Bibliographie

43.1. Histopathologie du kératocône

[1] Sherwin T, Brookes NH. Morphological changes in keratoconus : pathology or pathogenesis. Clin Experiment Ophthalmol 2004;32(2):211–7.
[2] Santodomingo-Rubido J, Carracedo G, Suzaki A, et al. Keratoconus : an updated review. Contact Lens Anterior Eye J Br Contact Lens Assoc 2022;45(3), 101559.
[3] Reinstein DZ, Archer TJ, Gobbe M. Corneal epithelial thickness profile in the diagnosis of keratoconus. J Refract Surg Thorofare NJ 1995 2009;25(7):604–10.
[4] Sandali O, El Sanharawi M, Temstet C, et al. Fourier-domain optical coherence tomography imaging in keratoconus : a corneal structural classification. Ophthalmology 2013;120(12):2403–12.
[5] Kanellopoulos AJ, Aslanides IM, Asimellis G. Correlation between epithelial thickness in normal corneas, untreated ectatic corneas, and ectatic corneas previously treated with CXL ; is overall epithelial thickness a very early ectasia prognostic factor ? Clin Ophthalmol Auckl NZ 2012;6:789–800.
[6] Hollingsworth JG, Bonshek RE, Efron N. Correlation of the appearance of the keratoconic cornea in vivo by confocal microscopy and in vitro by light microscopy. Cornea 2005;24(4):397–405.
[7] Niederer RL, Perumal D, Sherwin T, McGhee CNJ. Laser scanning in vivo confocal microscopy reveals reduced innervation and reduction in cell density in all layers of the keratoconic cornea. Investig Opthalmology Vis Sci 2008;49(7):2964.
[8] Ebihara N, Funaki T, Matsuda H, et al. Corneal abnormalities in the NC/Nga mouse : an atopic dermatitis model. Cornea 2008;27(8):923–9.
[9] Kim WJ, Rabinowitz YS, Meisler DM, Wilson SE. Keratocyte apoptosis associated with keratoconus. Exp Eye Res 1999;69(5):475–81.
[10] Kaldawy RM, Wagner J, Ching S, Seigel GM. Evidence of apoptotic cell death in keratoconus. Cornea 2002;21(2):206–9.
[11] Collier SA. Is the corneal degradation in keratoconus caused by matrix-metalloproteinases? Clin Experiment Ophthalmol 2001;29(6):340–4.
[12] Wilson SE, He YG, Weng J, et al. Epithelial injury induces keratocyte apoptosis : hypothesized role for the interleukin-1 system in the modulation of corneal tissue organization and wound healing. Exp Eye Res 1996;62(4):325–7.
[13] Sykakis E, Carley F, Irion L, et al. An in depth analysis of histopathological characteristics found in keratoconus. Pathology (Phila) 2012;44(3):234–9.
[14] Sawaguchi S, Fukuchi T, Abe H, et al. Three-dimensional scanning electron microscopic study of keratoconus corneas. Arch Ophthalmol Chic Ill 1960 1998;116(1):62–8.
[15] Naderan M, Jahanrad A, Balali S. Histopathologic findings of keratoconus corneas underwent penetrating keratoplasty according to topographic measurements and keratoconus severity. Int J Ophthalmol 2017;10(11):1640–6.
[16] Zimmermann DR, Fischer RW, Winterhalter KH, et al. Comparative studies of collagens in normal and keratoconus corneas. Exp Eye Res 1988;46(3):431–42.
[17] Takahashi A, Nakayasu K, Okisaka S, Kanai A. Quantitative analysis of collagen fiber in keratoconus. Nippon Ganka Gakkai Zasshi 1990;94(11):1068–73.
[18] Fullwood NJ, Tuft SJ, Malik NS, et al. Synchrotron x-ray diffraction studies of keratoconus corneal stroma. Invest Ophthalmol Vis Sci 1992;33(5):1734–41.
[19] Winkler M, Chai D, Kriling S, et al. Nonlinear optical macroscopic assessment of 3-D corneal collagen organization and axial biomechanics. Invest Ophthalmol Vis Sci 2011;52(12):8818–27.
[20] Mocan MC, Yilmaz PT, Irkec M, Orhan M. In vivo confocal microscopy for the evaluation of corneal microstructure in keratoconus. Curr Eye Res 2008;33(11-12):933–9.
[21] Du G, Liu C, Li X, et al. Induction of matrix metalloproteinase-1 by tumor necrosis factor-α is mediated by interleukin-6 in cultured fibroblasts of keratoconus. Exp Biol Med 2016;241(18):2033–41.
[22] Rock ME, Moore MN, Anderson JA, Binder PS. 3-D computer models of human keratocytes. CLAO J 1995;21(1):57–60.
[23] Patel DV, McGhee CNJ. Mapping the corneal sub-basal nerve plexus in keratoconus by in vivo laser scanning confocal microscopy. Investig Opthalmology Vis Sci 2006;47(4):1348.
[24] Patel D, McGhee C. Understanding keratoconus : what have we learned from the New Zealand perspective ? Clin Exp Optom 2013;96(2):183–7.
[25] Kenney MC, Nesburn AB, Burgeson RE, et al. Abnormalities of the extracellular matrix in keratoconus corneas. Cornea 1997;16(3):345–51.
[26] Fernandes BF, Logan P, Zajdenweber ME, et al. Histopathological study of 49 cases of keratoconus. Pathology (Phila) 2008;40(6):623–6.
[27] Rabinowitz YS. Keratoconus. Surv Ophthalmol 1998;42(4):297–319.
[28] Weed KH, MacEwen CJ, Cox A, McGhee CNJ. Quantitative analysis of corneal microstructure in keratoconus utilising in vivo confocal microscopy. Eye 2007;21(5):614–23.
[29] El-Agha MSH, El Sayed YM, Harhara RM, Essam HM. Correlation of corneal endothelial changes with different stages of keratoconus. Cornea 2014;33(7):707–11.

