ARCHIVOS DE LA SOCIEDAD ESPAÑOLA DE OFTALMOLOGÍA

www.elsevier.es/oftalmologia

Original article

In vitro antibiotic susceptibility to fluoroquinolones☆,☆☆

C.A. Wong, V. Galvis, A. Tello, D. Villareal, J.J. Rey*

Fundación Oftalmológica de Santander–Clínica Carlos Ardila Lülle (FOSCAL), Universidad Industrial de Santander, Laboratorio Higuera Escalante–Centro de Diagnóstico Ocular OCULAB

ARTICLE INFO

Article history:
Received 4 November 2010
Accepted 21 June 2011
Available online 23 June 2012

Keywords:
Bacterial resistance
Antibiotics
Fluoroquinolones
Moxifloxacin
Gatifloxacin

ABSTRACT

Objective: To determine the antibiotic susceptibility of bacteria recovered from cultures of ocular infections in the Fundación Oftalmológica de Santander–Clínica Carlos Ardila Lulle (FOSCAL).

Materials and methods: Retrospective descriptive study of a series of registries of cultures of samples from ocular surfaces and intraocular fluids from the OCULAB-FOSCAL laboratory in Floridablanca (Colombia) made between January and December of 2007. Antibiotic sensitivity screening by the method of Kirby–Bauer with impregnated Sensi-Discs™ of determined antibiotic concentrations was performed.

Results: A total of 352 samples were studied: 160 from conjunctiva, 150 from cornea and 42 from intraocular fluids. Of the total of the samples more than one microorganism was recovered 45.65% of the samples. Gram-positive and gram-negative bacteria were identified in 78.7 and 18.4%, respectively. Resistance to gatifloxacin, moxifloxacin, ciprofloxacin and levofloxacin was observed in 6.3, 8.9, 33.2 and 35.6%, respectively, of gram-positive bacteria. Resistance to gatifloxacin, moxifloxacin, ciprofloxacin and levofloxacin was also observed in 7.4, 16.7, 16.7% and 25.9%, respectively, of gram-negative bacteria. The overall bacterial resistance (gram-positive and gram-negative) to moxifloxacin was 10.15%, and to gatifloxacin it was 6.46%, being which showed a statistically significant difference ($p < 0.05$).

Conclusions: In our study the development of bacterial resistance to fourth generation fluoroquinolones was demonstrated in ocular samples. However, lower levels of resistance to fourth generation fluoroquinolones compared with that of third and second generation were found, particularly to gram-positive. Gatifloxacin showed lower resistance levels than moxifloxacin. Nevertheless, interpretation of this superiority must be made with caution in the clinical field, since other factors, such as tissue penetration and *in vivo* activity, must be taken into account.

☆ Please cite this article as: Wong CA, et al. Susceptibilidad antibiótica *in vitro* a fluoroquinolonas. Arch Soc Esp Oftalmol. 2012;87:72–8.

☆☆ Presented in part and winner of first place to free labor in the XXXIV National and International Congress of Ophthalmology held in Bogota, Colombia from 10 to 14 August 2010.

* *Corresponding author.*
E-mail address: cwongm@institutowong.com (C.A. Wong).

2173-5794/$ – see front matter

Susceptibilidad antibiótica *in vitro* a fluoroquinolonas

Palabras clave:
Resistencia bacteriana
Antibióticos
Fluoroquinolonas
Moxifloxacino
Gatifloxacino

RESUMEN

Objetivo: Determinar la susceptibilidad antibiótica de la bacterias obtenidas en cultivos de infecciones oculares en la Fundación Oftalmológica de Santander - Clínica Carlos Ardila Lulle (FOSCAL).

Materiales y métodos: Estudio descriptivo retrospectivo de una serie de registros de cultivos de muestras de superficie ocular y líquidos intraoculares del laboratorio OCULAB-FOSCAL en Floridablanca (Colombia) realizados entreenero y diciembre de 2007. Se realizó antibiograma por el método de Kirby-Bauer con sensidiscos impregnados de concentraciones determinadas de antibiótico.

