

Keratoconus and Its Prevalence in Macedonia

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Abstract

Aim. This is an epidemiological study which shows the prevalence and demographic distribution of keratoconus, and indicates the risk factors in aetiology of keratoconus in Macedonia.

Material and methods. In this retrospective longitudinal 8 year study, 2.254 patients wearing contact lenses were included, out of which 68 were diagnosed with keratoconus. All newly registered keratoconus cases in the period from October 1996 until April 2004 were included.

Results. The mean age value of keratoconus onset was 26.81 ± 1.25 . In the gender distribution, 52.9% (36) were female, 47.1% (32) were male. Out of 68 patients with keratoconus, 42.6% (29) had secondary education, and 35.2% (24) had university degree. Fifty eight cases (84.8%) were bilateral, 15.2% (10) were unilateral.

Conclusion. The prevalence of keratoconus in Macedonia was 6.8 patients per 100.000 citizens. The age of keratoconus onset in Macedonia was the same as in the British and French studies, and the sex ratio was the same as the in a 48 year clinical and epidemiological study in the USA. The Bilateral disease at the time of diagnosis was with a higher percentage than in other studies. Education and place of living (urban versus rural) did not appear to be a risk factor for keratoconus onset in Macedonia.

Introduction

Keratoconus is a non-inflammatory, progressive disease with high and distorted keratometric values, apical thinning and corneal ectasia. It appears bilaterally in 96% of cases, although asymmetric cases are also possible (1). It typically appears at first in one eye and through further progression in the other eye as well. The greatest risk for progression of the keratoconus and its appearance in the other eye is present in the first 6 years after the diagnosis has been made (2-5).

Keratoconus is usually an isolated (non-syndromic) disease, but it has been associated with the Down syndrome, Leber's congenital amaurosis, Turner's syndrome, prolapse of the mitral valve, collagenoses, retinitis pigmentosa and Marfan's syndrome (6).

The aetiology of the keratoconus is unknown. The primary trigger in the appearance of the keratoconus is also unknown, although several factors have been mentioned: change in the hormonal status, genetic predisposition, alteration of the cytokines and/

or their receptors in the cornea and injuries caused by long term mechanical rubbing of the eye lids (7-9). The most frequent presentation of the keratoconus is that of a sporadic disease, but it has been confirmed that a small number of patients have a positive family anamnesis of an autosomal dominant heritage (10-12).

Keratoconus typically appears between the age of 10 and 20, with a decline of the visual acuity in one eye, due to the progressive astigmatism and myopia. Later on, the astigmatism becomes irregular. The course of keratoconus is variable as the condition progresses and the value of the astigmatism in the other eye increases as well. In the keratoconus diagnosis, curvature assessments in keratoconus keratometry is essential, as well as determining the high keratometric values.

The keratometric classification of the keratoconus (13) according to the keratometric values (KM) of the milder meridian is made in three groups: 1st Group - early stage of keratoconus (KM<48 D); 2nd Group - mid stage of keratoconus (KM=48-54 D); and 3rd Group - late stage of keratoconus (KM>54 D).

The treatment of the keratoconus and other non-inflammatory corneal diseases connected to the corneal thinning can vary from a simple correction with glasses to keratoplastic (14, 15). The contact lenses are one of the best solutions for correcting refractive errors and they should be prescribed as soon as possible in cases with keratoconus, in order to prevent further development of amblyopia. The visual acuity in keratoconus is far better with contact lenses than with glasses (14, 15). The benefit of the rigid toric gaspermeable (RGP) contact lenses in correcting the keratoconus is in achieving better visual acuity than with glasses (16). The most common type of rigid contact lenses which are fitted in keratoconus is the RGP cone contact lenses (17).

The aim of this study was to analyse the prevalence and demographic distribution of keratoconus, and indicates the risk factors in aetiology of keratoconus in Republic of Macedonia.

Material and methods

Investigated group

This is a retrospective longitudinal 8 year study which included 2254 patients wearing contact lenses, registered in the private ophthalmology office, office for contact lenses "Deus" in Skopje, of which 68 patients (105 eyes) were diagnosed with keratoconus. The

study included all the newly registered cases of keratoconus in the period from October 1996 to April 2004. During this period all the patients with keratoconus on the entire territory of Macedonia were examined in 2 offices for contact lenses: one state in the Polyclinic "Bukuresht" and one private –the above mentioned contactologic office "Deus". It is therefore assumed that in that period of 8 years half of the newly registered cases of keratoconus were examined in the private office for contact lenses "Deus" whose contactologic file was used in our retrospective study.

