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Abstract Book

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Keratoconus- Clinical Applications

Application of Raw Tomography Data to Individualize Patient Progression Analysis

Authors

Rishabh Singh[1], Karen Chen[1], Brian Perez[1], Leejee Suh[1]

Affiliation

[1]Columbia University Irving Medical Center, United States

Abstract

Purpose: Corneal tomography devices collect thousands of points of raw data to generate clinical reports. We apply this underutilized data modality to

1.) Identify localized changes in corneal morphology and

2.) Create individualized patient visualizations to monitor longitudinal changes.

Methods: Pachymetry, anterior/posterior elevation, densitometry, and curvature parameters were extracted for 84 eyes that underwent crosslinking between January 2020 and July 2025. We developed a data processing pipeline to extract a central 3 mm radius of raw data (2809 points), perform binning into 48 concentric sectors, and visualize localized changes by sector for each patient. OphthoACR, a previously validated GPT-4-based platform to automate chart review from unstructured clinical data, extracted visual acuity (VA) by visit date. Pre-CXL parameters (mean and by sector) and VA were compared with post-CXL outcomes at 1, 6, and 12 months.

Results: At 1-month post-CXL, we identified significant increases in mean and localized densitometry (+6.17 GSU), anterior elevation (+2.19 μm), posterior elevation (+7.63 μm), as well as decreases in curvature (-0.10 mm) and pachymetry (-13.22 μm). The average VA had decreased by 0.064 logMAR units. By 12 months, while mean parameters (excluding pachymetry) had normalized, significant localized changes were present in central densitometry (+2.87 GSU), inferocentral anterior elevation (-2.23 μm), and inferior curvature (+0.06 μm). Average VA improved by 0.156 logMAR units.

Conclusions: Raw tomographic data enable the identification of localized changes to corneal structure. Integration of this modality into AI data processing platforms like OphthoACR can further enhance clinical workflows to simultaneously contextualize anatomic changes with clinical endpoints.

Biography: Rishabh Singh

Rishabh Singh is a PGY-3 ophthalmology resident at Columbia University Medical Center. He studied biomedical engineering at Cornell and started his career at a biotechnology startup before heading to medical school at Boston University. He applies his engineering background & passion for technology to impact clinical care in the field of ophthalmology.

Automated triage for new keratoconus referrals using multi-modal deep learning

Authors

Marcello Leucci[1], Shafi Balal[1], Daniel Gore[1], Nikolas Pontikos[1], Bruce Allan[1]

Affiliation

[1]Moorfields Eye Hospital, United Kingdom

Abstract

Purpose: We developed and validated deep learning models to predict keratoconus progression risk using multi-modal imaging and clinical data, enabling risk-stratified patient monitoring.

Methods: We analysed 7,396 eyes of 3,893 patients (internal dataset) and 963 eyes of 519 patients (external validation dataset) with keratoconus who underwent MS-39 (CSO Italia, Florence, Italy) AS-OCT and Placido topography between October 2020 and June 2024. We defined progression using the global consensus criteria requiring changes in multiple parameters above device-specific precision limits. We compared conventional machine learning, unimodal deep learning, and multi-modal fusion architectures to predict two-year progression risk from baseline data. We developed recurrent neural networks to incorporate data from sequential clinic visits. We assessed clinical utility through simulated risk-stratified triage pathways in an external validation cohort. We measured ROC-AUC, sensitivity, specificity, and predictive values for two-year keratoconus progression prediction.

Results: The multi-modal intermediate fusion model combining AS-OCT, Placido images, and tabular data achieved the highest baseline performance (AUROC = 0.84, 95% CI: 0.83-0.85). Sequential visit models using LSTM architecture substantially improved predictive accuracy (AUROC = 0.93, 95% CI: 0.91-0.96). 58% of patients could be classified as low risk (90% chance of correctly predicting no progression in two years) after their baseline clinic visit, rising to 83% with inclusion of data from a second clinic visit.

Conclusions: AI models can be used to develop risk-stratified pathways for monitoring keratoconus, reducing unnecessary follow-up for patients at low risk of progression,

whilst ensuring optimal resource allocation and timely intervention for those at high risk.

Biography: Marcello Leucci

Dr. Marcello Leucci is the Lead Optometrist of the Keratoconus Service at Moorfields Eye Hospital NHS Foundation Trust in London, United Kingdom.

He is responsible for the development of clinical protocols for keratoconus monitoring and progression criteria, and he plays an active role in research and innovation in corneal ectatic disorders and imaging technologies.

In addition to his specialist optometry practice, Dr. Leucci serves as Clinical Director for Digital Safety at Moorfields, bridging the fields of optometry, corneal disease management, and health-technology integration.

Corneal Tissue Addition Keratoplasty (CTAK) in Keratoconus: Refractive and Topographic Outcomes

Authors

Karanpreet Multani[1], Kamran Riaz[1]

Affiliations

[1]Dean McGee Eye Institute, Oklahoma City, United States

Abstract

Purpose: To evaluate visual, refractive, and topographic outcomes of corneal tissue addition keratoplasty (CTAK) in patients with keratoconus and post-surgical ectasia.

Methods: Retrospective review of CTAK cases at a tertiary center. Collected demographics, Pentacam topography, visual acuity, and refraction. Primary outcomes included changes in flat K, steep K, Kmax, UCVA, BCVA, and SE. Postoperative values at 1 day, 1 week, 1 month, and ≥3 months were compared with baseline.

Results: 19 eyes (mean age 36.3) were analyzed. At latest follow-up, mean flat K, steep K, and Kmax decreased by 3.75 D, 3.94 D, and 3.82 D, respectively. Astigmatism decreased 0.20 D. UCVA improved to 20/125, BCVA to 20/60, and SE to –0.47 D from –3.3 D.

Conclusions: Our findings demonstrate that CTAK produces notable improvements in corneal shape and functional vision. These results support CTAK as a reliable therapeutic option for patients with keratoconus and post-surgical ectasia.

Biography: Karanpreet Multani

Karanpreet Multani, MD, is a Pre-Residency Research Fellow in Ophthalmology at the Dean McGee Eye Institute in Oklahoma City. He received his Doctor of Medicine from the University of Oklahoma College of Medicine and completed his undergraduate studies in Biomedical Sciences at the University of Oklahoma.

He has contributed to multiple publications as both first and co-author in areas including anterior segment surgery, intraocular lens outcomes, and community-based vision screening. His current research focuses on surgical outcomes in keratoconus, innovations in cataract surgery, and the application of artificial intelligence in ophthalmic education and diagnostics.

Early diagnosis of Keratoconus: A Review and Systematic analysis

Authors

Hany Eldefrawy[1],[2], Sunil Mamtora[2], Jorge Alio[1]

Affiliations

[1]Universidad Miguel Hernández, Alicante, Spain

[2]Bristol University, Bristol, UK

Abstract

A systematic literature search was conducted using Medline (Dialog), Embase (Dialog), and preprint databases to identify articles published between June 2014 and June 2024. The search focused on early diagnosis of keratoconus, forme fruste keratoconus, and borderline ectatic cases. Keywords included corneal topography, optical coherence tomography (e.g., RTvue OCT), MS39, epithelial mapping, corneal biomechanics, and artificial intelligence.

The search strategy was structured around two primary concepts: (1) Keratoconus and (2) Early Diagnosis. Both thesaurus terms (e.g., MeSH terms in Medline and EMB [AA2] terms in Embase) and relevant free-text keywords (i.e., terms appearing in titles, Abstracts, or Author-supplied keywords) were used to refine the search.

A total of 651 references (set S16) were retrieved as the primary result. An additional 1,091 references (set S19) were identified through a broader search strategy, which captured articles where “early diagnosis” was mentioned within the full text. In total, 1,742 references (651 from set S16 and 1,091 from set S19) were screened at the Abstract level. The primary objective was to evaluate the effectiveness of these tools in screening early keratoconus, in terms of diagnostic sensitivity, specificity, and the area under the receiver operating characteristic (ROC) curve. Both sets of references were systematically screened.

Following the initial screening, 53 articles were selected for full-text evaluation. Of these, 17 studies met the inclusion criteria. These studies focused on the early diagnosis of keratoconus using curvature-based topographic devices (Placido-disc), elevation-based devices (including tomography, pachymetry, wavefront analysis, and epithelial mapping), as well as biomechanical assessments.

Biography: Hany Eldefrawy

Mr. El-Defrawy graduated with distinction from Cairo University in 1995 and completed his basic and higher surgical training in Egypt in 2004. He earned his Doctorate from Cairo University in 2003, obtained the Fellowship Diploma in Ophthalmology from the Royal College of Physicians and Surgeons of Glasgow in 2002, and achieved MRCS (Edinburgh) in 2009. He subsequently undertook fellowship training in medical retina, cataract, and paediatric ophthalmology at institutions in London and the University of Bristol (2010–2013).

He currently works as a self-employed ophthalmic surgeon with SpaMedica, performing cataract and laser procedures for both routine and complex cases. He performs approximately 3,000 phacoemulsification and intraocular lens procedures annually. He is actively involved in teaching and supervising junior trainees. In 2023, he completed a diploma in cataract and refractive surgery from the University of Miguel Hernández.

Efficacy and Safety of KeraVio using Violet Light-Emitting Glasses and Cyanocobalamin Drops for Progressive Keratoconus: A Pilot Study

Authors

Hidenaga Kobashi[1], Kazuo Tsubota[2], Ikuko Toda[3]

Affiliations

[1]Department of Ophthalmology, Keio University School of Medicine, Tokyo, Japan

[2]Tsubota Laboratory, Inc., Tokyo, Japan

[3]Department of Ophthalmology, Minami Aoyama Eye Clinic, Tokyo, Minato-ku, Tokyo, Japan

Abstract

Purpose: To evaluate the efficacy and safety of KeraVio treatment, a minimally invasive corneal cross-linking technique that combines cyanocobalamin eye drops with violet light (VL) irradiation, in patients with progressive keratoconus.

Methods: This prospective, single-arm exploratory study included three patients (mean age, 36.67 ± 11.24 years; 2 males, 1 female) with progressive keratoconus. Treatment consisted of 0.02% cyanocobalamin eye drops administered six times daily and VL irradiation via TLG-003 eyeglasses worn 4.5 hours per day for three months. Patients were followed for six months. The primary endpoint was the change in maximum keratometry (Kmax). Secondary endpoints included thinnest corneal thickness (TCT), demarcation line (DL), best-corrected visual acuity (BCVA), uncorrected visual acuity (UCVA), manifest refraction, intraocular pressure, corneal endothelial cell density, corneal haze, slit-lamp/fundus examination findings, and periocular skin changes.

Results: The mean Kmax change at 6 months was −0.37 ± 6.82 D. The mean change in the TCT was −7.33 ± 19.66 μm. BCVA and UCVA remained stable (mean BCVA change: −0.03 ± 0.15 logMAR; mean UCVA change: 0.04 ± 0.07 logMAR). No clinically observed changes in refraction, intraocular pressure, endothelial cell density, corneal clarity, or retinal findings were detected. No adverse events occurred.

Conclusions: KeraVio treatment appeared to be safe for use in this small cohort. However, owing to the limited sample size and variable Kmax responses, further large-scale, controlled studies are needed to determine the efficacy of this treatment in the context of halting keratoconus progression.

Biography: Hidenaga Kobashi

Dr. Hidenaga Kobashi is an ophthalmologist and vision science researcher based in Tokyo, Japan. He completed his medical internship at Kyorin University School of Medicine (2006–2008) before joining the Department of Ophthalmology at Kitasato University School of Medicine, where he served as a Research Fellow from 2008 to 2016. He then continued his work in corneal and anterior segment research as a Postdoctoral Research Fellow at Harvard Medical School and the Schepens Eye

Research Institute/Massachusetts Eye and Ear Infirmary under the supervision of Dr. Joseph B. Ciolino (2016–2017).

Since 2017, Dr. Kobashi has been an Associate Professor in the Department of Ophthalmology at Keio University School of Medicine. He also serves as a Senior Researcher at Tsubota Lab Inc. In addition to his academic roles, he is active in innovation and entrepreneurship, currently holding chief executive positions at two Tokyo-based companies: Toneasy Inc. (since 2020) and the Kobashi Eye Research Institute Co., Ltd. (since 2024).

Keratoconus vs. Pseudokeratoconus in Fuchs Endothelial Corneal Dystrophy: Diagnostic and Therapeutic Challenges

Author

Mostafa Aghi[1]

Affiliation

[1]University Hospital Jena, Germany

Abstract

Introduction:

The differential diagnosis between keratoconus and pseudokeratoconus in patients with concurrent suspicion of keratoconus and Fuchs endothelial corneal dystrophy (FECD) remains a significant clinical challenge. This case series of five patients explores diagnostic and therapeutic strategies to facilitate distinction between these entities and to guide optimal management.

Methods: Five patients with suspected keratoconus and FECD were analyzed. Diagnostic evaluation included corneal tomography, clinical examination, and biometric assessment. Two patients underwent Descemet membrane endothelial keratoplasty (DMEK).

Results: Cases 1 and 2: Corneal tomography revealed characteristic patterns of pseudokeratoconus secondary to FECD, allowing a clear differentiation from true keratoconus.

Case 3: Tomographic findings were inconclusive, and a definitive distinction between keratoconus and pseudokeratoconus could not be established.

Case 4: Tomography was likewise inconclusive. Following DMEK, the corneal changes regressed, confirming pseudokeratoconus.

Case 5: This case highlighted the challenges of biometry and intraocular lens calculation in planned triple-DMEK. Due to bilateral bullous keratopathy, reliable measurements were only possible after corneal abrasion.