Resultados: Se recogieron un total de 352 muestras de los cuales 160 fueron de conjuntiva, 150 fueron de córnea y 42 de líquidos intraoculares. Se recuperó más de un microorganismo en el 45,65% del total de las muestras. El 78,7 y el 18,4% de las bacterias identificadas correspondieron a Gram positivos y a Gram negativos, respectivamente. El 6,3, 8,9, 33,2 y 35,6% de las bacterias Gram positivas fueron resistentes a gatifloxacino, moxifloxacino, ciprofloxacino y levofloxacino, respectivamente. El 7,4, 16,7, 16,7 y 25,9% de las bacterias Gram negativas fueron resistentes a gatifloxacino, moxifloxacino, ciprofloxacino y levofloxacino, respectivamente. La resistencia bacteriana global (tanto Gram positivos como Gram negativos) a moxifloxacino fue del 10,15% y a gatifloxacino del 6,46%, siendo esta diferencia estadísticamente significativa ($p < 0,05$).

Conclusiones: En nuestro estudio, se evidenció el desarrollo de resistencia bacteriana en muestras oculares incluso con las fluoroquinolonas de cuarta generación. Sin embargo se encontraron menores niveles de resistencia para las fluoroquinolonas de cuarta generación que para las de tercera y segunda generación, especialmente entre Gram positivos. Gatifloxacino mostró menores niveles de resistencia que la moxifloxacino. La interpretación de esta superioridad debe, sin embargo, hacerse con cuidado en el campo clínico, ya que se deben tener en cuenta otros factores como la penetración tisular y la actividad *in vivo*.

Introduction

The introduction of antimicrobial agents was one of the most significant developments in modern medicine, although it was soon found that microorganisms were able to develop resistance to said agents. In order to counteract the development and dissemination of resistant organisms, a rational use of antibiotics has been proposed as well as a call to discover and develop new antimicrobial agents.[1]

The ophthalmologist must confront various types of infections, the most common of which are superficial infections such as conjunctivitis which fortunately do not lead to severe consequences. On the other hand, corneal or posterior segment infections such as endophthalmitis and retinitis can produce severe visual sequels. Endophthalmitis has been associated to severe visual loss in 20% of patients[2] and frequently requires posterior vitrectomy and the application of intravitral antibiotics. Due to the severity of this type of infection, prevention is the most appropriate approach and prophylactic presurgery antibiotic treatments have become the norm.

Fluoroquinolones are bactericide agents frequently used in ophthalmology[3] due to their high effectiveness, broad range and specific activity on gram-negative pathogens. Fluoroquinolones prevent the synthesis of bacterial deoxyribonucleic acid (DNA) due to the inhibition of topoisomerases II and IV.[4,5] According to their activity, they are divided in second generation fluoroquinolones such as ciprofloxacin; third-generation fluoroquinolones such as levofloxacin; and fourth generation such as moxifloxacin and gatifloxacin.[6]

In general, fluoroquinolones are considered to be very good options for treating and preventing various ocular infections.[7–9] This explains their increasing use in ophthalmology.[10] However, improper use of either systemic of topical antibiotics can lead to the appearance of bacterial resistance. In fact, some recent studies suggest that this resistance could be appearing even with fourth generation fluoroquinolones.[11] Accordingly, the aim of this paper is to analyze *in vitro* antibiotic susceptibility of the ocular pathogen flora in ocular infection cultures at the Ophthalmological Foundation of Santander–Carlos Ardila Lulle Clinic (FOSCAL), Floridablanca (Colombia). The collected information could be useful for an empirical selection of antibiotics in addition to providing a true picture of microbial resistance in our environment.

Materials and methods

A descriptive and retrospective study of a series of records of ocular surface sample cultures (corneal or conjunctival) and intraocular liquids of the OCULAB–FOSCAL Lab (Floridablanca-Santander, Colombia), between January and December 2007.