43.2. Imageries in vivo

[30] Weed K, MacEwen C, Cox A, et al. Quantitative analysis of corneal microstructure in keratoconus utilising in vivo confocal microscopy. Eye 2007;21:614–23.
[31] Grieve K, Georgeon C, Andreiuolo F, et al. Imaging microscopic features of keratoconic corneal morphology. Cornea 2016;35(12):1621–30.
[32] Niederer RL, Perumal D. Laser scanning in vivo confocal microscopy reveals reduced innervation and reduction in cell density in all layers of the keratoconic cornea. Invest Ophthalmol Vis Sci 2008;49(7):2964–70.
[33] Teo AWJ, Mansoor H, Sim N. In vivo confocal microscopy evaluation in patients with keratoconus. J Clin Med 2022;11(2):393.
[34] Mocan MC, Yilmaz PT, Irkec M. The significance of Vogt's striae in keratoconus as evaluated by in vivo confocal microscopy. Clin Exp Ophthalmol 2008;36:329–34.
[35] Cruzat A, Pavan-Langston D, Hamrah P. In vivo confocal microscopy of corneal nerves : analysis and clinical correlation. Semin Ophthalmol 2010;25:171–7.
[36] Ozgurhan EB, Kara N, Yildirim A. Evaluation of corneal microstructure in keratoconus : a confocal microscopy study. Am J Ophthalmol 2013;156:885–93. e882.
[37] Kawabuchi M, Chongjian Z, Islam AT. The effect of aging on the morphological nerve changes during muscle reinnervation after nerve crush. Restor Neurol Neurosci 1998;13:117–27.
[38] Mazzotta C, Hafezi F, Kymionis G. In vivo confocal microscopy after corneal collagen crosslinking. Ocul Surf 2015;13:298–314.
[39] Mazzotta C, Traversi C, Baiocchi S. Corneal healing after riboflavin ultraviolet-A collagen cross-linking determined by confocal laser scanning microscopy in vivo : Early and late modifications. Am J Ophthalmol 2008;146:527–33.
[40] Mazzotta C, Balestrazzi A, Traversi C. Treatment of progressive keratoconus by riboflavin-UVA-induced cross-linking of corneal collagen : ultrastructural analysis by Heidelberg retinal tomograph II in vivo confocal microscopy in humans. Cornea 2007;26:390–7.
[41] Mazlin V, Xiao P, Dalimier E, et al. In vivo high resolution human corneal imagine using full-field OCT. Biomed Opt Express 2018;8(2):557–68.
[42] Reinstein DZ, Archer TJ, Gobbe M. Corneal epithelial thickness profile in the diagnosis of keratoconus. J Refract Surg 2009;25(7):604–10.
[43] Li Y, Tan O, Brass R. Corneal epithelial thickness mapping by fourier-domain optical coherence tomography in normal and keratoconic eyes. Ophtahlmology 2021;119:2425–33.
[44] Sandali O, El Sanharawi M, Temstet C. Fourier-domain optical coherence tomography imaging in keratoconus : a corneal structural classification. Ophthalmology 2013;120(12):2403–12.
[45] Fuentes E, Sandali O, El Sanharawi M, et al. Anatomic predictive factors of acute corneal hydrops in keratoconus : an optical coherence tomography study. Ophthalmology 2015;122:1653–9.

