# The Psychometric Quality of Life Impact of Keratoconus Treatment with the Athens Protocol: A long-term Study. ARVO 2016

John Datseris, MD[1], George Asimellis, PhD [1], A. John Kanellopoulos, MD [1-2]
1: Laservision.gr Eye Institute, Athens, Greece 2: NYU Langone Medical School, New York, NY

## Introduction

Keratoconus (KCN) is considered an unpredictably progressive eye disease that 'softens' the cornea. The resulting corneal thinning and 'bulging' may distort or even significantly reduce vision.

Visual rehabilitation of keratoconus has been traditionally managed with spectacle correction and/or soft contact lenses, until irregular astigmatism necessitated application of Rigid Gas Permeable (RGB) contact lenses. In cases of RGP intolerance (estimated up to 21% of cases[]), or in advancing keratectasia progression, a penetrating keratoplasty, in which the patient's cornea is discarded and replaced with a fresh donor cornea was employed.[] This procedure is associated with significant morbidity[-]. It is noted that, despite the use of this drastic procedure, visual rehabilitation may still necessitate additional refractive procedures[] in order to reduce the very common irregular astigmatism[-] and high postoperative anisometropia associated with penetrating keratoplasty.[9] Even in cases where PK generally achieved acceptable visual outcomes, long-term graft survival declined rapidly after the second decade because the endothelial cells of the donor cornea tend to be gradually rejected by the host. Primary graft survival rates have been reported to 50% at 20 years,[-] falling even further with repeat grafts.

Over the last decade collagen cross-linking (CXL), has been proven that it can effectively arrest the progression of keratectasia. In this treatment, vitamin B2 and ultraviolet light (UV-A) are applied to the cornea in a short procedure that 'stiffens' the cornea and stops disease progression.[-] To further improve the topographic and refractive outcomes, CXL can be combined with customized excimer laser anterior-surface normalization.[-] The combination of surface ablation with CXL may hold promise for far wider applications beyond the originally-envisioned keratectasia arrest. In keratoconic eyes, CXL combined with excimer-laser partial photorefractive keratectomy may offer improved visual rehabilitation, in addition to biomechanical strengthening. The procedure known today as the Athens Protocol[-] has evolved to include sequentially, same-session, excimer-laser epithelial debridement (50 μm), partial topography-guided excimer-laser stromal ablation, and high-fluence UVA irradiation (6 mW/cm²), accelerated (15΄) CXL. Early results,[] as well as anterior-segment optical coherence tomography quantitative findings [] are indicative of the long-term stability of this combined procedure. Clinical outcomes analysis over a large case sample and long follow-up time indicate post-operative efficacy.[]

Considering both the importance of Health-Related Quality of Life (HR-QoL) and the contribution of modern medicine therapeutic methods concerning surgical visual rehabilitation, the purpose of this research is to assess the HR-QoL before and after the management of keratectasia with the Athens Protocol.

## Materials and Methods

34 patients (age 15 to 51 years, 25 male, 09 female) treated for progressive keratoconus were randomly selected for retrospective telephone interview and individual questionnaire submission. A disease-specific health-related quality of life (HRQoL) questionnaire was administered before and after the Athens Protocol intervention. The administrative questionnaires NEI VFQ 25/39 and IVI-28 were applied. Reliability of collected data was evaluated with Cronbach's Alpha test.

## Results

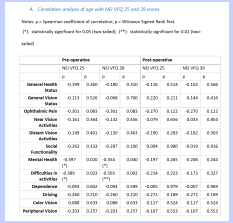
Patient age was 15 to 51 years at the time of the operation. Mean time past the operation during which the questionnaires were administered was 45±22 months. General visual acuity, psychological well - being and driving facility showed significant improvement. Younger keratoconic patients tend to have more enhanced psychology and to cope better with difficulties in everyday activities (pre op) than older patients

## Discussion

The concept of quality of life (QoL), although it has become under research interest recently, is not new. Aristotle was among the first who defined various such concepts, and linked with the values of life, prosperity and the ability of human beings to achieve a level of 'good life'. QoL research interest in social sciences and psychology re-emerged in the 1940s. With the economic boom that followed the war and the progress of medicine in the 1960s, the concept of prosperity and need for more quality of life and not just an extension of the life cycle emerged.[]