On the territory of the Republic of Macedonia there is no national register of registered patients with keratoconus. In that period there were no other contactologic offices on the territory of the Republic of Macedonia, which register the patients with keratoconus. Therefore, it could be established that the files in this private office for contact lenses present half of the cases with keratoconus on the entire territory of the Republic of Macedonia

Classification of the patients

Based on the contactologic file, questionnaires containing the following data were prepared: age, sex, nationality, place of residence, education, visual acuity achieved with and without correction, computer refractometry with an auto-refractometer, keratometric values K1 and K2 (KM) and a prescription of the definite contact lens (with its parameters BCR, OAD and dioptic strength).

The data were classified based on two criteria. The first classification was made based on the keratometric values of the following groups: 1. Group - early stage of keratoconus (KM<48 D); 2. Group - mid stage of keratoconus (KM =48-54 D); and 3. Group - late stage of keratoconus (KM >54 D). The second classification was made based on the values of the base curve radius (BCR) of the subscribed rigid toric (RGP) contact lenses: 1. Group -BCR > 7.00 mm (KM <48 D); 2. Group -BCR=6.25-7.00 mm (KM=48-54 D); and 3. Group -BCR <6.25 mm (KM>54 D).

Statistical analysis

In the statistic evaluation, the data were divided into series with attributive features and series with numeric features. The percentage of the structure was prepared in the series with attributive features, while the average value and the standard deviation were prepared in the series with numeric features.

The prevalence of a disease among a statistical population is defined as the total number of cases of

the disease among the population at a given time, which would involve the measurement of all individuals affected by the disease within a particular period of time.

Incidence of keratoconus is measurement of the number of new individuals who contract a disease during a particular period of time. Macedonia has a population of 2 million (20 X 100.000 citizens). To calculate the prevalence of the keratoconus in Macedonia, the total number of cases of keratoconus (including both contactological ordinations) is divided by 20.

Results

Demographic data for keratoconus in the Republic of Macedonia are given in Table 1.

Table 1: Demographical data for keratoconus in Macedonia.

Variable	Value
Prevalence	6.8 in 100.000 citizens
Age (Mean \pm SD) of keratoconus onset	26.81 \pm 1.25
Gender distribution	
Males	36 (52.9%)
Females	32 (47.1%)
Education	
High education	24 (35.2%)
Secondary Education	29 (42.6%)
Place of residence	
Urban	37 (54.4%)
Rural	31 (45.5%)
Appearance	
Unilateral	10 (15.6%)
Bilateral	58 (84.4%)

The average age of keratoconus manifestation during first check up was 26.81 \pm 1.25. Regarding gender distribution, 52.9 % (36) were males. Out of a total number of 68 patients, 42.6 % (29) had secondary education while 35.2% (24) had higher education. The place of residence of 54.4 % (37) from the examinees was the city of Skopje, the capital of the Republic of Macedonia, while the other 45.5% (31) resided outside Skopje (urban versus rural environment). Fifty eight cases (84.4%) with keratoconus were bilateral and 15.6 % (10) were unilateral.

A total of 68 patients diagnosed with kerato-

conus (105 eyes) were included in the study. Out of the total of 105 eyes, 11 eyes were corrected with PMMA (hard) contact lenses, 5 eyes with rigid toric (RGP) contact lenses, and the rest of 89 eyes with RGP-cone (rigid toric conic) contact lenses. Only 7 out of 105 eyes showed unsatisfactory visual acuity (<0.5), with an average value of 0.32. The remaining 98 eyes showed satisfactory visual acuity (>0.5) with an average value of 0.85.

Eighty eight percent (88.7%) out of 98 eyes with satisfactory visual acuity (>0.5) reached satisfactory visual acuity due to a correction with an RGP-cone (rigid toric conic) contact lenses. Out of these 98 eyes, only 5 were corrected with an RGP-toric (rigid toric) contact lenses, which had a plan to a minimal spherical dioptric value and this confirms their use in the earlier stadiums of keratoconus.