[46] Basu S, Vaddavalli PK, Vemuganti GK. Anterior segment optical coherence tomography features of acute corneal hydrops. Cornea 2012;31:479–85.
[47] Kymionis GD, Grentzelos MA, Plaka AD, et al. Correlation of the corneal collagencross-linking demarcation line using confocal microscopy and anterior segmentoptical coherence tomography in keratoconic patients. Am J Ophthalmol 2014;157:110–5. e1.
[48] Shetty R, Pahuja NK, Nuijts RM, et al. Current protocols of corneal collagen cross-linking : visual, refractive, and tomographic outcomes. Am J Ophthalmol 2015;160(2):243–9.
[49] Bouheraoua N, Jouve L, El Sanharawi M, et al. Optical coherence tomography and confocal microscopy following three different protocols of corneal collagen crosslinking in keratoconus. Invest Ophthalmol Vis Sci 2014;55:7601–9.
[50] Anwar M, Teichmann KD. Deep lamellar keratoplasty : surgical techniques for anterior lamellar keratoplasty with and without baring of Descemet's membrane. Cornea 2002;21(4):374–83.
[51] Scorcia V, Busin M, Lucisano A, et al. Anterior segment optical coherence tomography-guided big-bubble technique. Ophthalmology 2013;120:471–6.
[52] Kanellopoulos AJ, Binder PS. Collagen Cross-Linking (CCL) with sequential topography-guided PRK : a temporizing alternative for keratoconus to penetrating keratoplasty. Cornea 2007;26(7):891–5.
[53] Moraes R, Ghanem R, Ghanem V, Santhiago M. Haze and visual acuity loss after sequential photorefractive keratectomy and corneal cross-linking for keratoconus. J Refract Surg 2019;35:109–14.
[54] Nakamura T, Isogai N, Kojima T. Implantable collamer lens sizing method based on swept-source anterior segment optical coherence tomography. Am J Ophthalmol 2018;187:99–107.
[55] Rocamora L, Orlando J, Lwowski C, et al. Postoperative vault prediction for phakic implantable collamer lens surgery : LASSO formulas. J Catar Refr Surg 2023;49(2):126–32.