QoL today may be defined as a multi-dimensional assessment of the current living conditions of the individual within the culture and value framework in which he/she lives.[] QoL is a set of general well-being that combines the objective indicators and subjective assessments of natural, physical, social and emotional well-being simultaneously with the extent of personal growth and meaningful activities.[]

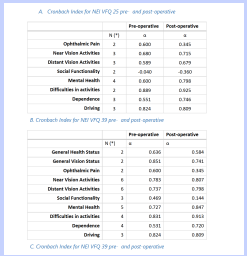
Health-related quality of life (HR-QoL) is the difference between patient expectations and the existing state of their health, which may undergo changes, in line with the progression of their disease.[] States often consider HR-QoL data for the decisions for the allocation of limited financial resources for health.[] HR-QoL is evaluated from data derived mainly from weighted questionnaires. The questions may have only one answer or a certain range and may involve either one or more aspects of health status (multidimensional).[]



A. Correlation analysis of age with NEI VFQ 25 and 39 scores

Notes: ρ = Spearman coefficient of correlation; p = Wilcoxon Signed Rank Test.
(*): statistically significant for 0.05 (two tailed). (**): statistically significant for 0.01 (two-tailed)

| | Pre-operative | | Post-operative | |
|---|---|---|---|---|
| | NEI VFQ 25 | NEI VFQ 39 | NEI VFQ 25 | NEI VFQ 39 |
| | ρ p | ρ p | ρ p | ρ p |
| General Health Status | -0.199 0.260 | -0.180 0.310 | -0.136 0.514 | -0.102 0.566 |
| General Vision Status | -0.113 0.526 | -0.068 0.700 | 0.220 0.211 | 0.144 0.416 |
| Ophthalmic Pain | -0.301 0.083 | -0.301 0.083 | -0.270 0.122 | -0.270 0.122 |
| Near Vision Activities | -0.361 0.364 | -0.132 0.456 | 0.079 0.656 | 0.033 0.854 |
| Distant Vision Activities | -0.149 0.401 | -0.130 0.445 | -0.190 0.285 | -0.182 0.305 |
| Social Functionality | -0.262 0.133 | -0.287 0.100 | 0.084 0.080 | -0.020 0.916 |
| Mental Health | -0.397 (*) 0.020 | -0.356 (*) 0.040 | -0.197 0.265 | -0.206 0.244 |
| Difficulties in activities | -0.389 (*) 0.023 | -0.503 (**) 0.002 | -0.254 0.223 | -0.173 0.327 |
| Dependence | -0.093 0.602 | -0.094 0.599 | -0.085 0.979 | -0.007 0.969 |
| Driving | -0.260 0.210 | -0.260 0.210 | -0.272 0.189 | -0.272 0.189 |
| Color Vision | -0.098 0.619 | -0.098 0.493 | 0.127 0.524 | 0.127 0.524 |
| Peripheral Vision | -0.203 0.257 | -0.203 0.257 | -0.187 0.553 | -0.187 0.553 |



A. Cronbach Index for NEI VFQ 25 pre - and post-operative

| | N (*) | Pre-operative α | Post-operative α |
|---|---|---|---|
| Ophthalmic Pain | 2 | 0.600 | 0.845 |
| Near Vision Activities | 3 | 0.680 | 0.735 |
| Distant Vision Activities | 5 | 0.589 | 0.679 |
| Social Functionality | 2 | -0.040 | -0.390 |
| Mental Health | 4 | 0.600 | 0.786 |
| Difficulties in activities | 2 | 0.889 | 0.605 |
| Dependence | 3 | 0.551 | 0.786 |
| Driving | 3 | 0.824 | 0.889 |