Conclusions:

This case series highlights the diagnostic dilemma of suspected keratoconus in patients with FECD and underscores that, in selected cases, a definitive diagnosis may only be achievable following DMEK.

Biography: Mostafa Aghi

Dr. Mostafa Aghi is a Consultant Ophthalmologist and Deputy Head of Department at University Hospital Jena, Germany. He specializes in corneal surgery and keratoplasty and holds the titles Dr. med, FEBO, and FEBOS-CR.

Management of Chronic Corneal Hydrops with Double Lenticule Transplantation

Authors

Ceren Semiz[1], Faruk Semiz[1]

Affiliations

[1]Prishtina Eye Hospital, Kosovo, Albania

Abstract

Purpose: To evaluate the outcomes of double lenticule transplantation in keratoconus patients with chronic corneal hydrops.

Methods: This study included 24 keratoconus eyes with chronic corneal hydrops after prior crosslinking, indicated for penetrating keratoplasty. All underwent double lenticule transplantation with one full lenticule (134.2 ± 18.0 μm, –6.70 ± 0.91 D) and one semi-moon lenticule (149.4 ± 14.6 μm), customized to astigmatism.

Results: At 1 year, UDVA/CDVA improved from 1.73 ± 0.24 to 0.76 ± 0.17 / 0.42 ± 0.07 logMAR; Q value from –0.75 ± 0.05 to –0.62 ± 0.04; K1/K2 from 71.7 / 61.0 to 66.8 / 61.0 D; CCT from 348.0 ± 20.3 to 482.5 ± 8.7 μm, without complications.

Conclusion: Double lenticule transplantation using one full and one semi-moon lenticule appears to be a safe and effective alternative to penetrating keratoplasty, providing stromal thickening and maintaining corneal clarity in keratoconus eyes with chronic hydrops.

Biography: Faruk Semiz

Faruk Semiz, MD is a practicing ophthalmologist and corneal surgeon based in Prishtina, Kosovo. He serves as the Head of the Ophthalmology Department at Eye Hospital in Prishtina. Over the years, he has developed particular expertise in SMILE-derived lenticule transplantation, keratoconus treatment, and corneal stromal implants for managing complex refractive errors, including post-LASIK hyperopia and presbyopia.

Precision Analysis and Inter-Device Agreement of a Hybrid OCT–Placido Aberrometer for Corneal Higher-Order Aberrations in Graded Keratoconus

Authors

Jinhai Huang[1], Rui Ning[1], Yizhou Yang[1], Xingtao Zhou[1]

Affiliation

[1]Eye & ENT Hospital, Fudan University, China

Abstract

Purpose: To quantify the measurement precision of corneal higher-order aberrations (HOAs) obtained with a combined anterior-segment optical coherence tomography (AS-OCT) and Placido-disk topographer (MS-39) across progressive keratoconus stages and to establish device-specific agreement relative to a Scheimpflug/Placido-based system (Sirius).

Methods: In this prospective comparative study, anterior-surface, posterior-surface, and total corneal HOAs were computed from three repeated acquisitions. Intraobserver repeatability was characterized by within-subject standard deviation (Sw), test–retest repeatability (TRT), and intraclass correlation coefficient (ICC). Interobserver reproducibility was assessed with an identical statistical framework. Agreement

between instruments was examined via paired t-tests, Bland–Altman analysis, and 95 % limits of agreement (LoA), stratified by keratoconus severity.

Results: Ninety-nine keratoconic eyes were enrolled. Intraobserver Sw did not exceed 0.16 μm and TRT did not exceed 0.44 μm for anterior and total corneal HOAs; ICCs ≥0.874 were consistently observed. Posterior corneal HOAs exhibited Sw ≤0.04 μm with ICCs ranging from 0.739 to 0.991. Interobserver Sw remained ≤0.17 μm and TRT ≤0.29 μm across all corneal surfaces, with ICCs of 0.956–0.998 (anterior), 0.84–0.997 (posterior), and 0.923–0.997 (total). Notably, TRT showed a stage-dependent reduction with advancing keratoconus. The 95 % LoA were narrow and varied systematically with disease grade.

Conclusions: The MS-39 hybrid platform delivers reproducible corneal HOA measurements across the entire keratoconus spectrum. The device demonstrates strong metrological equivalence to the Sirius, supporting its interchangeable use in clinical and research settings for quantitative corneal aberrometry.

Biography: Jinhai Huang

Dr. Huang is a Shanghai Distinguished Professor (Oriental Scholar), Researcher, Associate Chief Physician, and Doctor of Medicine at the Eye & ENT Hospital and Eye Institute of Fudan University. He serves as Master and Post-doctoral Supervisor, Executive Vice-President of the Medical-Engineering Research Institute of the Eye & ENT Hospital, Vice Director of the Department of Optometry at Fudan University, and Vice Director of both the Shanghai Optometry Research Center and the OCULUS Asia-Pacific Research and Training Center.

His clinical and research work spans myopia prevention and control, refractive surgery planning, IOL power calculation, keratoconus screening, and corneal cross-linking. His scientific interests extend to interdisciplinary advances in ophthalmology and optometry, including ocular biometric measurement, gene editing, and nanobiomaterials

Dr. Huang has published more than 170 academic papers in leading journals such as Nature Communications, ACS Nano, Ocular Surface, Chemical Engineering Journal, Ophthalmology, and Carbohydrate Polymers.

Quantitative Corneal Epithelial Wavefront Signatures for Precise Detection of Keratoconus and Forme Fruste Keratoconus

Authors

Jinhai Huang[1], Rui Ning[1], Chak Seng Lei[1], Xingtao Zhou[1], Xiaoying Wang[1]

Affiliation

[1]Eye & ENT Hospital, Fudan University, China

Abstract

Purpose: To rigorously evaluate the discriminative performance of corneal epithelial wavefront aberrations in distinguishing forme fruste keratoconus (FFKC) and clinically manifest keratoconus (KC) from normal corneas.

Methods: 326 right eyes (91 normal, 87 FFKC, 148 KC) were imaged with anterior-segment optical coherence tomography. Epithelial aberrations within a 6-mm zone were decomposed into Zernike coefficients; total RMS, HOAs RMS, coma, trefoil, spherical, and secondary astigmatism were extracted. Stepwise logistic regression generated composite epithelial aberration indices (EAI-FFKC, EAI-KC). Diagnostic accuracy was assessed by the area under the ROC curve (AUC) with sensitivity and specificity.

Results: Epithelial HOAs were significantly elevated in both FFKC and KC cohorts compared with normal eyes (all $P < 0.001$). In the FFKC versus normal comparison, HOAs RMS and coma yielded AUCs of 0.714 (95 % CI 0.647–0.781) and 0.788 (0.725–0.850), respectively. The composite EAI-FFKC maximized discriminatory power (AUC 0.822; 95%CI 0.768–0.877) with 77.0% sensitivity and 75.8% specificity. For KC versus normal, HOAs RMS exhibited AUCs ranging from 0.976 to 0.998 (sensitivity 95.2 %–100%, specificity 92.3%–96.7%), while coma reached AUCs of 0.974–0.997 (sensitivity 92.9%–100%, specificity 96.7%–98.9%). The integrated EAI-KC achieved near-perfect separation (AUC 0.996; 95% CI 0.993–0.999), with 98.6 % sensitivity and 98.9 % specificity.

Conclusions: Epithelial wavefront analysis tracks abnormal epithelial remodeling throughout the entire keratoconus spectrum, from subclinical forme fruste to advanced ectasia, establishing epithelial aberrations as a robust, non-invasive biomarker for diagnosing both KC and FFKC.

Biography: Jinhai Huang

Dr. Huang is a Shanghai Distinguished Professor (Oriental Scholar), Researcher, Associate Chief Physician, and Doctor of Medicine at the Eye & ENT Hospital and Eye Institute of Fudan University. He serves as Master and Post-doctoral Supervisor, Executive Vice-President of the Medical-Engineering Research Institute of the Eye & ENT Hospital, Vice Director of the Department of Optometry at Fudan University, and Vice Director of both the Shanghai Optometry Research Center and the OCULUS Asia-Pacific Research and Training Center.

His clinical and research work spans myopia prevention and control, refractive surgery planning, IOL power calculation, keratoconus screening, and corneal cross-linking. His scientific interests extend to interdisciplinary advances in ophthalmology and optometry, including ocular biometric measurement, gene editing, and nanobiomaterials.

Dr. Huang has published more than 170 academic papers in leading journals such as Nature Communications, ACS Nano, Ocular Surface, Chemical Engineering Journal, Ophthalmology, and Carbohydrate Polymers.

Refractive Outcome of Lenticule Addition Keratoplasty with Collagen Crosslinking in Progressive Keratoconus

Authors

Murugesan Vanathi[1], M. S. Swathi[1], Sneha Aggarwal[1], Neiweti Lomi[1], Noopur Gupta[1], Radhika Tandon[1]

Affiliation

[1]All India Institute of Medical Sciences, New Delhi, India

Abstract

Purpose: To report the clinical outcome of LAK [Bowman's (BM)+ Stromal Lenticule] with CxL in KCN.

Methods: Prospective longitudinal study in 10 cases of progressive. Donor corneal lenticule (BM + anterior stroma) of 150mm was inserted into FL-assisted lamellar pocket (at 180mm depth), followed by accelerated CxL. VA (UCVA/BSCVA), MRSC, Scheimpflug corneal topography, ASOCT & CORVIS was done pre-op, post-operative

day 1, month-1, 3 & 6 & final follow-up. Outcome measures reported include corneal tectonic stability, refractive outcome, topography changes, and lenticule thickness.

Results: Over a mean follow-up of 29.6+5.42 months of 10 patients (mean age 20.1±3.6 years with mean preoperative Kmax 61.26±3.46 D, mean thinnest pachymetry 413.7±15.93 μm (395-441 μm), mean logMAR UCVA 1.348 ± 0.30 (1-1.78) & MRSE -7.65 ± 4.14 (-3.0 to -14.38 D), BM+stromal LAK noted UCVA improvement in 5 patients, BCVA improvement in 7 (1-3 lines). Change at M6 in mean MRSE was from -7.65±4.14 to -7.63 ± 3.84; corneal astigmatism from -4.75 ± 2.55 to -3.0±0.65; mean spherical error from -5.28±4.65D to -6.13± 3.87 D was stable at final follow-up. Corneal flattening in K1 & K2 meridians with K-Max change of 5.78±2.41 D; Q value decrease from -1.093±0.98 to -0.589±0.46 at M6 & -0.28±0.44 at M12, indicating a transition from a more prolate to a lesser prolate surface. LAK did not affect posterior corneal elevation; 3 eyes had epithelial ingrowth at M 3–6; persisting BM striae at M12 in 1 patient.

Conclusion: BM+stromal LAK with CXL is effective in corneal flattening and stability in progressive keratoconus.

Biography: Murugesan Vanathi

Dr. M. Vanathi completed her medical training at Madras Medical College, Chennai, followed by ophthalmology residency and cornea specialization at AIIMS, New Delhi. She also undertook an international clinical fellowship at the Singapore National Eye Centre (SNEC). She currently serves as Professor of Ophthalmology at AIIMS, New Delhi

She has extensive clinical and surgical experience in cornea and ocular surface disease, cataract and refractive surgery, limbal stem-cell transplantation, and corneal transplantation. Her academic output includes more than 250 indexed international publications, numerous book chapters, and editorial leadership as editor of Postgraduate Ophthalmology.

An accomplished corneal surgeon, she is actively involved in clinical practice, surgery, research, and eye-banking initiatives. Her areas of special interest include advanced lamellar keratoplasty, limbal stem-cell transplantation, ocular surface disease, paediatric keratoplasty, refractive surgery, and contact lens–related pathology.

She is the current Editor-in-Chief of the Indian Journal of Ophthalmology.

The donut technique for hyperopic treatment in irregular corneas and keratoconic patients - long-term follow-up

Authors

Karim Gaballah[1], Osama Ibrahim[2]

Affiliations

[1]Helwan University, Egypt

[2]Alexandria University, Egypt

Abstract

For decades, refractive surgery for hyperopia has been challenging, particularly with respect to achieving stable and predictable outcomes.

In this study, we present the “donut technique,” an innovative customized modification of PRK for hyperopic patients with irregular corneas and keratoconus. This approach provides rapid healing, predictable refractive outcomes, correction of topographic irregularities, and—most importantly—long-term stability of both refraction and corneal curvature, with follow-up extending to 10 years.

Biography: Karim Gaballah

Professor and head of the ophthalmology department, Helwan University, Cairo, Egypt. Consultant of cornea and refractive surgery

Cross-Linking - Clinical Applications

A Case of Multi-drug Resistant Infectious Necrotizing Scleritis Treated with Rose-Bengal Photodynamic Therapy

Authors

Jaime Martinez Martinez[1], Dena Ballouz[1], Juan Carlos Navia[1], Salo Merikansky[1], Carol Karp[1], Guillermo Amescua[1]

Affiliation

[1]Bascom Palmer Eye Institute, United States

Abstract

Purpose: Infectious necrotizing scleritis is a destructive and vision-threatening infection of the sclera. Despite aggressive antibiotic and surgical treatment, up to 33% of cases may require evisceration or enucleation. We present a case of infectious necrotizing scleritis caused by multi-drug resistant bacteria, successfully treated with Rose-Bengal Photodynamic Therapy.

Methods: Clinical and microbiology results were obtained from electronic medical record chart review. Rose-Bengal Photodynamic Therapy (RB-PDAT) was performed using the Bascom Palmer protocol as previously described.

