicians agree that clinical use of topical corticosteroids is justified in cases of acute EKC where there is the threat of incapacitating visual loss from persistent subepithelial infiltrates, pseudomembranous conjunctivitis and iridocyclitis.4,22-24 Steroids suppress conjunctival and corneal inflammation to provide symptomatic relief, but they do not act to shorten the course of EKC.25

It is important to recognize the risks and indications for proceeding with corticosteroids when treating presumed ocular viral infections. The possibility of misdiagnosing an early presentation of herpes simplex type I, acanthamoeba or fungal infection in combination with use of topical corticosteroids could be detrimental to a patient’s ocular health.13,23 The increased incidence of side effects from long-term use such as cataracts and glaucoma should be considered, but are less likely to be a factor when treating acute disease.23 When corticosteroids are used, they are often reserved until patients present with a pseudomembrane or symptomatic subepithelial infiltrates4,6 (see Table 2). However, there is clinical evidence that this prolongs the duration of SEIs.4 The literature also reports that both long- and short-term use of topical corticosteroids enhances adenovirus replication and prolongs adenovirus shedding.23,25 Researchers have suggested that normal adenovirus clearance is inhibited by the strong anti-inflammatory and anti-immune effects of the corticosteroid.23 Romanowski et al. demonstrated in numerous experimental studies that corticosteroids, ranging from the more potent 1% prednisolone acetate to the less potent 0.12% prednisolone acetate, all increased the duration of viral shedding in varying degrees.13,23 One of these studies found that long-term treatment with 1% prednisolone acetate profoundly altered immune clearance and could potentially increase the risk of transmission and promote the number and extent of community and medical facility epidemics.23 Another concluded that the risk of using a corticosteroid and prolonging an infection must be weighed against the clinical benefit of short-term more limited potency corticosteroids used for symptomatic relief.23 The controversial use of corticosteroids in conjunction with EKC treatment would not need to be a consideration with the development of an anti-inflammatory therapeutic that does not inhibit adenoviral clearance or an effective antiadenoviral agent.

The effects of non-steroidal topical therapeutics on adenovirus conjunctivitis are limited. NSAIDS do
not affect adenovirus clearance but have demonstrated no better relief to patient symptoms from viral conjunctivitis than artificial tears.\textsuperscript{27,28} Cyclosporine was specifically explored for treating symptoms caused by subepithelial infiltrates.\textsuperscript{29,30} Though one study found subjective improvement of local symptoms with 1% cyclosporine eyedrops, as compared to 0.2% cidofovir or a combination of 0.2% cidofovir + 1% cyclosporine; no acceleration in improvement of clinical symptoms was found compared to the natural course of the EKC infection.\textsuperscript{29} Romanowski et al. found that treatment with both 2.0% and 0.5% cyclosporine A in the rabbit model significantly reduced the formation of SEI's.\textsuperscript{30} However, use of topical cyclosporine A increased adenoviral replication, similar to the results reported with corticosteroid use.\textsuperscript{30}

Research has been directed toward the treatment of adenoviral keratoconjunctivitis with antiviral compounds. Ribavirin has been explored in clinical studies and was found to have restricted \textit{in vitro} activity and lack efficacy against the three predominant adenovirus serotypes associated with EKC (Ad8, Ad19 and Ad37).\textsuperscript{7,8} Nucleoside analogues are also known to be active against adenoviral infections and examples of this drug class include cidofovir and ganciclovir.\textsuperscript{31} Success in cidofovir studies using the rabbit model led to clinical trials in the USA to investigate cidofovir against human ocular adenovirus. An early study by Hillenkamp showed no acceleration in improvement of EKC clinical symptoms with 0.2% cidofovir; however the authors speculated that the concentration of cidofovir was too low.\textsuperscript{32} Another study evaluating the efficacy of cidofovir 1% ophthalmic preparation with and without cyclosporine A 1% demonstrated that cidofovir decreases the frequency of severe corneal opacities.\textsuperscript{33} However, its clinical use was deemed limited because the frequent administration was associated with local toxicity.\textsuperscript{33} Cidofovir development has been stopped in the USA secondary to clinical concerns about its toxicity and because of evidence regarding possible emergence of clinical resistance.\textsuperscript{8}

