



Current optometric practices and attitudes in keratoconus patient management



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ABSTRACT

Purpose: To compare the current optometric practices and attitudes in the management of keratoconus patients in the UK and Spain.

Methods: An online survey (adapted to optometric practices) was distributed via a newsletter emailed by various professional organizations in the UK and Spain.

Results: Four hundred and sixty-four practitioners (126 in the UK; 338 in Spain) who prescribed gas permeable GP contact lenses (CLs) more than once per month (54.8% of UK practitioners and 28.1% of practitioners in Spain; $p < 0.01$) responded to the questionnaire. A combination of multiple factors is considered necessary in the keratoconus detection (79.4% in the UK, 75% in Spain; $p = 0.68$), and the use of classification criteria is considered relevant (67.5% in the UK, 70.7% in Spain; $p = 0.49$). There is a high consensus on the consideration that GP CL fitting is more difficult in keratoconus (79.4% in the UK, 80.5% in Spain; $p = 0.79$) requiring more diagnostic lenses (3.2 ± 1.4 and 3.4 ± 1.2 in the UK and Spain, respectively; $p = 0.72$) than are necessary for healthy eyes. Using corneal topography is uncommon from both countries (38.1% in the UK, 59.8% in Spain; $p < 0.01$), with a similar ophthalmologist referral pattern (at initial diagnosis, 50% in both the UK and Spain; $p = 1.00$). Few cases of co-management with ophthalmologists were noted (no co-management reported by 60.3% in the UK and 72.8% in Spain, $p = 0.01$).

Conclusion: This study provides initial observations and evidence regarding keratoconus management by optometrists in the UK and Spain and shows similarity in the professional practices and attitudes of practitioners in these two countries.

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1. Introduction

Keratoconus is a progressive, bilateral and asymmetric corneal disorder characterized by a thinning of the corneal stroma, protrusion of the anterior corneal surface, and an irregular astigmatism [1,2]. Keratoconus commonly appears during puberty, in the second decade of life, and it progresses until the fourth decade of life, at which point it generally stabilizes [1,2]. The estimated prevalence in the general population has been 1 per 2000 [1,2], although a recent study raises this prevalence up to one case per 375 habitants [3].

There are several ocular symptoms and signs of keratoconus that are important in the diagnosis of this disease in a routine eye exam, such as significant loss of visual acuity which cannot be compensated with spectacles, increasing against-the-rule astigmatism, appearance of “scissor” shadows while performing retinoscopy, or presence of biomicroscopy findings (Fleischer's ring, Vogt's striae, corneal scarring or Munson's sign) [1,2]. In addition, corneal topography and tomography are of paramount importance in keratoconus diagnosis [2].

In the very early stages of the disease, spectacles and soft contact lenses (CL) with toric design are adequate to correct myopia and regular astigmatism [4,5]. When keratoconus progresses, rigid gas permeable (GP) CL with specific design to keratoconic eyes are used to improve visual acuity because the tear layer between the CL and the anterior surface of the cornea reduces

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visual distortion and forms a new regular optical surface [4,5], thereby improving patients' visual acuity. Moreover, in a patient with advanced keratoconus or who has failed a trial of GP lenses, other types of CL can be prescribed, as hybrid CL or scleral CL [4,5].

If the condition appears to be undergoing progression, ultraviolet crosslinking (UV-CXL) has been proposed to halt keratoconus progression [2,6]. The aim of the UV-CXL is to increase the corneal rigidity and biomechanical stability of the cornea to stop the progression of keratoconus and save patients' vision [2,6] in early and moderate keratoconus patients (with corneal thicknesses >400 μm younger than 40 years old) [2,6].

Intrastromal corneal ring segments (ICRS) can be indicated when keratoconus patients have unsatisfactory vision with spectacles and/or CL or when continued CL wear is intolerable [2,6]. Finally, corneal transplant is the last option in the management of keratoconus patients [2,6].

Optometrists are primary health care specialists trained to examine the eyes to detect defects in vision, signs of injury, ocular diseases or abnormality and problems with general health, as highlighted by the College of Optometrists in the UK [7] and the Spanish Council of Optometrists following Spanish's regulations [8]. Furthermore optometrists play a paramount role in the early diagnosis and management of keratoconus [2,9], but little is known about the reality of the optometric management of these patients in Europe. In 2015, Hodge et al. [10] analysed the patterns of practice and referral criteria of optometrists in Australia regarding patients with keratoconus. However, there is no reported evidence regarding the attitudes of optometrists involved in the management of keratoconus patients in European countries, such as the United Kingdom (UK) or Spain.