Results: A 92-year old female presented corneal ulcer and scleral abscess caused by pan-sensitive Klebsiella pneumoniae and multi-drug resistant Corynebacterium jeikkeium. Scleritis continued to worsen despite topical and subconjunctival antibiotic therapy. RB-PDAT with scleral debridement and amniotic membrane placement was performed on day 10, with resolution of infection on day 45 after presentation.

Conclusions: RB-PDAT may act as a useful adjunct to scleral infections resistant to standard antibiotic treatment.

Biography: Jaime Martinez Martinez

Dr. Jaime D. Martínez, MD, is an Associate Professor of Clinical Ophthalmology at the Bascom Palmer Eye Institute, University of Miami. He earned his medical degree from the Autonomous University of Guadalajara, completed ophthalmology training at Asociación para Evitar la Ceguera in Mexico City, and pursued both research and clinical fellowships in cornea and external diseases at Bascom Palmer. His clinical focus includes complex corneal disorders, ocular surface reconstruction, and high-risk corneal transplantation, while his research has centered on innovative antimicrobial approaches such as Rose Bengal photodynamic therapy, dry eye disease, and ocular microbiology. He has **Author**ed numerous peer-reviewed publications and is actively involved in education and mentorship at an international level.

Combined wavefront-guided and corneal cross-linking for irregular corneas, long-term follow-up

Authors

Karim Gaballah[1], Osama Ibrahim[2]

Affiliations

[1]Helwan University, Egypt

[2]Alexandria University, Egypt

Abstract

Irregular corneas pose a major challenge in refractive surgery, as traditional approaches often fail to deliver accurate or stable visual outcomes. Conditions such as keratoconus and post-surgical ectasia can produce irregular astigmatism, leading to reduced visual acuity and suboptimal results with standard treatments.

In this study, we present long-term follow-up data and key insights on the combined use of wavefront-guided PRK and corneal collagen cross-linking for irregular corneas in keratoconic patients. The goal is to optimize both visual acuity and visual quality, with a particular focus on improving wavefront error.

Biography: Karim Gaballah

Professor and head of the ophthalmology department, Helwan University, Cairo, Egypt. Consultant of cornea and refractive surgery

Corneal cross-linking in thin corneas following the sub400 protocol

Authors

Teodor Stefanache[1], Spyros Atzamoglou[1], David Knight[1], Francisco Figueiredo[1,2]

Affiliations

[1]Ophthalmology, Royal Victoria Infirmary, Newcastle upon Tyne, United Kingdom

[2]Biosciences Institute, Newcastle University Faculty of Medical Sciences, Newcastle upon Tyne, United Kingdom

Abstract

Purpose: To report clinical outcomes of keratoconus patients undergoing the sub-400 protocol in a UK tertiary referral centre.

Methods: We conducted a prospective audit of patients with progressive keratoconus and thin corneas (<400 µm) referred to Cornea Service at Royal Victoria Infirmary, Newcastle upon Tyne. Consecutive cases treated between March 2022, and June 2024 were included. The protocol involved epithelial debridement, 20 minutes of isotonic riboflavin application, pachymetry measurement at the thinnest point, and 3 mW/cm^2UV exposure according to the collagen crosslinking (CxL) sub-400 protocol. Outcomes included demographics, BCVA (logMAR), slit-lamp examination, specular microscopy, and corneal tomography, with follow-up at 1, 3, 6, 12, and 18 months.

Results: Twelve patients (13 eyes; M:F ratio 5:7) with a mean age of 26.9 years (SD 7.2) were included. Preoperative mean visual acuity was 0.74 logMAR (SD 0.43), which remained stable at 6 months. Mild stromal haze was seen in 30.7% at 1 month but resolved by 3 month visit. No other complications occurred.

At 6 months, tomographic analysis showed mean K1 decreased from 58.07D to 57.45D, K2 from 64.49D to 64.05D, and Kmax from 77.34D to 76.06D, none statistically significant ($p>0.05$). Only 2 patients (15.4%) showed signs of progression. Pachymetry decreased from 386.2 µm to 364.6 µm ($p=0.09$). Endothelial cell counts remained stable.

Conclusions: Individual analysis showed that 84.6% (n=11) of eyes remained stable with no complications, suggesting the sub-400 protocol is a safe and effective option for halting keratoconus progression in thin corneas. Larger numbers with longer follow-up are warranted.

Biography: Teodor Stefanache

Dr. Teodor Stefanache is a Corneal Fellow at the Royal Victoria Infirmary in Newcastle upon Tyne, United Kingdom. His clinical and research interests focus on complex corneal and ocular surface disease, including limbal stem-cell deficiency, neurotrophic keratopathy, and keratoplasty. He has contributed to peer-reviewed work on outcomes after limbal stem-cell transplantation and on cross-linking approaches in thin corneas, reflecting an active role in tertiary-level corneal care and academic ophthalmology.

Corneal Cross-Linking in the Treatment of Keratoconus in Children – A Retrospective Analysis

Authors

Ewa Wróblewska-Czajka[1], Magdalena Kijonka[1], Patrycja Potrawa[1], Katarzyna Walasz[1], Magdalena Nandzik[1], Edward Wylęgała[1]

Affiliations

[1]Department of Ophthalmology, Faculty of Medical Sciences in Zabrze, Medical University of Silesia, Okręgowy Szpital Kolejowy, Panewnicka 65, 40-760 Katowice, Poland.

Abstract

Purpose: Pediatric keratoconus is characterized by rapid progression and an aggressive clinical course, making early intervention crucial. Corneal cross-linking (CXL) is currently the only procedure proven to slow or halt disease progression. This study aimed to evaluate the effectiveness and safety of CXL in children with progressive keratoconus.

Methods: Retrospective analysis of 30 eyes (21 patients, aged 11–17) treated with epithelium-off accelerated or sub400 CXL. Comorbidities included Down syndrome, atopy, and family history. Mean follow-up: 14.4 months. Supportive therapy included trehalose drops and, selectively, anti-allergic or anti-inflammatory treatment.

Results: Disease stabilization based on corneal topography (ABCD progression display, Pentacam HR) was observed in 24 eyes (80%). Best-corrected visual acuity improved or remained stable in 26 eyes (86.6%). Keratoconus progression occurred in 6 eyes (20%). Reported complications included sterile corneal infiltrates (6.6%), herpes simplex virus reactivation (3.3%), and haze (3.3%).

Conclusions: Accelerated and sub400 CXL protocols are effective and relatively safe treatment options for progressive keratoconus in pediatric patients. Early qualification for the procedure and tailored supportive therapy, particularly in patients with atopy or systemic comorbidities, may increase the likelihood of disease stabilization.

Biography: Magdalena Kijonka

Dr. Magdalena Kijonka currently works at the Chair and Clinical Department of Ophthalmology, Faculty of Medical Sciences in Zabrze, Medical University of Silesia. She is a cataract and refractive surgeon. Her clinical and research interests focus on the diagnosis and management of corneal and anterior segment disorders. She has **Author**ed and co-**Author**ed several scientific publications and actively participates in international conferences, where she values the opportunity to exchange knowledge and experiences with colleagues from around the world.

Comparative Results and Side Effects of "Epi-Off" versus “Epi-on iontophoresis” Accelerated Cross-Linking Procedure at 10-Year Follow-Up

Authors

Elena Albe[1]

Affiliations

[1]Istituto Clinico Humanitas, Italy

Abstract

Purpose: The aim of our study was to compare the long-term safety of Epithelial-off (Epi-off) and Epi-on iontophoresis accelerated corneal cross-linking (CXL) in patients with progressive keratoconus (Kc), differentiating the results in the four different keratoconus Krumeich stage categories.

Methods: Epi-off CXL using the accelerated method (9 mW/cm2, 10 minutes) was performed in 98 eyes of 64 patients (Off-CXL group), and Epi-on iontophoresis accelerated method (9 mW/cm2, 10 minutes) in 84 eyes of 59 patients with progressive Kc. Eyes with the 4 different Krumeich stage Kc and topographic evidence of progression were included. Main outcomes comprised refraction, keratometry measurements, uncorrected (UCVA) and best-corrected visual acuity (BCVA), and topographical indices. The follow-up period was 10 years.

Results: Topographical indices, BSCVA, and thinnest corneal point were statistically significantly decreased compared with baseline at all time points, in both groups. Preoperative Kc stage was related in the Epi-off group with over-flattening effect, reduction in cornea thickness, and BSCVA reduction after 5 years, with an increased rate of side effects in preoperative Kc stage I and II.

Conclusion: Epi-off and Epi-on iontophoresis accelerated CXL have the same efficacy in terms of improvement in visual and topographic outcomes in Kc stage III and IV, however corneal thinning and side effects related to corneal flattening are significantly higher in the Epi-off group Kc stage I and II, suggesting that CXL has to remain a surgical procedure indicated in progressive Kc rather than considering it a prophylactic procedure in all the patient with a Kc diagnoses.

Biography: Elena Albe

Corneal Specialization and studies on Corneal Cross-Linking since the first clinical Italian Study back in 2004.

Corneal biomechanical changes after 1 year of epi-off accelerated corneal collagen crosslinking in patients affected by progressive keratoconus

Authors

Michele Lanza[1], Luigi Serra[1], Salvatore Ambrosio[1], Francesco Abbate[1], Francesca Agricola[1], Francesca Simonelli[1]

Affiliations

[1]Università della Campania Luigi Vanvitelli, Italy

Abstract

Purpose: to evaluate the corneal biomechanics changes in eyes affected by progressive keratoconus (KC) undergone accelerated (30 mV/cm2) corneal collagen crosslinking (ACCC).

Methods: ACCC procedures were performed in 51 KC eyes of 40 patients with a mean age of 23.8 ± 5.19 years (ranging from 15 to 36 years). Before treatment, a complete eye visit including visual acuity, slit lamp evaluation, corneal tomography, and corneal biomechanics evaluation was performed and repeated at 1, 3, 6, and 12 months follow-up. The biomechanical parameters evaluated in this study were: maximus deflection amplitude (MDA), applanation time 1(AT1), applanation velocity 1 (AV1), applanation time 2 (AT2), applanation velocity 2 (AV2), highest concavity time (HCT), and peak distance (PD). Differences were evaluated with the Paired Student T Test.

Results: After 1 year of treatment, biomechanics parameters showed the following mean values: MDA= 1.19 ± 0.17 mm; AT1=7.12 ± 0.28 sec, AV1= 0.17 ± 0.04 m/s, AT2= 22.03 ± 0.6 sec, AV2= -0.32 ± 0.07 m/s, HCT= 17.06 ± 0.52 ms, PD= 5.11 ± 0.19 mm. Whereas MDA, AT1, AV1, AT2, and AV2 did not show significant changes HCT and PD showed a significant increase compared to values obtained before ACCC.

Conclusions: According to data observed in this study, even if they need to be confirmed in a larger population and longer follow-up, 30 mV/cm2 ACCC is able to

stabilize the corneal biomechanical properties of the eyes affected by progressive KC at 1-year follow-up.

Biography: Michele Lanza

Michele Lanza completed his medical training at the Università di Napoli (Italy) in 2001 and his residency in ophthalmology at the Seconda Università di Napoli in 2005. He obtained a PhD in Biocybernetics and Biomedical Engineering from the Silesian University of Technology, Faculty of Biomedical Engineering, Katowice (Poland), in 2018.

He is currently an Associate Professor of Ophthalmology in the Multidisciplinary Department of Medical, Surgical and Dental Sciences at the Università della Campania Luigi Vanvitelli. He serves as an editor for Frontiers in Medicine, Scientific Reports, and the Journal of Current Medicine, and acts as a reviewer for 25 international peer-reviewed ophthalmology journals.

Dr. Lanza has authored or co-authored more than 100 presentations at international congresses, over 60 at national meetings, and 92 publications in impact-factor journals. His clinical and research interests include refractive surgery, glaucoma, cataract surgery, and ocular complications of neurological diseases.

Evaluation of epi-off accelerated corneal collagen crosslinking in patients affected by progressive keratoconus: 1 year follow up

Authors

Michele Lanza[1], Rosa Boccia[1], Luigi Serra[1], Italo Fattore[1], Teresa Cangiano[1], Francesca Simonelli[1]

Affiliation

[1]Università della Campania Luigi Vanvitelli, Italy

Abstract

Purpose: to investigate efficacy, safety, and outcomes after epi-off accelerated (30 mV/cm2) corneal collagen crosslinking (ACCC) in eyes affected by progressive keratoconus (KC) after 1 year of treatment.

Methods: ACCC procedures were performed in 51 progressive KC eyes of 40 patients with a mean age of 23.8 ± 5.19 years (ranging from 15 to 36 years). A complete eye visit, including visual acuity and intraocular pressure evaluation measurements, slit lamp

evaluation, and Scheimpflug camera scan providing anterior and posterior corneal curvature and corneal thickness, was performed at baseline and at 1, 3, 6, and 12 months follow-up. Mean anterior (AMK) and posterior (PMK) keratometry, anterior maximus keratometry (Kmax), and thinnest corneal point (TCP) changes were evaluated with Paired Student t-test.

Results: after 1 year of ACCC, no significant variations were observed in AMK (-0.06 ± 0.61 D, $p=0.12$), PMK (-0.04 ± 0.11 D, $p=0.09$), and TCP (-2.33 ± 11.21 D, $p=0.14$). No complications were detected in every patient treated, and best corrected distance visual acuity (BCDVA) was stable (mean change: -0.03 ± 0.14 logMAR, $p=0.07$) at 1-year follow-up.