Topical ganciclovir 0.15% ophthalmic gel is now available commercially in the United States. With topical administration, ganciclovir 0.15% ophthalmic gel achieves therapeutic levels in the aqueous and cornea and is a known effective treatment for herpetic epithelial keratitis.\textsuperscript{33} Ganciclovir has been advocated for ‘off-label’ use against EKC because it has shown potential against specific adenovirus serotypes \textit{in vitro}.\textsuperscript{9} A study in Saudi Arabia compared the effects of ganciclovir 0.15% ophthalmic ointment with preservative-free artificial tears for 18 patients with adenovirus keratoconjunctivitis.\textsuperscript{34} The ganciclovir group demonstrated resolution of the conjunctivitis in 7.7 days, as opposed to 18.5 days for the artificial tears patients.\textsuperscript{34} Additionally, only two of the cases treated with ganciclovir developed subepithelial opacities while their presence was detected in seven cases treated with artificial tears.\textsuperscript{34} The authors of this study determined that topical ganciclovir 0.15% ophthalmic ointment is safe and effective for the treatment of adenoviral conjunctivitis.\textsuperscript{34} The effects of ganciclovir on adenoviral keratoconjunctivitis need to be demonstrated on a larger scale as well as show its effectiveness against adenoviral strains seen in other countries.\textsuperscript{12}

Promising results have been noted in the treatment of adenovirus conjunctivitis with povidone-iodine (PVP-I). Clinical practice has seen the use of ocular applications of povidone-iodine in various capacities including pre- and postoperative ocular surgical prophylaxis, prevention of neonatal conjunctivitis and treatment for bacterial conjunctivitis.\textsuperscript{35-37} Povidone-iodine has a broad antimicrobial spectrum \textit{in vitro} and effectively kills bacteria, fungi, viruses and protozoa.\textsuperscript{35,36} A study by Pelletier et al. investigated a topical combination agent that contained 0.4% povidone-iodine as an anti-viral and 0.1% dexamethasone as a potent steroid.\textsuperscript{37} The expectation of the study was to ‘effectively treat both the inflammatory and infectious components of acute adenoviral conjunctivitis by decreasing the symptomatic period following infection, shortening the duration of viral shedding and reducing the potential for infectious transmission.’\textsuperscript{'37} The study followed the clinical course of positive RPS Adeno Detector conjunctivitis while monitoring serial virology markers by quantitative PCR and CC-IFA.\textsuperscript{37} The results demonstrated that all eyes had rapid improvement of conjunctival infection and discharge with a decrease in viral titers at the same time, warranting a need for further study of this combination agent.\textsuperscript{37} The authors of another study confirmed ‘the efficacy of topical dexamethasone 0.1%/povidone-iodine 0.4% (FST-100) in reducing clinical symptoms and infectious viral titers in a rabbit model of adenoviral keratoconjunctivitis.’\textsuperscript{38,39} This study concluded that FST-100 has the potential to become the preferred drug in treating adenoviral conjunctivitis in humans and could be most effective in the treatment of more serious forms of infection, including EKC.\textsuperscript{38} Reports of off-label use of povidone-iodine have also claimed to preserve visual function and reduce viral spread.\textsuperscript{38} One protocol calls for the medical provider to anesthetize the affected eye, instill a pretreatment NSAID, then instill four to five drops of 5% povidone-iodine solution, have the patient roll his or her eyes around for full exposure, swab the lid margins with the solution while the patient waits for approximately 60 s and finally wash the ocular tissue with sterile saline irrigating solution.\textsuperscript{39} Development continues of various compounds that have demonstrated anti-adenoviral activity. The endogenous microbicide agent N-chlorotaurine has shown evidence of antimicrobial activity against EKC and was also well-tolerated with minimal side effects.\textsuperscript{40,41} There is clearly a need for a potent anti-viral drug that addresses patient symptoms, prevents SEI formation and does not interfere with viral clearance.\textsuperscript{30}

### Conclusion

Until an effective antiviral or a better alternative to treat EKC becomes available, clinicians must be cautious in their use of corticosteroids. Eye care providers must carefully consider the risks involved with the use of a corticosteroid for symptomatic relief of EKC and its potential to prolong an infection. The extended period of adenovirus shedding associated with the use of corticosteroids could also enhance the spread of EKC and lead to increased local epidemics. Even with the current limited treatment options for EKC, the fact still remains that intervention is required during the viral replication stage, and patients often do not solicit medical consultation until the inflammatory manifestations interfere with their daily activities. Eye care
providers should be aware that their management decisions in treating adeno-viral conjunctivitis play a very important role in containing epidemics and minimizing patient morbidity. While the search for anti-viral therapy with better efficacy and minimal side-effects continues, the management of EKC will continue to present a clinical dilemma. Accurate diagnosis and prevention of transmission should be stressed as the first line of defense available to contain the dissemination of EKC. The current therapeutic treatment regimen for an EKC patient’s signs and symptoms needs to maintain a judicious case-by-case approach to prevent any visual consequence(s).

Conflicts of interest

The authors have no conflicts of interest to declare.

References