Table 1
Antibiotics suspected of causing allergy symptoms during hospital admission.

Antibiotic(s) involved	Patients with suspected allergy symptoms (*N* = 165)		Patients who received the antibiotic after an allergy had been ruled out (*N* = 46) (%)
	Number of patients	Percentage by antibiotic group (%)	
Penicillins	18	131 (79.4)	44 (33.6)
Penicillins + beta-lactamase inhibitors	56		
Cephalosporins	27		
Meropenem	25		
Aztreonam	5		
Quinolones	32	19.3	2 (6.2)
Aminoglycosides	4	2.4	–
Co-trimoxazole	9	5.4	–
Vancomycin	12	7.2	–
Clindamycin	7	4.2	–

the literature[2] (mainly beta-lactams and skin manifestations), and most patients did not provide previous allergy tests. A detailed medical history, in which the patient is questioned about his/her symptoms, possible concomitant factors and circumstances accompanying the previous event, is fundamental in order to rule out allergic symptoms related to other clinical entities. In many cases, a detailed medical history is sufficient to steer us towards an intolerance or adverse drug reaction, rather than towards allergy symptoms. Recording a false antibiotic allergy in a patient's medical history may lead to the prescription of other more expensive drugs or drugs which are less effective.[3–6] The administration of beta-lactams, the main group of antibiotics involved in suspected allergies in our hospitalised patients, was eventually possible in the majority after they had been reviewed by the allergy department.[7] Likewise, the outpatient study also allowed allergies to be ruled out in a significant number of patients. Possible limitations of this study are its retrospective nature and that, by assessing hospitalised patients, allergies were potentially overestimated because of the patients' specific comorbidities, as well as polymedication due to the risk of drug interactions that this entails.

In conclusion, a detailed medical history of the patient, together with assessment by the allergy department, are fundamental to confirm or rule out allergy to an antibiotic group, allowing, in the majority of cases, its subsequent use and preventing the administration of more expensive and less optimal treatments.

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Corneal infection due to *Moraxella nonliquefaciens*

Infección corneal debida a Moraxella nonliquefaciens

Moraxella spp accounts for approximately 5% of all corneal ulcers[1] and can lead to severe complications. Several investigations have focused on the characteristics of *Moraxella* keratitis[2,3] but until recently, no cases of corneal infections due to *Moraxella nonliquefaciens* have been published in the medical literature. We have reported a case of corneal abscess due to *M. nonliquefaciens*,[4] and after this, we have seen two additional cases of corneal infection due to this pathogen. In this article we describe the main characteristics of these very rare infections.

Case 1. An 85-year-old man refers red eye and intense pain. A corneal ulcer located in the inferior hemicornea with a minor

Table 1
Main characteristics of patients with corneal infection due to *Moraxella nonliquefaciens*.

Case	Age (years)/ sex	Type of infection/ location	Underlying conditions and/or risk factors	Clinical manifestations	Microbiological diagnosis	Identification method	Antimicrobial treatment	Outcome
1	85/Male	Corneal ulcer Inferior	Lagophthalmos (corneal exposure)	Red eye, intense pain, minor epithelial defect, inferior corneal infiltrate	Corneal ulcer culture	Maldi-tof MS	Tobramycin + ciprofloxacin	Cure
2	73/Female	Corneal ulcer Central	Previous blepharo-conjunctivitis	Red eye, pain, central corneal infiltrate, conjunctival hiperemia	Corneal ulcer culture	Maldi-tof MS	Vancomycin + ceftazidime + moxifloxacin	Cure
3[a]	71/Male	Corneal abscess Central	Previous corneal damage	Red eye, loss of vision, corneal edema, central corneal infiltrate	Corneal abscess culture	Maldi-tof MS	Vancomycin + ceftazidime + tobramycin + azythromycin	Cure

[a] Cobo F, et al. JMM Case Reports, 2018.

epithelial defect was detected. Treatment with tobramycin plus ciprofloxacin plus cycloplegic eyedrops was started. Several corneal scrapings were taken, and they were processed for bacterial and fungal culture. No study for viruses was performed. Gram staining exhibited no microorganisms. On the second day of incubation the growth of abundant colonies of a non-hemolytic and both positive catalase and oxidase microorganism was reported in pure culture. A mass spectrometry method (Bruker Biotyper, Billerica, MA) identified the strain as *M. nonliquefaciens* (log score 2.024). The culture in Sabouraud agar was negative after 21 days of incubation. Susceptibility to amoxicillin-clavulanate, cefotaxime, levofloxacin, azithromycin, thrimetroprim-sulphametoxazole was demonstrated. At 3 months of follow-up neither recurrence nor complications were observed.

Case 2. A 73-year-old woman was seen due to red eye and pain. Physical examination revealed conjunctival hiperemia and a central corneal ulcer with a minor infiltrate. Treatment with vancomycin plus ceftazidime plus cycloplegic eyedrops was started. Corneal scrapings were processed in the same way that in the case 1. On the first day of incubation, the growth of abundant colonies of a microorganism of the same characteristics that in the case 1 was reported in pure culture. The mass spectrometry method also identified the strain as *M. nonliquefaciens* (log score 2.144). The culture in Sabouraud agar was negative after 21 days of incubation. Susceptibility was the same that in case 1. Treatment was then modified and moxifloxacin eyedrops plus ciprofloxacin in ointment was started. After 6 months, a corneal re-epithelization was demonstrated and no recurrence was observed.

Ocular infections due to *M. nonliquefaciens* have been rarely described. These, have been classically associated with some predisposing factors such as chronic alcoholism, malnutrition, diabetes mellitus, and poor sanitary habits.[5,6] However, our patients did not have any of these systemic factors, but they had local predisposing diseases such as corneal damage or previous corneal infection (Table 1), like recent investigations found.[3,7,8] The recent scientific evidence has demonstrated that local predisposing factors may be more important that systemic factors for *Moraxella* keratitis.

Clinically, corneal infection due to *Moraxella* spp has been characterized as a central ulceration with deep stromal involvement, hypopyon, and perforation. None of our patients had hypopyon or deep stromal involvement. Some investigations have shown that location of ulcer is variable[2,8] and hypopion is not always present.[7]

The treatment of choice for *M. nonliquefaciens* infections has not yet been established. Moreover, no specific breakpoints have been established for species of *Moraxella* other than *M. catarrhalis*, so we have used these breakpoints for interpretation. In our three patients, different successful treatment regimens were used (Table 1), as well as in other investigations involving *Moraxella* corneal infections.[2,3,7,8] The best outcome seems to be obtained with a multi-drug approach in most cases.[3,7,8]

A study reported good outcome in all patients, except two of them who showed perforation despite aggressive medical and surgical therapy,[8] and tends to recover within 2 weeks in the majority of patients.[3] The patients that had undergone penetrating keratoplasty for corneal perforation had a poor visual outcome.[7] Our patients had a good outcome and a complete re-epithelization was demonstrated.

In conclusion, keratitis caused by *M. nonliquefaciens* is rare and must be suspected in patients with local predisposing factors such as corneal damage or previous corneal infection. Treatment of corneal traumas is very important in order to avoid dissemination of infection into the eye, so prompt and appropriate treatment of these lesions may help to both avoid complications and recover total vision.

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