Conclusions: according to data observed in this study, even if they need to be confirmed in a larger population and longer follow-up, ACCC using an energy of 30 mW/cm2 could be a safe and effective procedure aiming to stabilize the clinical conditions of eyes affected by progressive KC.

Biography: Michele Lanza

Dr. Michele Lanza completed his medical degree at the Università di Napoli (Italy) in 2001 and finished his Ophthalmology residency at the Seconda Università di Napoli in 2005. He later earned a PhD in Biocybernetics and Biomedical Engineering from the Silesian University of Technology, Faculty of Biomedical Engineering, Katowice (Poland), in 2018.

He is currently an Associate Professor of Ophthalmology in the Multidisciplinary Department of Medical, Surgical and Dental Sciences at the Università della Campania Luigi Vanvitelli. Dr. Lanza serves as an editor for Frontiers in Medicine, Scientific Reports, and the Journal of Current Medicine, and acts as a peer reviewer for 25 international ophthalmology journals.

Dr. Lanza has authored or co-authored 92 papers in impact-factor journals, more than 100 presentations at international congresses, and over 60 presentations at national meetings. He is a frequently invited speaker at national and international conferences.

His clinical and research interests include refractive surgery, glaucoma, cataract surgery, and ocular complications of neurological diseases.

Scleral Lens Reservoir-Assisted Corneal Swelling in Thin Keratoconic Corneas: Efficacy of Riboflavin Soaking for CXL

Authors

Billel Sichaib[1], Amel Hamdi[1], Moatez Billah Mekki[1], Said Yahiaoui[1], Okba Titah[1], Amine Taibi[1]

Affiliation

[1]Ibn Al Haythem Center, Algeria

Abstract

Purpose: To evaluate the efficacy of inducing corneal swelling to achieve a minimum corneal pachymetry (CP) of 400 µm during the riboflavin soaking phase of corneal cross-linking (CXL) in Algerian patients with thin keratoconic corneas.

Methods:

Prospective study of 157 consecutive thin corneas. After epithelium removal, corneas were soaked with Ribo-Ker using a scleral lens reservoir. CP was monitored hourly with AS-OCT. If the cornea did not swell to 400 µm within two hours, the soaking was discontinued, and a sub-400 CXL protocol was performed.

Results: 98 had a baseline CP between 300 and 400 µm; 92% (n=90) of these successfully reached 400 µm. Among the 48 corneas with a baseline CP between 200 and 299 µm, 27% (n=13) reached 400 µm. Finally, none of the 11 corneas with a baseline CP less than 200 µm achieved a CP of 400 µm.

Conclusion: Thin keratoconic corneas with a baseline pachymetry between 300 and 400 µm are likely to swell sufficiently during the riboflavin soaking phase to be treated with the standard CXL protocol. However, corneas thinner than 300 µm are unlikely to reach the 400 µm threshold, necessitating a modified protocol for safe treatment.

Biography: Moatez Billah Mekki, MD

Moatez Billah Mekki is an ophthalmologist surgeon at the Ibn Al-Haythem Center in Algiers, with a strong focus on anterior segment imaging for cataract and corneal disease. His work highlights the practical value of AS-OCT and SS-OCT in challenging cases, including cataract assessment in opaque media and detailed visualization of Dua–Descemet's membrane tears in hydrops. In this study, he provided expert imaging interpretation and OCT-guided clinical evaluation, ensuring consistent acquisition and precise morphological documentation to support robust surgical decision-making.

SMILE Plus Custom Fast Cross-Linking vs SMILE Alone: 12-Month Outcomes in Myopic Eyes

Authors

Mario Troisi[1], Marco Fantozzi[2], Ciro Caruso[3], Massimo Mammone[2], Chiara Fantozzi[4], Ciro Costagliola[5]

Affiliations

[1]University Hospital of Salerno, Salerno, Italy

[2]San Rossore Medical Center, Pisa, Italy

[3] Pellegrini Hospital, Naples, Italy

[4] Policlinico Gemelli Hospital, Rome, Italy

[5] University of Naples Federico II, Naples, Italy

Abstract

Purpose: To compare visual and optical quality, refractive outcomes, and safety after small-incision lenticule extraction (SMILE) alone versus SMILE combined with Custom Fast corneal cross-linking (X-COMBI-CF) in myopic eyes over 12 months, testing whether adjunct cross-linking confers superior optical performance without additional adverse effects, and evaluate early postoperative recovery and stability.

Methods: Single-center, retrospective, interventional comparative series. Twenty-three patients: SMILE (n=10) or X-COMBI-CF (n=13). All the procedures were performed by the same surgeon. Adjunct protocols: epi-on 15 $mW/cm^2 \times 2$ min or intrastromal 30 $mW/cm^2 \times 90$ s. Assessments at 1 day, 1 week, 1, 3, 6, 12 months: spherical equivalent, UCVA, BSCVA, keratometry, pachymetry, endothelial count, pupil, HOAs, spherical aberration, coma.

Results: Groups were comparable for refraction, vision, keratometry, pachymetry, endothelial count, and pupil (all $p>0.05$). X-COMBI-CF showed lower higher-order aberrations, spherical aberration, and coma ($p \leq 0.02$ at 1 month; $p \leq 0.001$ at 3–12 months). Epi-on and intrastromal variants performed similarly. No corneal haze or other safety signals were observed, with clinically meaningful reductions.

Conclusions: Adjunctive X-COMBI-CF improves optical quality compared to SMILE alone without compromising safety. The benefits may extend beyond ectasia prophylaxis, supporting its use in borderline corneas or those with an elevated ectasia risk. Findings justify considering X-COMBI-CF as a quality-enhancing adjunct after SMILE; longer prospective randomized follow-up should confirm durability, patient-reported outcomes, cost-effectiveness, and health-economic value.

Biography: Mario Troisi

Dr. Mario Troisi (MD, FEBO) is an ophthalmologist at Salerno University Hospital. He graduated from the University of Salerno and completed residency at the University of Naples Federico II. He holds a postgraduate masters in Biostatistics for Clinical Research and in Systematic Reviews/Meta-analysis. His clinical and research focus is the ocular surface and corneal pathology, with emphasis on advanced imaging/microscopy, novel therapeutics, and customized corneal cross-linking (CXL) protocols. He has authored 25+ peer-reviewed papers and a monograph, presented at 40+ conferences, and received awards from ESCRS, EVER, EuDES, ARVO, EuCornea, SICSSO, and others. He serves as a reviewer and editorial board member for international journals and organizes the EVER 2025 course “Advanced Microscopy Techniques in the Diagnosis of Ocular Surface Diseases.” He is also editor of an open-access book on artificial intelligence in ophthalmology (IntechOpen). His current work centers on optimizing customized/accelerated CXL dosing models, stromal riboflavin kinetics, and real-world outcomes.

Automated Image Processing of Annular Dark Shadow for Keratoconus Detection

Authors

Arige Gideon Abousaid[1], Joan Gispets[2], Manel Larrosa Exposito[2], Eva Jimenez Vargas[3], Einat Shneor[1]

Affiliations

[1]Department of Optometry and Vision Science, Jerusalem Multidisciplinary College, Jerusalem, Israel

[2]Department of Optics and Optometry, Universitat Politècnica de Catalunya, Terrassa, Spain

[3]Facultat d'Informàtica de Barcelona, Universitat Politècnica de Catalunya, Terrassa, Spain

Abstract

Purpose:

Early detection of keratoconus remains challenging, particularly in mild or suspect cases. This study assessed the diagnostic potential of the Annular Dark Shadow (ADS) using computerized image-processing methods. We developed an automated pipeline for smartphone-based ADS images and tested its accuracy against clinical diagnosis in differentiating disease severity.

Methods:

Subjects (N=71) underwent best-corrected visual-acuity, slit-lamp-biomicroscopy, retinoscopy, corneal-tomography, and smartphone-ophthalmoscope ADS imaging. Clinical diagnosis served as the reference defining three categories from 111 eyes (Keratoconus N=53, keratoconus-mild/suspect N=14, and healthy control N=44), yielding 381 images. ADS images were analyzed with an automated pipeline (YOLO pupil detection, region-of-interest cropping, CNN classification).

Results:

Binary classification (healthy vs. disease, based on clinical-diagnosis) achieved >92% accuracy; three-class stratification (healthy vs. mild/suspect vs. Keratoconus) reached ≈91%. Cross-validation supported generalization. Misclassifications occurred mainly between keratoconus categories, while clinically healthy eyes were rarely misclassified. Accuracy improved with expert-selected best-quality photographs, underscoring the role of image quality in performance.

Conclusions:

Automated ADS image analysis is a reliable tool for keratoconus detection and severity stratification. Integration into screening could enable earlier diagnosis, reduce dependence on examiner expertise, and allow scalable, cost-effective programs using accessible smartphone-based imaging combined with artificial intelligence approaches.

Biography: Arige Gideon Abousaid

I am an optometrist with over 20 years of clinical experience and a PhD student at the Universitat Politècnica de Catalunya. I serve as a clinical supervisor at the Jerusalem Multidisciplinary College Eye Clinics, where I mentor students in general optometry and contact lens practice. My clinical work includes managing a wide spectrum of patients, with a special focus on keratoconus diagnosis and vision rehabilitation through customized contact lens fitting. I also work in a private clinic alongside an ophthalmologist, focusing on pediatric eye examinations and the early detection of visual disorders.

My research centers on keratoconus, particularly in developing early and cost-effective diagnostic strategies. I have co-authored several scientific papers, including two as first author: Revisiting the Oil Droplet Sign in Keratoconus and a narrative review on strategies for early keratoconus diagnosis. I am currently investigating novel applications of the oil droplet sign to improve early detection and screening.

Assessment Of the Association Of Advanced Keratoconus With Atopy And Family History In Patients Attending Benghazi Teaching Eye Hospital

Authors

Seham Alraaydi[1], Hammad Elzarrug[2]

Affiliations

[1]Ophthalmology Department, Faculty of Medicine, Benghazi University, Libya

[2]Faculty of Medicine, Benghazi University, Libya

Abstract

Keratoconus is an asymmetrical, progressive disease that significantly affects visual acuity and overall quality of life. The aim of this study was to assess the association between keratoconus, atopy, and family history among patients attending Benghazi Teaching Eye Hospital.

Materials and **Methods**: A cross-sectional study was conducted among patients with keratoconus attending the ophthalmology clinics at Benghazi Teaching Eye Hospital. Data were collected through a questionnaire-based interview and analyzed using SPSS version 26.

Results: The study included 100 patients with advanced keratoconus. The mean age was 28.7 ± 8.9 years (range 13–55 years), and 89% were younger than 40 years. The male-to-female ratio was 1.04:1. A positive family history was recorded in 35% of patients, with no significant difference between males and females ($p = 0.950$). A history of allergy (atopy) was present in 69% of patients.

This study highlights the importance of discouraging eye rubbing in children and screening individuals with a positive family history to enable early detection.

Biography: Seham Alraaydi

Dr. Seham Salem Alraaydi is an ophthalmologist based in Benghazi, Libya. She graduated from the Faculty of Medicine at the University of Benghazi in 2020 and completed her Master's degree in Medicine in 2025. She currently practices at Benghazi Eye Hospital, where she is involved in clinical diagnosis and management of ocular diseases, assists in surgical procedures, and contributes to training and research activities.

She is enrolled in the FRCS program and is a member of the Libyan Board of Ophthalmology. Dr. Alraaydi's professional interests include clinical ophthalmology, surgical care, and academic research.

Biomechanical and structural implications of lenticule insertion procedures

Authors

Abby Wilson[1], Maryam Boutkhil[1], John Marshall[1]

Affiliation

[1]University College London, London, United Kingdom

Abstract

Purpose: Tissue-based lenticules are being increasingly used to treat keratoconus. Insertion of lenticules involves incisions into the corneal stroma, introducing changes to its structure and biomechanical properties. Here, we compare flap, pocket, and delamination techniques with the aim of identifying the method that best preserves corneal structure and biomechanics.

Methods: Second Harmonic Generation (SHG) imaging and speckle interferometry were used to assess changes to the structure and biomechanics of porcine corneas under physiological pressures pre and post-lenticule insertion. 12 porcine corneas (4 per procedure) were examined < 48hrs post-mortem. Data was used to inform computational biomechanical treatment models.

Results: TBC

Conclusions: In already structurally compromised corneas such as those of Keratoconus patients, preserving and improving the structural integrity of the cornea is paramount to the long-term success of the procedure. Through structural and biomechanical assessment of the effects of these procedures we can optimise them to reduce the potential for complications.

Biography: Abby Wilson

Abby Wilson is a current RAEng Research Fellow at University College London, specializing in optical device development and application for the assessment of corneal biomechanics.

Complications of Intrastromal Corneal Ring Segments in Keratoconus: Case Series and Literature Context

Authors

Katarzyna Walasz[1], Ewa Wróblewska-Czajka[1], Magdalena Nandzik[1], Magdalena Kijonka[1], Adam Wylęgała[1], Edward Wylęgała[1]

Affiliation

[1]Clinical Department of Ophthalmology, Faculty of Medical Sciences in Zabrze, Medical University of Silesia, Okręgowy Szpital Kolejowy, Katowice, Poland

Abstract

Purpose: To present rare but clinically significant complications of intrastromal corneal ring segment implantation in keratoconus patients, based on our case series and current evidence-based medicine.

Methods: We retrospectively reviewed 5 keratoconus patients treated with intrastromal corneal rings in our ophthalmology department. Clinical outcomes and complications were analyzed and compared with available literature data.

Results: Observed complications comprised bilateral corneal decompensation with secondary glaucoma, ring migration, corneal perforation, and a persistent epithelial defect, corresponding to rare but previously reported adverse events in evidence-based studies.