The aim of this study is to survey a large number of optometrists and CL opticians in the UK and Spain to explore their current practices and attitudes regarding the management of keratoconus patients and describe how current practices and attitudes are influenced by infrastructure such as corneal topographers and years of experience.

2. Materials and methods

2.1. Questionnaire design

A questionnaire was specifically designed and adapted to European (UK and Spain) professional practice, based on previous questionnaires used to investigate the practice and attitudes of optometrists in relation to keratoconus patients in other countries [10] to facilitate results comparison. The questionnaire was developed using Google Forms (www.google.com/forms/about/) in English and Spanish languages. Prior to its dissemination, the questionnaire was revised by five different experts (two from the UK and three from Spain) to guarantee that the questions were clear, understandable, and relevant to optometry practice in the UK and Spain. A consensus was reached between the authors and experts.

The questionnaire began with a brief explanation of the purpose of the study and invited optometrists to provide anonymous responses. The questionnaire comprised 17 questions (Appendix A in the Supplementary material): Questions 1 to 8 asked about the general CL practice of respondents. In the remaining 11 questions, practitioners were asked to consider a statement with respect to the management of keratoconus; specifically, the statements related to the detection of the disease, classification of severity, GP CL fittings, patient management and referral practice. The majority of questions were multiple choice, with several options provided for respondents. Just one item (11.c) required an open-ended response (concerning the disease classification that practitioners used in their practice). All collected responses remained

anonymous, and the respondents consented to the use of the data upon completion of the survey.

2.2. Data collection

A link to the online survey was distributed via a newsletter emailed between April and August 2016 to local optometrists by various professional organizations: the General Optical Council, Association of Optometrists (including in the online version of the journal *Optometry Today*) and British Contact Lens Association (via social media) in the UK and The Spanish College of Optometrists in Spain.

2.3. Data analysis

Statistical analysis was performed using the SPSS 15.0 (SPSS, Chicago, IL, USA) statistical package for Windows. Deviations of the variables from a normal distribution were assessed using the Kolmogorov-Smirnov test ($p < 0.05$ indicated that the data were normally distributed). Descriptive data analysis was performed with the mean \pm standard deviation (SD) in continuous variables and/or percentages reported for each question.

Response frequencies were calculated, and the association between practice variables was assessed with a chi-squared test for ordinal categorical data.

Differences in years of experience (question 2) and diagnostic lenses used in GP CL fittings (question 13) between practitioners in the two countries were analysed for statistical significance using Student's *t*-test. *P* values < 0.05 were considered statistically significant.

3. Results

3.1. Demographic information

A total of 464 eye-care practitioners (126 practitioners [115 optometrists and 11 CL opticians] in the UK and 338 Spanish optometrists) responded to the questionnaire. UK practitioners reported a significantly higher number of years of experience (21.5 ± 13.3 years; range from 1 to 48) than did the Spanish optometrists (16.0 ± 9.0 years; range from 1 to 40) ($p < 0.01$).

Only 38.1% of UK respondents had a corneal topographer in their practice; however, the majority of Spanish respondents (59.8%) reported the use of this device in their clinical practice ($p < 0.01$). Of all respondents who reported having a corneal topographer, the most common technology was Placido-based videokeratography (86.4% for UK respondents and 73.6% for Spanish respondents), followed by the mixed (combined Placido-based with Scheimpflug) topographer (6.8% for UK respondents and 13.2% for Spanish respondents), and Scheimpflug topographer (6.8% for UK respondents and 5.1% for Spanish respondents). Finally, 8.1% of Spanish optometrists with a corneal topographer had more than one corneal topographer available.

Additional post-qualification or specific training on cornea and/or CL was by approximately half of the respondents in each country (61.1% for the UK and 50.3% for Spain; $p = 0.04$); however, British practitioners were more likely to be a member of some contact lens association (31.0%) than Spanish optometrists (7.7%) ($p < 0.01$).

3.2. GP CL clinical practice

There was a difference in the rate of prescription of GP lenses between practitioners in the two countries. UK practitioners prescribed more GP lenses (54.8% prescribed GP CL once per month or more) than were prescribed by the Spanish optometrists (28.1%) ($p < 0.01$) (Fig. 1). The main barriers to fitting GP lenses reported by

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