B. Cronbach Index for NEI VFQ 39 pre - and post-operative

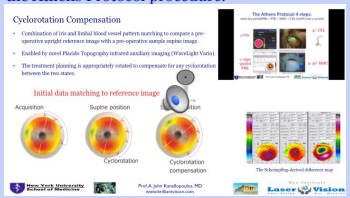
| | N (*) | Pre-operative α | Post-operative α |
|---|---|---|---|
| General Health Status | 2 | 0.636 | 0.594 |
| General Vision Status | 2 | 0.851 | 0.741 |
| Ophthalmic Pain | 2 | 0.600 | 0.845 |
| Near Vision Activities | 6 | 0.783 | 0.807 |
| Distant Vision Activities | 6 | 0.737 | 0.789 |
| Social Functionality | 3 | 0.469 | 0.144 |
| Mental Health | 5 | 0.727 | 0.847 |
| Difficulties in activities | 4 | 0.831 | 0.953 |
| Dependence | 4 | 0.531 | 0.720 |
| Driving | 3 | 0.824 | 0.889 |

C. Cronbach Index for NEI VFQ 39 pre - and post-operative

Individual questionnaire completion can be achieved by post, phone interview, electronically or by presenting the questionnaire directly to the respondent.[] The postage-mail method of has minimum costs, can cover large geographical areas and gives enough time for completion, however, has the lowest responsiveness compared to other methods.[] The electronic individual filling (interview via computer) has the benefits of objectivity, access to a large population and the automated flow of questions. However, it requires some degree of computer literacy, and of course internet access. HR-QoL evaluation questionnaires must satisfy certain criteria in order to provide clinically useful results. These include validity (content, criterion, construct), reliability, sensitivity, and responsiveness.[]

There is no specifically-developed questionnaire for keratoconus.[] The NEI VFQ questionnaire was developed for the evaluation of QoL in relation to vision diseases such as age-related macular degeneration. Similar results were obtained from the Collaborative Longitudinal Evaluation of Keratoconus (CLEK) study.[]

The IVI questionnaire is associated with the impact of vision deterioration of, which been utilized by other research groups on Keratoconus. There have been two other published articles in the peer-review literature on the subject matter of the impact of keratoconus in quality of life: Gothwal et.al. employed the IVI questionnaire for the assessment of KCN only;[] Labiris et.al. employed the VFQ questionnaire for the assessment of KCN and a combined laser-CXL treatment.[] The present study extends on this topic by evaluating the self-reported improvement following an 'accelerated' CXL management by the Athens Protocol procedure.




The results of the study, derived from non-parametric tests, indicate a clear improvement in QoL following the Athens Protocol procedure. In NEI VFQ 25/39 all scores show remarkable improvement, other than those of general health and color vision, which do not affect the QoL in patients with Keratoconus. The scores of the General vision, mental health and driving showed the greatest improvement, but the scores of Distant and Near Vision Activities, the difficulties of the activity and the Ophthalmic Pain also showed measureable improvement. The importance of mental health is confirmed by the results of the IVI-28 questionnaire, in which the score of emotional Wellness presents the biggest improvements, as compared with the level of mobility and independence and the scores of reading and Reading and Information Awareness, respectively. The VFQ 25/39results appear to be influenced by age.

Younger age patients tend to be more positive about their state mental health and difficulties in their activities prior to the operation. Though there are no similar findings in the literature, this attitude can be attributed to the stage of the disease, which is usually early or mild compared to older age patients. Also, as implied by the investigation, the resulting difference between the postoperative and preoperative status of the patient on the scale of Difficulty activities and scale of social functionality of NEI VFQ 39 is partly due to age.

The higher the age of respondents, the greater the resulting score difference, perhaps due to the stage of the disease depending on the preoperative satisfactory improvement after the operation. However it should again be noted that due to the originality of research, there are no such references, and therefore this specific hypothesis is based on individual clinical data.

## Conclusions

The findings of this study indicate a clear subjectively-assessed improvement in quality of life in keratoconic patients subjected to the Athens Protocol procedure. The results demonstrated significant improvements in quality of life related to the general vision, the distant and near vision, driving, and especially the mental health and emotional well-being of patients. The IVI-28 questionnaire proved reliable for the purposes of this research, although reliability issues arose mainly in social functioning score of NEI VFQ.



New York University School of Medicine

Prof.A. John Kanellopoulos, MD
www.brilliantvision.com

Clinical & Research Eye Institute
Laser Vision
Athens - Greece