Conclusions: Although intrastromal corneal rings improve vision in keratoconus, clinicians should remain vigilant for serious complications. Careful patient selection, surgical technique, and long-term follow-up are essential to reduce risks.

Biography: Katarzyna Walasz

Katarzyna Walasz graduated from the Poznań University of Medical Sciences and is currently in the fifth year of her ophthalmology residency at the Chair and Clinical Department of Ophthalmology, Faculty of Medical Sciences in Zabrze. Her clinical and scientific interests focus on the diagnosis and management of corneal and anterior segment disorders, combining patient care with research in advanced imaging and modern therapeutic approaches. She has authored and co-authored several academic works and actively participates in international conferences, where she values the opportunity to exchange knowledge and experiences with colleagues from around the world. Passionate about both clinical practice and academic development, she is committed to integrating evidence-based medicine into daily ophthalmic care. Beyond her professional activities, she is an enthusiastic traveler and a keen sports admirer, finding balance between her medical career and personal passions.

Controlled Immunomodulation Preserves Collagen Integrity and Promotes Corneal Stability in Keratoconus

Authors

Maneesha Mohan[1], Rohit Shetty[1], Pooja Khamar[1], Swaminathan Sethu[1], Arkasubhra Ghosh[1], Abhijit Sinha Roy[1]

Affiliations

[1]Narayana Nethralaya, India

Abstract

Purpose- This study evaluated whether topical trehalose 3%, a known antioxidant and autophagy-enhancing agent, could contribute to corneal stabilization in early to moderate keratoconus.

Methods- 352 eyes of 226 patients were treated with topical trehalose 3% four times daily for six months. Pentacam from two visits,≥6 months apart, was included. Eyes with prior cross-linking, corneal scarring, other ectasias, or previous surgery were excluded. Progression assessed using both conventional Kmax thresholds (0.75D, 1.0D, 1.25D) and a validated random-forest AI model incorporating 37 tomographic parameters. Primary outcomes were area under the curve (AUC), accuracy, and reclassification rates. Secondary outcomes included changes in keratometry, pachymetry, Belin–Ambrosio indices, and higher-order aberrations.

Results- The AI model showed excellent performance, with AUC values of 0.930, 0.954, and 0.944 at the three Kmax thresholds, and overall accuracy >95%. Stable eyes were correctly identified in >95%, while 43–58% of clinically progressive eyes were reclassified as stable. AI-stable groups demonstrated minimal shifts in keratometry (<0.2D), pachymetry (<3 μm), BAD-D (<0.05), and RMS aberrations (<0.2 μm), whereas AI-progressive groups showed significantly larger worsening, consistent with true disease activity.

Conclusion- Topical trehalose 3% was associated with AI-verified tomographic stability, suggesting that controlled immunomodulation targeting inflammation, oxidative stress, and impaired autophagy may preserve collagen integrity and potentially delay surgical intervention in early keratoconus.

Biography: Maneesha Mohan

Dr. Maneesha Mohan is a Consultant in the Department of Cornea and Refractive Services at Narayana Nethralaya, Bengaluru, India. She completed her medical training, followed by postgraduate ophthalmology training at Aravind Eye Hospital, Madurai, India. She subsequently undertook a two-year-long-term clinical fellowship in Cornea and Anterior Segment at the L.V. Prasad Eye Institute (LVPEI), Hyderabad, finishing in 2020.

Her clinical and research interests include keratoconus, dry eye disease, and refractive surgery. She is actively involved in clinical research, postgraduate teaching, and collaborative initiatives aimed at improving outcomes in corneal cross-linking and anterior segment surgery.

Corneal Surfaces Changes in the Prescription of RGP Contact Lenses in Different Parameters

Authors

Abolfazl Ahmadi Shokouh[1]

Affiliation

[1]Hormozgan University of Medical Sciences (HUMS), Bandar Abbas, Iran

Abstract

This study aimed to identify the minimum changes in corneal parameters after one day of wearing RGP lenses with two different fits. Because lens parameters can be modified to achieve a proper fit—and these modifications can themselves induce changes in corneal shape—the study examined how flatter versus steeper fits affect the cornea.

Among candidates with irregular astigmatism, low or moderate myopia, and astigmatism less than 3 diopters, two lenses were ordered for each eye: one flatter than the best-fit lens and one steeper. Before lens wear and after one full day of wear, the cornea was imaged using Orbscan. Six parameters were assessed: central corneal thickness, total or central astigmatism, astigmatism at 3 mm and 5 mm, and the BFS of the anterior and posterior corneal surfaces.

Statistical analysis showed significant ($p < 0.05$) increases in corneal thickness with the flatter lenses, and significant changes in astigmatism in the central 3 mm and 5 mm zones with both fitting types. No significant changes were found in the remaining parameters.

In terms of corneal edema, prescribing a flatter and larger lens is preferable to a steeper and smaller one. Based on the changes observed in the central 3 mm and 5 mm zones, the use of either type of RGP fit may increase the likelihood of amblyopia in low-light conditions compared with daylight.

Biography: Abolfazl Ahmadi Shokouh

Dr. Abolfazl Ahmadi Shokouh is an optometrist with extensive clinical, academic, and administrative experience. He served as Director of the Optometry Group at Zahedan

University of Medical Sciences from 1995 to 1999. From 1999 to 2000, he was responsible for the electrophysiology unit in the Eye Ward of Iran University of Medical Sciences, and in 2000, he headed the optometry unit at the Iranian Hospital in Dubai. Since 2005, he has led the optometry ward at HUMS.

In addition to his institutional roles, he has operated a private ophthalmic clinic and para-clinic, contributing to a broad range of clinical services. He has conducted numerous research and innovation projects, many of which have been presented internationally.

He holds a BSc in Optometry (1999) and an MSc in Optometry (2001).

Detecting incipient Keratoconus on MS-39 Maps with Graph Descriptors Beyond Conventional Metrics

Authors

Francisco Javier Abellan Martínez[1], Andrea Bernal Ganzalez[1], Maria Guadalupe Garrido Ceca[1]

Affiliations

[1]Hospital de la Princesa, Madrid, Spain

Abstract

Purpose: To test whether graph-based analysis of posterior-surface topography can localize the cone and improve discrimination between mild keratoconus (KC) and high physiological astigmatism versus conventional topographic metrics in eyes with similar anterior curvature.

Methods: Retrospective analysis of 211 MS-39 maps (114 KC; 97 non-KC) from 69 patients. Posterior-surface divergence identified local extrema as graph nodes; graph descriptors trained a Gradient Boosting classifier. Comparators: thinnest pachymetry, anterior/posterior curvature. Five-fold cross-validation; paired differences assessed with McNemar's test.

Results: Graph model: sensitivity 0.88±0.09, specificity 0.91±0.04, accuracy 0.89±0.06. Conventional metrics: 0.85±0.09, 0.77±0.15, 0.80±0.06. McNemar indicated significant overall and specificity differences favoring graphs (χ^2=13.0 and 5.0; p=0.04). Benefits were greatest in eyes with similar anterior curvature.

Conclusions: Graph construction on posterior maps provides higher accuracy and specificity than standard metrics and is less impacted by extra-cone artifacts.

Limitations: few subclinical/advanced cases; single-center device. Next steps: multicenter external validation, device transferability, longitudinal monitoring, and clinically interpretable indices for routine use

Biography: Francisco Javier Abellan Martínez

Francisco J. Abellán Martínez, MD, is an ophthalmologist specializing in anterior segment and glaucoma at Hospital Universitario de La Princesa (Madrid) and a collaborator with Universidad Autónoma de Madrid. His research focuses on AI-driven analysis of corneal and anterior-segment imaging for early keratoconus detection and postoperative bleb assessment. He has presented at national and international meetings, including SEO and ESCRS.

Distribution of corneal densitometry in different grades of keratoconus

Authors

Engy Mostafa[1], Amr Mounir[1], Islam Awny[1], Hassan Shams[2]

Affiliations

[1]Sohag University, Egypt

[2]Azhar University, Egypt

Abstract

Purpose: To evaluate the use of Scheimpflug tomography in corneal densitometry (CD) in comparing the stages of keratoconic eyes.

Methods: Keratoconic (KC) corneas (stages 1–3 classified according to the topographic parameters) were examined using the Scheimpflug tomographer (Pentacam, Oculus) using the CD software. CD was measured over three different depths (anterior stromal layer [120 μm], posterior stromal layer [60 μm], and middle stromal layer between these two layers), and concentric annular zones (0.0 to 2.0, 2.0 to 6.0, 6.0 to 10.0, and 10.0 to 12.0 mm diameter area).

Results: The study participantsvwere divided into three groups: keratoconus (KC) stage 1 (KC1) with 64 participants, keratoconus stage 2 (KC2) with 29 participants, and keratoconus stage 3 (KC3) with 36 participants. Comparing CD of all three layers (anterior, central, and posterior) of the cornea over different circular annuli (0–2, 2–6, 6–10, and 10–12 mm) revealed a significant difference in the 6–10 mm annulus between all groups and in all layers (P = 0.3, 0.2, and 0.2, respectively). Area under curve (AUC) was

done. It revealed that the central layer showed the highest specificity (93.8%) in comparing KC1 and KC2, whereas CD in the anterior layer between KC2 and KC3 had the highest specificity (86.2%).

Conclusion: CD showed increased values in the anterior corneal layer and in the annulus 6–10 mm more than other locations in all stages of KC.

Biography: Engy Mostafa

Dr. Engy Mostafa is an anterior segment and refractive surgeon and a faculty member in the Department of Ophthalmology at Sohag University. She completed her ophthalmology training at Sohag University Hospital and earned her PhD in refractive surgery, with part of her doctoral work conducted at UT Southwestern Medical Center in Dallas, Texas.

She serves as Managing Editor of the Sohag Medical Journal. Dr. Mostafa has an extensive publication record with an H-index of 11 and has participated in numerous international ophthalmology meetings.

Eyelid Cosmetics, Ocular Surface Inflammation, and Keratoconus: A Prospective Study with a Randomized Lid-Hygiene Sub-trial

Authors

Dishitha Rathod[1], Rohit Shetty[1], Swaminathan Sethu[1]

Affiliations

[1]Narayana Nethralaya, India

Abstract

Purpose:

Evaluation of eyelid cosmetics on ocular surface inflammatory-biomarkers in healthy individuals and in keratoconus (KC) patients, and to assess whether medicated tea tree oil (TTO) lid-wipes mitigate cosmetic-associated inflammation.

Methods:

In this prospective cohort study, healthy cosmetic users (n≈50) underwent ≥7-day cosmetic washout followed by 3 weeks of standardized eyelid cosmetic application. Tear samples were collected after washout and post-cosmetic use. A parallel KC-cohort

(with and without cosmetic use) was similarly profiled. Eight biomarkers relevant to ocular surface disease and KC were quantified using standardized multiplex "biomarker pathfinder" panel. Primary endpoints were MMP-9, IL-6, TNF-α, and ICAM-1; four additional markers were exploratory. In a randomized, parallel sub-trial, cosmetic users were assigned to TTO-based versus non-medicated wipes for makeup removal. The primary outcome was change in biomarker levels from washout to post-cosmetic use; secondary outcomes included intergroup differences (KC vs healthy) and the effect of lid hygiene. Significance was set at $\alpha=0.05$.

Results: In healthy eyes, cosmetics significantly upregulated MMP-9, IL-6, TNF-α, and ICAM-1 compared with washout (all $p<0.05$). KC eyes showed larger proportional increases (30–40%) over elevated baselines, exceeding changes in healthy controls. In the sub-trial, TTO-wipes reduced biomarker elevation by ~40% relative to non-medicated wipes ($p<0.05$).

Conclusions: Eyelid cosmetics induce measurable ocular surface inflammation, with disproportionately greater responses in KC. Medicated TTO lid-wipes mitigate this effect, supporting their prophylactic use. Given the implications for cross-linking and surface ablation, cosmetic hygiene should be emphasized in KC management. Longitudinal studies are warranted to test whether inflammation modulation influences disease progression.

Biography: Dishitha Rathod

Young, dynamic cataract and refractive surgeon with a keen interest in keratoconus.

Five-Year Follow-up of Telocyte Cells in Fresh Lenticule Transplantation for Advanced Keratoconus

Authors

Ceren Semiz[1], Faruk Semiz[1], Gamze Tanrıverdi[2], Merjem Purelku[3]

Affiliations

[1]Prishtina Eye Hospital, Kosovo, Albania

[2]Department of Histology and Embryology, Istanbul University-Cerrahpaşa, Türkiye

[3]Department of Histology and Embryology, Bahçeşehir University, Türkiye

Abstract

Purpose: To investigate the presence and potential of telocytes in the stroma extracted via SMILE (Small Incision Lenticule Extraction) surgery from keratoconus patients several years post-treatment.

Methods: This retrospective study included 60 eyes with stage 2–3 keratoconus (Amsler–Krumeich), corneal thickness between 300–419 μm, and indication for penetrating keratoplasty. Exclusion criteria were active anterior segment pathology, corneal thickness ≥420 μm, and prior corneal or anterior segment surgery. Fresh convex-shaped lenticules harvested from myopic SMILE donors were implanted into recipient corneas. To characterize telocytes and progenitor cells, six lenticule samples (one untreated and five postoperatively explanted at 1–5 years) were analyzed using CD34 immunohistochemistry, CD34/PDGFR-β and CD34/c-kit double immunofluorescence, and transmission electron microscopy

Results: In untreated keratoconic lenticules, CD34 staining revealed irregular, thinned collagen fibers and reduced stromal cell density with degenerative changes. At 1–3 years post-surgery, stromal cell density increased, including CD34-positive progenitor cells and telocytes, but declined after 4–5 years. Double immunofluorescence staining confirmed the unique immunophenotype and morphology of telocytes. At the 5-year follow-up, uncorrected distance visual acuity improved from 1.34 to 0.58 logMAR and corrected distance visual acuity from 1.11 to 0.43 logMAR. Central corneal thickness increased from 367.5 μm to 480.4 μm. K1 and K2 decreased from 53.16/59.93 to 51.35/54.89. The Q-value improved from −0.75 to −0.47. All changes were statistically significant ($p < 0.001$).