The number of eyes classified in the first keratometric group (early stage of keratoconus -KM<48 D) was 52.08 % (50), in the second group (mid stage of keratoconus -KM=48-50 D) 36.45 % (35) of the total number of eyes. The third group had the smallest percentage of examined eyes (late stage of keratoconus -KM> 54 D) 11.57 % (20).

The average value of BCR (Base curve radius) by groups was: for the first group (BCR>7.00 mm, KM<48 D) 7.20 \pm 1.25 mm, for the second group (BCR = 6.25-7.00 mm, KM=48-54 D) 6.55 \pm 1.73 mm and for the third group (BCR<6.25 mm, KM> 54 D) 5.90 \pm 1.64 mm.

The average value of the OAD (Overall diameter) by groups was: for the first group 9.28 \pm 1.21 mm, for the second group 8.96 \pm 1.12 mm and for the third group 7.42 \pm 1.55 mm.

The average value of the visual acuity on distances without correction and with subscribed RGP contact lenses (with correction), by groups was: for the first group VOD: 0.12 sc. 0.76 cc VOS: 0.23 sc 0.81 cc, for the second group VOD: 0.14 sc. 0.72 cc VOS: 0.21 sc. 0.75 cc and for the third group VOD: 0.13 sc. 0.67 cc. VOS: 0.14 sc. 0.62 cc.

Out of 68 patients with keratoconus, Hydrops corneae condition was registered with only one patient at the age of 26, with initial keratoconus detection at the age of 19, and progression period of 7 years.

Discussion

The prevalence of keratoconus in Macedonia was 6.8 patients per 100.000 citizens, a result that is

higher than the prevalence of keratoconus in the Ural (1 patient per 500.000) (18) closest to the mentioned, but smaller compared to the prevalence in the US (54.5 patients per 100.000) and Denmark (86 patients per 100.000) (19, 20). The prevalence of keratoconus in the US varies also according to the results of Kennedy JH, 1986 (20), its yearly incidence is 2 per 100.000, and the prevalence 54.5 per 100.000 citizens.

One hundred seventy two (172) patients with keratoconus can be expected in Macedonia. In the course of 8 years, 2.1% of all the contactual patients in Macedonia showed presence of keratoconus. The results obtained were lower compared to the one yearlong British study with a higher number of diagnosed keratoconus (21), where 16.4% of all contactological patients showed presence of keratoconus.

The average age of keratoconus manifestation in Macedonia (26.81 ± 1.25 year) was approximately the same as the values obtained in the Finish and French studies (22, 23), higher compared to the Arab and Indian population (24, 25) and lower compared to the prospective Scottish study (30.9 ± 10.4 years) (12). The seven year prospective longitudinal multi-centric American study (CLEK) showed a significantly higher average age at the first examination with diagnosed keratoconus (40.2 ± 11.0 years) (26).

Concerning the gender distribution, as opposite to the more frequent appearance in females among the Arab population (24), and the more frequent appearance in males among the British and Scottish population (12, 21), our study showed a percentage representation of females almost identical to the American study (CLEK) (44.4 % female) (26). The Finish study showed that there is no difference in gender distribution regarding keratoconus (22).

The bilateral appearance at the moment of diagnosis of keratoconus was 84.4% and it was similar to the values obtained with the Scottish study (88.5 %) (12) but higher compared to the values in the American study (59%) (20).

All the examinees in our group belonged to the Caucasian population. The obtained values from the examinees specimen on the territory of Macedonia showed that the androgen hormonal status can not be considered as a risk factor for the appearance of keratoconus regarding the gender distribution.

The rigid contact lenses (RGP-cone), compared to the PMMA (hard) and RGP-toric (rigid toric), represent contact lenses of choice for keratoconus

correction. The percentage of patients that have achieved satisfactory sight sharpness (>0.5) as well as the most common and most efficient correction with an RGP-cone, was confirmed with the British study as well (21).

In summary, the prevalence of keratoconus in Macedonia was 6.8 patients per 100.000 citizens. Gender, education and place of residence (urban versus rural environment) are excluded as risk factors for the appearance of keratoconus in Macedonia.

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