Conclusions: Fresh lenticule transplantation is a safe, cost-effective, and reliable procedure that enhances corneal thickness, improves visual acuity, and facilitates corneal repair.

Biography: Faruk Semiz

Faruk Semiz, MD is a practicing ophthalmologist and corneal surgeon based in Prishtina, Kosovo. He serves as the Head of the Ophthalmology Department at Eye Hospital in Prishtina. Over the years, he has developed particular expertise in SMILE-derived lenticule transplantation, keratoconus treatment, and corneal stromal implants for managing complex refractive errors, including post-LASIK hyperopia and presbyopia.

Mind the age gap when assessing keratoconus progression with Scheimpflug imaging

Authors

Bart Van Dooren[1], Hasan Shabani[1], Wishal Ramdas[1], Annette Geerards[2], Magda Smoor[1], Caroline Klaver[1]

Affiliations

[1]Erasmus Medical Center, Netherlands

[2]Rotterdam Eye Hospital, Netherlands

Abstract

Purpose: To evaluate age-related differences in corneal curvature and their possible implications for the detection of keratoconus progression. For this purpose, cross-sectional analysis of all European participants of the fourth cohort of the Rotterdam Study with at least one reliable Pentacam scan and virgin eyes was performed.

Methods: Assessed parameters were ARC, PRC, Kmax, and Kmean. Association with age was investigated using multiple linear regression models. ARC & PRC change rates were compared to the 80% confidence interval for keratoconus progression.

Results: 1785 participants met the study's eligibility criteria. Linear regression showed that ARC, PRC, Kmax, and Kmean changed with age in the same direction of keratoconus progression (P<.001). For every ten years of age, these parameters changed with -0.02mm, 0.04mm, 0.33D, and 0.18D, respectively.

Conclusion: These rates suggest that Pentacam might start to falsely indicate significant progression in ARC or PRC after 6 or 10.5 years of follow-up, respectively, because of normal age-related changes. Caution is therefore recommended when diagnosing keratoconus progression over longer time, as some changes might reflect normal corneal aging.

Biography: Bart Van Dooren

Corneal specialist with special interest in the pathophysiology of corneal disease, foremost Keratoconus.

Motion Tracking Brillouin Microscopy vs. Multimodal Corneal Imaging for Keratoconus Suspect Identification

Author

J. Bradley Randleman[1]

Affiliation

Cleveland Clinic Cole Eye Institute, United States

Abstract

Purpose: To compare the efficacy of Motion-tracking (MT) Brillouin microscopy and multimodal corneal imaging for keratoconus suspect identification.

Methods: Prospective cross-sectional study evaluating 56 eyes from 56 patients, including 28 eyes from 28 bilaterally normal control patients and 28 eyes from 28 keratoconus suspect patients. All patients underwent Scheimpflug, AS-OCT, Corvis ST) and MT Brillouin microscopy imaging using a custom-built device. All readily available metrics from each clinical device were evaluated. Motion-tracking (MT) Brillouin microscopy data included mean and focal minimum MT Brillouin values within the anterior plateau region. Sensitivity, specificity, and area under the receiver operating characteristic curves (AUROC) were calculated.

Results: No significant differences were found between groups in any basic demographic parameter except the thinnest corneal thickness (556 mm vs. 526 mm; $P < 0.001$). MT Brillouin outperformed all other imaging technologies in group differentiation. The best performing metrics evaluated included MT Brillouin minimum (AUC = 0.999, Sensitivity 100%, Specificity 96%) and mean (AUC 0.981, Sensitivity 93%, Specificity 100%), Corvis ST Tomographic and Biomechanical Index (TBI) (AUC 0.906, Sensitivity 71%, Specificity 96%), Pentacam Random Forest Index (PRFI) (AUC 0.870, Sensitivity 64%, Specificity 96%), Keratoconus Index (KI) (AUC 0.873, Sensitivity 61%, Specificity 96%), and Index of Height Decentration (IHD) (AUC 0.859, Sensitivity 64%, Specificity 89%). The best epithelial metric, Epi 5mm ST-IN, performed poorly (AUC = 0.641, Sensitivity 67%, Specificity 68%).

Conclusions: Motion-tracking Brillouin microscopy metrics effectively identified focal corneal weakening in keratoconus suspects, outperformed all multimodal imaging metrics, and performed optimally at differentiating keratoconus suspect eyes from normal controls.

Biography: J. Bradley Randleman

Dr. J. Bradley Randleman is a Professor of Ophthalmology at the Cleveland Clinic Lerner College of Medicine and a member of the Cleveland Clinic Cole Eye Institute. He earned his BA from Columbia College (Columbia University, New York) and his MD from Texas Tech University School of Medicine, where he was elected to Alpha Omega Alpha. He completed his Ophthalmology residency at Emory University School of Medicine.

At Emory, Dr. Randleman served on the faculty, held the role of Assistant Residency Director, and completed fellowship training in cornea, external disease, and refractive surgery. He later became Director of the Cornea Section and was named the Hughes Professor of Ophthalmology in 2016. He subsequently joined the Keck School of Medicine of USC as Professor of Ophthalmology and Director of the Cornea & Refractive Surgery Service at the USC Roski Eye Institute before transitioning to his current post at the Cleveland Clinic.

His clinical practice focuses on corneal and intraocular lens refractive surgery, including LASIK and the management of corneal ectatic disorders. His research centers on early detection and management of corneal ectasia, with contributions to biomechanical screening technologies such as Brillouin microscopy.

Dr. Randleman has authored more than 150 peer-reviewed articles, over 20 book chapters, and several textbooks in refractive surgery and corneal cross-linking.

Precision Microneedle-Enhanced Riboflavin Delivery for Customized Corneal Cross-Linking in Keratoconus Therapy

Authors

Jinhai Huang[1], Mei Yang[1], Zhongxing Chen[1], Xingtao Zhou[1]

Affiliation

[1]Eye & ENT Hospital, Fudan University, China

Abstract

Purpose: This study is to develop a customized CXL treatment for keratoconus, utilizing microneedles to precisely deliver riboflavin directly into the cornea, thereby improving the precision and efficacy of the treatment compared to conventional methods.

Methods: The study encompassed crafting of four unique microneedle mold, namely circular, semi-circular, annular, and butterfly-shaped. These molds served as templates for fabricating microneedle arrays that were preloaded with an optimized solution of riboflavin and hyaluronic acid. The microneedles were subsequently employed to gently

penetrate the corneal epithelium while preserving the integrity of the underlying stromal layer. Following the application of the microneedles, the riboflavin (RF) solution was replenished to augment the RF concentration within the stroma, leveraging the punctures created by the microneedles. Microneedles were applied to A-CXL, and efficacy was evaluated compared with conventional RF A-CXL protocol.

Results: The application of the customized microneedles led to a notable flattening of the corneal curvature in the treated zone. Replenishing the RF solution enhanced the stromal riboflavin content, which is crucial for effective cross-linking. Moreover, the treatment facilitated a swift postoperative recovery of corneal tissue, demonstrating the potential to reduce healing durations. Importantly, the customized corneal cross-linking effects proved to be comparable to those achieved through the conventional epi-off CXL protocol.

Conclusions: The integration of customized microneedle riboflavin delivery with CXL presents an innovative treatment modality for keratoconus. This approach offers a more precise and efficient alternative to conventional methods, affording the possibility to customize treatments according to individual patient requirements.

Biography: Jinhai Huang

Dr. Huang is a Shanghai Distinguished Professor (Oriental Scholar), Researcher, Associate Chief Physician, and Doctor of Medicine at the Eye & ENT Hospital and Eye Institute of Fudan University. He serves as Master and Post-doctoral Supervisor, Executive Vice-President of the Medical-Engineering Research Institute of the Eye & ENT Hospital, Vice Director of the Department of Optometry at Fudan University, and Vice Director of both the Shanghai Optometry Research Center and the OCULUS Asia-Pacific Research and Training Center.

His clinical and research work spans myopia prevention and control, refractive surgery planning, IOL power calculation, keratoconus screening, and corneal cross-linking. His scientific interests extend to interdisciplinary advances in ophthalmology and optometry, including ocular biometric measurement, gene editing, and nanobiomaterials.

Dr Huang, is the Shanghai Distinguished Professor (Oriental Scholar), Dr. Huang has published more than 170 academic papers in leading journals such as Nature Communications, ACS Nano, Ocular Surface, Chemical Engineering Journal, Ophthalmology, and Carbohydrate Polymers.

Prospective Insights into Risk Factors, Disease Severity, and Management Outcomes in a Large Keratoconus Cohort from India

Authors

Namrata Sharma[1], Shivam Sharma[1], Lata Singh[1], Seema Sen[1], Seema Kashyap[1]

Affiliations

[1]All India Institute of Medical Sciences, New Delhi, India

Abstract

Purpose: Keratoconus is a progressive corneal ectasia affecting young individuals. This study prospectively evaluated demographic, clinical, and topographic features of Indian keratoconus (KC) patients and assessed outcomes following corneal cross-linking (CXL), deep anterior lamellar keratoplasty (DALK), and scleral contact lens fitting.

Method: This prospective study included 710 Indian patients (1420 eyes) diagnosed with KC at a tertiary eye care centre. Clinical data including demographics, risk factors, and lifestyle habits were recorded. Severity was graded by Pentacam-based indices. Surgical (CXL, DALK) and scleral lens outcomes were analysed, with visual acuity and topographic changes documented.

Result: Mean age at diagnosis was 21.60 ± 7.86 years; mean KC onset was 15.95 ± 7.92 years. Males represented 69.3%. Eye rubbing (64.15%), atopy (62.39%), and family history (12.11%) were prominent risk factors. Average screen exposure was 5.35 ± 3.00 h/day. Bilateral KC was seen in 79.86%. Severity distribution was mild (31.1%), moderate (49.3%), and advanced (19.6%). Mean Kmax was 57.19 ± 12.05 D; thinnest pachymetry was 443.00 ± 70.78 µm.

CXL stabilised topographic profiles in early and moderate KC, though some eyes showed transient haze-related visual decline. DALK, indicated for advanced/scarred corneas, yielded marked visual improvement and anatomical restoration. Scleral lenses significantly improved vision in irregular astigmatism, especially post-CXL and in advanced nonsurgical cases.

Conclusion: This large prospective study provides insights into epidemiology and clinical patterns of Indian KC. Tailored management with CXL, DALK, and scleral lenses ensures optimal outcomes across disease stages.

Biography: Namrata Sharma

Prof. Namrata Sharma, MD, DNB, FRCSEd, FRCOphth, is an internationally acclaimed ophthalmologist specializing in cornea, cataract, and refractive surgery. She is

Professor of Ophthalmology and Head of Unit-IV, Cornea, Cataract & Refractive Surgery Services at the Dr. Rajendra Prasad Centre, All India Institute of Medical Sciences (AIIMS), New Delhi. After completing her training at AIIMS, she pursued a fellowship at Moorfields Eye Hospital, London.

Her clinical expertise spans advanced cataract surgery, refractive procedures including LASIK, PRK, SMILE, and phakic IOLs, as well as corneal transplantation techniques such as DALK, DSAEK, and DMEK. She has contributed significantly to ocular surface disease, keratoprosthesis, and stem cell therapy.

Prof. Sharma has published over 580 peer-reviewed articles, **Author**ed more than 100 book chapters, and holds two patents. She has held several key leadership positions in national and international ophthalmic societies and has received numerous prestigious awards recognizing her outstanding contributions to ophthalmology.

Risk of Early Cataract Development and Lens Densitometric Changes Associated With Keratoconus Severity in Pediatric Patients

Authors

Kağan Dalkılıç[1], Huseyin Bugra Turk[1], Pinar Kosekahya[1], Kuddusi Teberik[1], Kemal Tekin[1]

Affiliation

[1]Ulucanlar Göz Eğitim ve Araştırma Hastanesi, Türkiye

Abstract

Purpose: To compare lens densitometry and keratometric parameters between pediatric keratoconus patients and healthy controls and assess whether keratoconus severity is associated with early cataract risk.

Methods: We analyzed 65 eyes of 45 pediatric keratoconus patients and 58 eyes of 37 controls. After pharmacologic dilation, Pentacam corneal topography measured Kmax, Kmean, thinnest corneal thickness (TCT), and lens densitometry (PDZ-1/-2/-3, mean PDZ). Group comparisons and correlation analyses were performed.

Results: PDZ values did not differ between groups (PDZ-1 $p=0.135$; PDZ-2 $p=0.531$; PDZ-3 $p=0.263$; mean $p=0.779$). In keratoconus, Kmean showed a positive correlation with mean PDZ ($r=0.282$, $p=0.023$), while TCT showed negative correlations with PDZ-2 ($r=-0.318$, $p=0.010$) and mean PDZ ($r=-0.298$, $p=0.016$).

Conclusions: Overall, densitometry did not differ from controls, yet greater disease severity was associated with significant changes. Higher Kmean correlated positively

with lens densitometry, while lower TCT correlated negatively. These findings suggest ectatic progression may contribute to cataract development beginning in childhood.

Biography: Kağan Dalkiliç

Dr. Kağan Dalkılıç is a resident physician in ophthalmology at Ulucanlar Eye Training and Research Hospital in Türkiye. He received his medical degree (MD) from Ankara University Faculty of Medicine in 2017 and began his ophthalmology residency and research training at Ulucanlar in 2024.

His current work focuses on clinical ophthalmology and research within the hospital's ophthalmology department.

Structural and Biomechanical Characterisation of Porcine-derived Lenticules

Authors

Maryam Boutkhil[1], John Marshall[1], Abby Wilson[1]

Affiliation

[1]University College London, London, United Kingdom

Abstract

Purpose: Porcine-derived Xenia lenticules are a regulatory-approved promising treatment for advanced keratoconus, with excellent biocompatibility and wide availability. Surgical outcomes of the implantation are dictated by several parameters, including lenticule extraction site, processing methods, insertion techniques, and implantation depth, which together influence biomechanical stability, visual restoration, and the risk of complications.

Methods: Using Second Harmonic Generation Microscopy for structural imaging and Interferometry for biomechanical assessment, non-operated corneas were evaluated under physiological pressures to establish a baseline analysis of stromal collagen structure. Differences between lenticule extraction depths, as well as the impact of processing techniques, were then assessed.

Results: Corneas showed a distinct depth-dependent structure which related closely to spatial biomechanical properties. Lenticules from different corneal sites had different structures, making it a critical parameter for integration within the host cornea.

Processed lenticules differed from unprocessed ones, both in collagen architecture and biomechanical stiffness.

Conclusion: This study highlights that lenticule properties depend on extraction sites and processing techniques. Structural differences between different extraction sites, along with biomechanical differences between processed and unprocessed lenticules, suggest that optimisation of these parameters is essential to maximise integration, enhancing biomechanics, and improving the clinical potential of corneal additive surgery.

Biography: Maryam Boutkhil

Maryame Boutkhil is a recent medical graduate currently pursuing a PhD at University College London under the supervision of Dr. Abby Wilson and Prof. John Marshall, focusing on optical imaging of corneal biomechanics in ectatic disorders and refractive surgeries.

Cross-Linking - Basic and Clinical Research

Experimental Studies to Enhance the Efficacy of Corneal Crosslinking

Authors

Yu Liu[1], Qingyan Zeng[2], Xinlan Lei[1], Mengying Qi[2], Lan Ke[2], Jin Que[2]

Affiliations

[1]Aier Eye Hospital of Wuhan University (Wuhan Aier Eye Hospital), China

[2]Hankou Aier Eye Hospital, China

Abstract

Objective: To evaluate chitosan (CS) as an adjunct to corneal cross-linking (CXL) for improving treatment outcomes in keratoconus.

Method: Ninety rabbit right eyes were divided into groups: accelerated CXL (ACXL), ACXL with 0.2% chitosan soaking after de-epithelialization for 20mins (CS-ACXL), and controls. Riboflavin concentration was measured via UHPLC-MS/MS. CCT, SSI, and collagen modulus (k1) using finite element analysis (FEA) were assessed at 7, 14, and 28 days. Imaging and histology via slit-lamp examination, OCT, IVCM, HE staining, second-harmonic generation (SHG) microscopy, two photon (TP) fluorescence microscopy were performed. And quantitatively comparing fluorescence integrated-intensity (FI) were performed to exam structural changes at 0, 7, 14, and 28 days after surgery

Results: Riboflavin uptake was similar between groups. At 14 days, k1 was significantly increased in both ACXL (36.94 ± 5.84 MPa) and CS-ACXL (37.98 ± 4.56 MPa) groups compared to controls (27.85 ± 1.57 MPa, $P < 0.001$). At 28 days, stiffness in the CS-ACXL group (36.72 ± 6.89 MPa) remained significantly higher than both controls ($P < 0.001$) and the ACXL group (31.46 ± 5.72 MPa, $P = 0.03$). The CS-ACXL group also showed notably higher fluorescence intensity at 7 days ($P = 0.007$), reduced inflammation, and more regular collagen structure.

Conclusion: Using 0.2% chitosan in CXL is safe for at least 28 days. While it doesn’t enhance riboflavin absorption, it improves corneal stiffness, promotes organized collagen remodeling, and suppresses inflammation.

Biography: Yu Liu

Dr. Liu Yu, MD, is an Attending Ophthalmologist with more than a decade of specialized clinical experience. He has **Author**ed two peer-reviewed SCI-indexed research articles, led a municipal-level scientific research project, and contributed to multiple provincial research initiatives. He is also a co-**Author** of a professional ophthalmology textbook and a frequent presenter at national and international conferences, reflecting his strong commitment to advancing ophthalmic research and clinical practice.

Establishing a Chicken Model of Corneal Crosslinking: A Pilot Study with UVA/Riboflavin and Transglutaminase

Authors

Byung Soo Kang[1], Mingjie Chen[1], Yong-ping Zheng[2], Chea-su Kee[1]

Affiliations

[1]School of Optometry, The Hong Kong Polytechnic University

[2]Department of Biomedical Engineering, The Hong Kong Polytechnic University,

Abstract

Purpose: Corneal crosslinking (CXL) has revolutionized the management of keratoconus, yet its influence on refractive development remains underexplored. This study aims to address this gap by establishing a chicken model, a widely utilized animal in vision research, to evaluate the biomechanical efficacy of ultraviolet-A/riboflavin (UVA/R) and transglutaminase (Tgase)-induced CXL.

Methods: Fifteen 6-day-old chicks were anesthetized, and the corneal epithelium of one eye was debrided over a 3 mm diameter area. The chicks were then randomly allocated to three groups (n=5 each) to receive CXL treatments: 1) UVA/R CXL at 3 mW/cm^2, 2) Tgase CXL with topical application of 2 U/mL Tgase, and 3) untreated controls. Thirty minutes after treatment, corneal strips (2 x 3mm) were collected for biomechanical testing using a calibrated, custom-built extensometer. An independent t-test was performed for statistical analysis, with all parameters expressed as mean ± standard deviation.

Results: UVA/R CXL significantly stiffened the cornea compared with controls (tangent modulus: 9.87±3.39 vs. 1.86±0.88 MPa at 20% strain, $p<0.001$; 16.39±4.44 vs. 3.95±0.85 MPa at 30% strain, $p<0.001$). Tgase CXL also produced a comparable stiffening effect (6.74±3.94 MPa at 20% strain, $p<0.05$; 11.39±2.85 MPa at 30% strain, $p<0.001$).

Conclusions: Both UVA/R and Tgase CXL effectively enhanced corneal biomechanics in the chicken model. These findings validate the feasibility of enzymatic crosslinking as an alternative to conventional UVA/R CXL and establish a foundation for future studies investigating the role of corneal biomechanics in refractive development.

Biography: Byung Soo Kang

My primary research interest is the role of corneal mechanobiology in refractive development. While corneal biomechanics measurements have become a routine clinical practice, the influence of corneal biomechanics on corneal structures and refractive development remains largely unknown. To achieve a deeper understanding of corneal mechanobiology, I have employed a non-invasive corneal biomechanics technique and utilized a cutting-edge proteomics approach on a novel animal model with altered corneal biomechanics.

Five-year corneal densitometry outcomes after cross-linking in pediatric keratoconus

Authors

Huseyin Bugra Turk[1], Pinar Kosekahya[1], Kuddusi Teberik[1], Serra Akyüz Bilgin[1]

Affiliations

[1]Ulucanlar Göz Eğitim ve Araştırma Hastanesi, Ankara, Türkiye

Abstract

Purpose: To evaluate long-term changes in corneal densitometry during a 5-year follow-up in pediatric keratoconus patients treated with corneal cross-linking (CXL).

Methods: Corneal densitometry was assessed using Scheimpflug imaging (Pentacam HR) in the 0-2 mm, 2-6 mm, 6-10 mm and 10-12 mm zones across anterior (120 μm), posterior (60 μm), and central stromal layers. Measurements were recorded preoperatively and at 6 months, 12 months and 5 years after epithelium-off CXL.

Results: Corneal densitometry significantly increased after CXL across anterior, central, posterior, and total layers ($p<0.001$). The most pronounced increase was observed in the anterior 0-2 mm zone within six months ($p<0.001$), followed by stabilization ($p>0.05$). In contrast, the 6-10 mm zone showed no significant early increase ($p>0.05$).

Conclusions: CXL induces persistent increases in corneal densitometry in pediatric keratoconus, with early stabilization in the central anterior zone. Total corneal densitometry remained stable at the end of the first year, supporting the long-term safety profile of the procedure. Longitudinal densitometry measurements may serve as

an objective parameter for monitoring corneal transparency and long-term outcomes after CXL.

Biography: Huseyin Bugra Turk

He was born in 1988 and graduated from Istanbul University Cerrahpaşa Faculty of Medicine in 2012. In 2020, he completed his residency training in the Department of Ophthalmology at Necmettin Erbakan University Meram Faculty of Medicine and became a specialist in ophthalmology. He is currently working at the Cornea Unit of the Ophthalmology Clinic, Ulucanlar Eye Training and Research Hospital. He is married and the father of three children.

Graphitic Carbon Nitride Quantum Dots for Enhanced Corneal Crosslinking

Authors

Jinhai Huang[1], Mei Yang[1], Xingtao Zhou[1]

Affiliation

Eye & ENT Hospital, Fudan University, China

Abstract

Purpose: To address the limitations (in-situ hypoxia) of accelerated corneal crosslinking (A-CXL) in the treatment of keratoconus, we propose the development of a novel, oxygen self-sufficient platform utilizing graphitic carbon nitride quantum dots (g-C3N4 QDs) to augment the treatment efficacy.

Methods: The study involved the synthesis of biocompatible g-C3N4 QDs and their composite with riboflavin (RF@g-C3N4 QDs), intended to serve as photocatalytic oxygen-generating nanomaterials during A-CXL. Detailed assessments were conducted to evaluate the oxygen generation capability, reactive oxygen species (ROS) yield, and biosafety of these materials. Furthermore, their A-CXL efficacy were evaluated on male New Zealand white rabbits and compared with the conventional epi-off RF A-CXL protocol.

Results: The g-C3N4 QDs and RF@g-C3N4 QDs composites exhibited excellent photocatalytic oxygen generation, elevated ROS yield, and outstanding biosafety. In the rabbit model, these materials proved to be significantly more effective in strengthening

the cornea after A-CXL compared to the RF protocol, suggesting a more effective treatment.

Conclusions: The study concludes that g-C3N4 QDs-based platforms possess notable potential for application in A-CXL, offering a promising approach to enhance corneal strength and treat corneal diseases, such as keratoconus and corneal ectasias. These findings prompt us to propose the potential application of g-C3N4 QDs in A-CXL for the treatment of corneal ectasias and various other corneal diseases.

Biography: Jinhai Huang

Dr. Huang is the Shanghai Distinguished Professor (Oriental Scholar), Researcher, Associate Chief Physician, and Doctor of Medicine at the Eye & ENT Hospital and Eye Institute of Fudan University. He serves as Master and Post-doctoral Supervisor, Executive Vice-President of the Medical-Engineering Research Institute of the Eye & ENT Hospital, Vice Director of the Department of Optometry at Fudan University, and Vice Director of both the Shanghai Optometry Research Center and the OCULUS Asia-Pacific Research and Training Center.

His clinical and research work spans myopia prevention and control, refractive surgery planning, IOL power calculation, keratoconus screening, and corneal cross-linking. His scientific interests extend to interdisciplinary advances in ophthalmology and optometry, including ocular biometric measurement, gene editing, and nanobiomaterials.

Dr. Huang has published more than 170 academic papers in leading journals such as Nature Communications, ACS Nano, Ocular Surface, Chemical Engineering Journal, Ophthalmology, and Carbohydrate Polymers.

Impact of Central vs Peripheral Cone Location on Corneal Cross-Linking Success in Pediatric Keratoconus

Authors

Rojda Yardımcı[1], Pinar Kosekahya[1], Huseyin Bugra Turk[1], Kuddusi Teberik[1]

Affiliations

[1]Ulucanlar Göz Eğitim ve Araştırma Hastanesi, Türkiye

Abstract

Purpose: To investigate the effect of cone location (central vs peripheral) on keratoconus progression after corneal cross-linking (CXL) in pediatric patients over a one-year follow-up.

Methods: This study included 48 eyes of 37 pediatric keratoconus patients. Eyes were grouped by cone location. Pre/postoperative tomography assessed Kmax, astigmatism, BCVA, CCT, and Belin ABCD parameters: A (anterior radius), B (posterior radius), C (corneal thickness), and D (distance visual acuity).

Results: The mean age was 15.97 ± 1.88 years (24 males, 13 females). No significant differences were found between groups in postoperative changes at 6 and 12 months ($p>0.05$). Preoperative ARC, A, PRC, B, C, and Kmax differed significantly between groups ($p<0.05$), though postoperative change magnitudes were similar ($p>0.05$).

Conclusions: Topographic comparisons showed greater keratoconus severity in the peripheral cone group. However, postoperative topographic changes were similar between groups. Thus, cone location (central vs. peripheral) may not significantly impact CXL outcomes despite greater severity. Further research is needed to confirm these findings.

Biography: Rojda Yardımcı

Born in 1997 in Denizli, Turkey, Dr. Yardımcı graduated from the Faculty of Medicine at Ordu University in 2021. After completing one year of general practice, he began his ophthalmology residency at Ulucanlar Eye Hospital in 2023, where he continues his training and clinical work.

Relationship of Cone Localization With Topographic Outcomes After Corneal Cross-Linking in Pediatric Keratoconus: 5 Years

Authors

Serra Akyüz Bilgin[1], Huseyin Bugra Turk[1], Pinar Kosekahya[1], Kuddusi Teberik[1]

Affiliations

[1]Ulucanlar Göz Eğitim ve Araştırma Hastanesi, Türkiye

Abstract

Purpose: This study aimed to investigate the relationship between the distance of the cone center, calculated from the total corneal refractive power map to the corneal

vertex (offset) and the topographic changes observed during a 5-year follow-up after corneal cross-linking (CXL) in pediatric keratoconus patients.

Methods: A total of 61 eyes from 48 pediatric keratoconus patients treated with epithelium-off CXL were retrospectively analyzed. Corneal topography (Pentacam®, Oculus) was performed preoperatively and at 6,12, and 60 months postoperatively. Correlations of cone offset with maximum keratometry (Kmax), pachymetry, higher-order aberration, asphericity, coma 0, coma 90, densitometry, and RMS were evaluated.

Results: The mean patient age was 16.04 ± 1.71 years (29 males, 19 females). Preoperative offset value was 1.59 ± 0.4 mm. No correlation was found in 6-month postoperative changes. At 12 and 60 months, as the cone offset value increased, the changes in Kmax and total RMS were found to decrease (both $p<0,05$).

Conclusions: Preoperative cone offset may predict CXL response and keratoconus progression in pediatric patients. A greater treatment effect was noted as the cone center approached the corneal vertex, likely reflecting central marking of standard CXL. Further studies should assess whether individualized centration by cone offset improves outcomes.

Biography: Serra Akyüz Bilgin

She was born in 1996 and graduated from Karadeniz Technical University Faculty of Medicine in 2020. Following her graduation, she worked as a general practitioner in the emergency department for two years. In 2022, she started her residency in ophthalmology at Ulucanlar Eye Training and Research Hospital, where she is currently continuing her training.

Study of the effect on the cornea and ultrastructure of collagen fiber treated with Secondary Transepithelial Corneal Collagen Cross-Linking: A Comparative Experimental Study

Authors

Wei Shengsheng[1]

Affiliation

[1]Shannxi Eye Hospital, Xi'an People's Hospital (Xi'an Fourth Hospital), Affiliated People's Hospital of Northwest University, Xi'an, China

Abstract

Purpose: To evaluate the safety and Ultrastructure of corneal collagen fibers of secondary transepithelial corneal collagen cross-linking (CXL) compared to a single CXL procedure in a rabbit model.

Methods: Ten New Zealand White rabbits were divided into two groups (n=5 each). In Group 1, the right eye underwent a single rapid transepithelial CXL. In Group 2, the right eye received a second CXL procedure 1 month after the first CXL. Postoperative evaluations included slit-lamp, anterior segment OCT, and corneal endothelial cell counts at 1 week and 1 month.

Results: Slit-lamp examinations revealed clear corneas without epithelial injury, haze, or scars in both groups post-CXL. OCT demonstrated statistically thinner central corneal thickness in the secondary CXL group compared to single CXL and controls at 1 week ($p<0.05$), with hyperreflective stromal fibrolamina observed at 1 month. Group 2 exhibited greater cross-linking depth (278 ± 32 μm) than Group 1 (212 ± 28 μm; $p<0.05$). Endothelial cell counts remained unchanged compared to controls ($p>0.05$).TEM imaging identified transverse, longitudinal, and oblique collagen lamellar layers in the central stroma, with scattered fibrils. Both CXL groups showed significant increases in anterior stromal collagen fiber diameter and cross-sectional area versus controls ($F=25.153$, 27.368; $p<0.001$). Group 2 demonstrated larger increases than Group 1 ($F=21.364$, 19.098; $p<0.001$), with cross-sectional area rising by 31.37% (Group 2) and 19.53% (Group 1).

Conclusion: Secondary transepithelial CXL is safe (no endothelial toxicity), induces more stromal remodeling vs single CXL, may boost biomechanical efficacy, supporting further study for progressive keratoconus.

Biography: Wei Shengsheng

Dr. Shengsheng Wei is a Doctor of Ophthalmology and Deputy Chief Physician at the Refractive Center. He is a member of the Eye Health Branch of the Chinese Association of Health Promotion and Education. His work focuses on myopia prevention and control, refractive error correction, keratoconus management with corneal collagen cross-linking, and basic research on femtosecond lasers and corneal tissue.

He has independently performed more than 30,000 laser corneal refractive procedures and corneal collagen cross-linking surgeries for keratoconus. His research includes corneal and keratoconus biomechanics, corneal sensory changes and color vision changes after refractive surgery, postoperative corneal sensation after all-femtosecond laser procedures, femtosecond laser–induced ultrastructural corneal changes, and laser cutting precision in corneal tissue. He has published more than 40 papers in SCI-indexed and core Chinese journals.

Special Section: Abstracts from Young Italian Residents

Comparison of SLAK and BSI in the Treatment of Keratoconus: Visual, Structural, and Statistical Results

Author

Sarah Donatelli[1]

Affiliations

[1]Università degli Studi "G. d'Annunzio" Chieti–Pescara, Italy

Abstract

Purpose: To compare visual, structural, and transparency outcomes after Stromal Lenticule Addition Keratoplasty (SLAK) versus Bowman Stromal Inlay (BSI) in keratoconus.

Methods: A retrospective analysis of 13 patients: 8 treated with SLAK and 5 with BSI. Visual acuity, keratometry, pachymetry, epithelial/stromal thickness, and clarity were assessed preoperatively and at 3 and 6 months. Friedman tests evaluated changes.

Results: SLAK achieved significant improvements in UDVA, CDVA ($p<0.001$), curvature metrics ($p<0.01$), and stromal/epithelial thickness ($p<0.01$), with preserved transparency. BSI showed no significant improvements except mild stromal thickening ($p=0.04$).

Conclusions: SLAK produced superior short-term functional and anatomical improvements versus BSI. Excimer laser–reshaped lenticules maintained transparency, supporting their future use for customized stromal augmentation.

Post-Refractive Surgery Corneal Ectasia After LASIK and SMILE: Management With Iontophoresis CXL and SLAK Technique

Author

Cesare Persavalli[1]

Affiliations

[1]Università degli Studi "G. d'Annunzio" Chieti–Pescara, Italy

Abstract

Purpose: To report bilateral post-refractive ectasia following LASIK and SMILE in the same patient, treated with iontophoresis-assisted CXL and SLAK.

Methods: A 23-year-old patient developed ectasia two years after LASIK (RE) and SMILE (LE). OCT confirmed progression. The RE underwent iontophoresis CXL; the LE underwent SLAK with stromal lenticule implantation into the SMILE pocket.

Results: The RE stabilized after iontophoresis CXL. The LE showed pachymetry restoration, a 6 D Kmax reduction, and BSCVA improvement from <2/10 to 6/10 (10/10 with CL). No further progression occurred.

Conclusions: Ectasia can follow both LASIK and SMILE. SLAK may restore biomechanical stability and visual function in advanced post-SMILE ectasia.

Evaluation of Keratoconus Progression Through a Multiparametric and Multimodal Analysis

Author

Nicolò Valsecchi[1]

Affiliation

[1]Università degli Studi di Brescia, Italy

Abstract

Purpose: To compare keratoconus progression parameters between Precisio® and Pentacam HR® and determine device interchangeability.

Methods: Eighty-eight eyes of 44 patients were examined using both tomographers at T0 and T1. Progression was defined as thinnest point reduction ≥20 µm and/or Kmax increase >1.0 D. Bland–Altman plots assessed agreement.

Results: Good mean agreement was found (Kmax bias −0.28 D; TCT bias +4.98 μm), but limits of agreement were wide, precluding interchangeability. Precisio detected progression in 22% versus 11.5% with Pentacam (RR 1.90; $p=0.12$).

Conclusions: Both devices reliably assess morphology, but longitudinal follow-up requires consistent use of the same platform. Multiparametric analysis remains essential for progression detection.

The Role of Epithelial Mapping in Differentiating Keratoconus From Pseudo-Ectasia: Two Contrasting Clinical Cases

Authors

Laura Longo[1], Maria Luisa Ferrato[1], Pietro Rosetta[1], Riccardo Vinciguerra[1]

Affiliations

[1]Humanitas San Pio X, Milan; Humanitas University, Rozzano (MI), Italy

Abstract

Purpose: To demonstrate the diagnostic value of epithelial thickness mapping in distinguishing keratoconus from pseudo-ectasia.

Methods: Two patients with abnormal topography underwent MS-39 tomography, including epithelial, curvature, pachymetric, and clinical assessment.

Results: Patient 1 showed epithelial hyperplasia mimicking ectasia; epithelial removal normalized topography. Patient 2 showed epithelial thinning over the cone apex, confirming keratoconus.

Conclusions: Epithelial mapping is critical for differentiating structural keratoconus from epithelial remodeling-induced pseudo-ectasia, preventing misdiagnosis in early presentations.

The MASI Index: A Novel Aberrometric Parameter Sensitive to High-Order Scattering in Early Fuchs Endothelial Dystrophy

Authors

Andrea Nastasi[1], Anna Bulfon[2], Pietro Rosetta[3], Riccardo Vinciguerra[3]

Affiliations

[1]Department of Biomedical Sciences, Humanitas University, Milan, Italy

[2]Department of Medicine – Ophthalmology, University of Udine, Italy

[3]Department of Ophthalmology, Humanitas San Pio X Hospital, Milan, Italy

Abstract

Purpose: To evaluate the diagnostic sensitivity of MASI, a novel micro-aberration scattering index capturing high-order scattering beyond the seventh Zernike order in early Fuchs endothelial dystrophy (FED).

Methods: Twenty-nine pseudophakic FED patients and 29 controls underwent Osiris aberrometry. The MASI index was computed from residual high-order wavefront components. Correlations with acuity, pachymetry, and endothelial density were analyzed.

Results: MASI was significantly higher in FED (44.09±32.03) versus controls (27.28±10.65; $p=0.011$), without correlation to VA, pachymetry, or cell density.

Conclusions: MASI identifies microscopic optical scattering independent of structural parameters, and may serve as an early biomarker of subclinical FED.

Aseptic Corneal Melting Following Epi-Off Collagen Cross-Linking: Advantages of a Staged Surgical Approach

Authors

Marian Sergiu Zimbru[1,2], Antonio Moramarco[1,2], Luigi Fontana[1,2]

Affiliations

[1]Ophthalmology Unit, Department of Medical and Surgical Sciences, Alma Mater Studiorum – University of Bologna, Italy

[2]IRCCS Azienda Ospedaliero-Universitaria di Bologna, Italy

Abstract

Purpose: To describe severe aseptic corneal melting after epi-off accelerated CXL and its management using a staged surgical strategy.

Methods: A 12-year-old male developed rapid stromal melting two days post-CXL. Negative microbiology and atopic history were noted. Conservative therapy failed; a conjunctival (Gundersen) flap was performed, followed by DALK after stabilization.

Results: The conjunctival graft arrested melting and prevented perforation, enabling elective DALK. At 12 months, BCVA reached 20/25 without complications.

Conclusions: Although rare, severe melting can occur after CXL in predisposed patients. A staged approach can stabilize the cornea and allow DALK instead of emergent PK.

Structural and Cellular Characterization of Post-CXL Super-Flattened Corneas: Evidence of Keratocyte Depletion

Authors

Arianna Serraiotto[1], Erika Bonacci[2], Riccardo Vinciguerra[3], Paolo Vinciguerra[3], Emilio Pedrotti[1]

Affiliations

[1]Eye Clinic, University of Verona, Italy

[2]Department of Engineering for Innovation Medicine, University of Verona, Italy

[3]Department of Ophthalmology, IRCCS Humanitas Research Hospital, Milan, Italy

Abstract

Purpose: To investigate structural and cellular characteristics of super-flattened corneas after CXL using in vivo confocal microscopy (IVCM).

Methods: Multicentre study of post-CXL patients (2023–2025). Super-flattened corneas (≥5.00 D Kmax reduction) were compared to non-flattened controls. IVCM evaluated epithelial, stromal, and endothelial morphology and keratocyte density.

Results: Thirty patients (15 per group) were included. Super-flattened corneas exhibited significantly reduced keratocyte density ($p<0.05$), particularly in anterior stroma ($p<0.01$), with mid-stromal depletion in a subset. No differences in age, axial length, or thickness were observed.

Conclusions: Super-flattening after CXL is associated with keratocyte depletion, suggesting impaired stromal repopulation as a mechanism for biomechanical collapse. Early detection may guide long-term monitoring.

Clinical Use of a Multilayer Perceptron Network Algorithm in Very Asymmetric Ectasia: A Case Series

Authors

Maria Luisa Ferrato[1], Laura Longo[1], Pietro Rosetta[1], Riccardo Vinciguerra[1]

Affiliations

[1]Humanitas San Pio X, Milan; Humanitas University, Rozzano (MI), Italy

Abstract

Purpose: To assess the performance of the MS-39 tomographer's neural network algorithm in detecting ectasia in very asymmetric ectasia (VAE).

Methods: Fifteen VAE patients were evaluated using MS-39 tomography. ANN classifications were compared with clinical/tomographic findings.

Results: The ANN correctly identified all ectatic eyes (100%). Among fellow eyes, 40% were classified as normal, 33.3% as borderline, and 26.6% as keratoconus.

Conclusions: The MS-39 neural network accurately detected ectatic patterns in VAE, supporting its role as an adjunctive tool for early ectasia recognition.