43.3. Hypothèses physiopathologiques

[56] Roberts CJ, Dupps Jr WJ. Biomechanics of corneal ectasia and biomechanical treatments. J Cataract Refract Surg 2014;40:991–8.
[57] Loukovitis E, Sfakianakis K, Syrmakesi P, et al. Genetic aspects of keratoconus : a literature review exploring potential genetic contributions and possible genetic. relationships with comorbidities. Ophthalmol Ther 2018 ;7:263–92.
[58] Bechara SJ, Waring 3rd GO, Insler MS. Keratoconus in two pairs of identical twins. Cornea 1996 ;15(1):90–3.
[59] Tuft SJ, Hassan H, George S. Keratoconus in 18 pairs of twins. Acta Ophthalmol 2012 ;90(6):e482–6.
[60] McMahon TT, Shin JA, Newlin A. Discordance for keratoconus in two pairs of monozygotic twins. Cornea 1999 ;18(4):444–51.
[61] Kriszt A, Losonczy G, Berta A, et al. Segregation analysis suggests that keratoconus is a complex non-mendelian disease. Acta Ophthalmol 2014 ;92:e562–8.
[62] Hardcastle AJ, Liskova P, Bykhovskaya Y. A multi-ethnic genom wide association study implicates collagen matrix integrity and cell differentiation pathways in keratoconus. Commun Biol 2021 ;4(1):266.
[63] Lapeyre G, Fournie P, Vernet R, et al. Keratoconus prevalence in families : a French study. Cornea 2020 ;39(12):1473–9.
[64] Wang Y, Rabinowitz YS, Rotter JI, Yang H. Genetic epidemiological study of keratoconus : evidence for major gene determination. Am J Med Genet 2000 ;93(5):403–9.
[65] Jeoung JW, Kim MK, Park S. VSX1 gene and keratoconus : genetic analysis in Korean patients. Cornea 2012 ;31(7):746–50.
[66] Zhang J, Cai B, Ma L. Clinical and genetic analysis VSX1 variants among families with keratoconus in northwest China. Front Genet (IF : 326 ; Q1) 2023 ;14, 1145426.
[67] Rabinowitz YS, Galvis V, Tello A, et al. Genetics vs chronic corneal mechanical trauma in the etiology of keratoconus. Exp Eye Res 2021 ;202, 108328.
[68] Héon E, Greenberg A, Kopp KK, et al. VSX1 : a gene for posterior polymorphous dystrophy and keratoconus. Human Molecular Genetics 2002 ;11(9):1029–36.
[69] Stabuc-Silih M, Strazisar M, Hawlina M. Absence of pathogenic mutations in VSX1 and SOD1 genes in patients with keratoconus. Cornea 2010 ;29(2):172–6.
[70] Davidson AE, Hayes S, Hardcastle AJ. The pathogenesis of keratoconus. Exp Eye Res 2021 ;202, 108328.
[71] Gordon-Shaag A, Millodot M, Shneor E. The genetic and environnemental factors for keratoconus. Biomed Res Int 2015 ;2015, 795738.
[72] Barros SP, Offenbacher S. Epigenetics : connecting environment and genotype to phenotype and disease. J Dent Res 2009 ;88:400–8.
[73] McConnies CW. Epigenetic mechanisms might help explain environmental contributions to the pathogenesis of keratoconus. Eye Contact Lens 2014 ;40(6):371–5.
[74] Shetty R. Biochemical markers and alterations in keratoconus. Asia Pac J Ophthalmol (Phila) 2020 ;9:533–40.
[75] Loh IP, Sherwin T. Is keratoconus an inflammatory disease ? The implication of inflammatory pathways. Ocul Immunol Inflamm 2022 ;30(1):246–55.
[76] Whitelock RB, et al. Cathepsin G, acid phosphatase, and alpha 1-proteinase inhibitor messenger RNA levels in keratoconus corneas. Invest Ophthalmol Vis Sci 1997 ;38:529–34.
[77] Goncu T, et al. Tear film and serum prolidase activity and oxidative stress in patients with keratoconus. Cornea 2015 ;34:1019–23.
[78] D'Souza S, Padmanabhan Nair A, Ram Sahu G, et al. Keratoconus patients exhibit a distinct ocular surface immune cell and inflammatory profile. Scientific Reports 2021 ;11:20891.
[79] Gupta P, Pathak M, Thakur B, et al. Association of keratoconus with serum levels of 25-hydroxyvitamin D and antioxidant trace elements : a systematic review and meta-analysis. Indian J Ophthalmol 2022 ;70:2818–24.
[80] Shivakumar S, Ghosh A, Jeyabalan N. Vitamin D enhances the autophagic lysosomal clearance in oxidatively stressed human corneal epithelial cells : a therapeutic intervention for keratoconus. Invest Ophthalmol Vis Sci 2019 ;60:2819.
[81] Wakankar AH, Shetty R, Khamar P. Trehalose in stabilization of progression of disease in KCN via autophagy modulation. Poster presented at : The American Academy of Ophthalmology (AAO) 2023 annual meeting ; November 3-6 ; San Francisco. PO060.
[82] Balasubramanian SA, Pye DC, Willcox MDP. Effects of eye rubbing on the levels of protease, protease activity and cytokines in tears : relevance in keratoconus. Clin Exp Optom 2013 ;96(2):214–8.
[83] McMonnies CW. Mechanisms of rubbing-related corneal trauma in keratoconus. Cornea 2009 ;28(6):607–15.
[84] Ridley F. Eye rubbing and contact lenses. Br J Ophthalmol 1961 ;45(9):631.
[85] Krachmer JH, Feder RS, Belin MW. Keratoconus and related noninflammatory corneal thinning disorders. Surv Ophthalmol 1984 ;28(4):293–322.
[86] Owens H, Gamble G. A profile of keratoconus in New Zealand. Cornea 2003 ;22(2):122–5.
[87] McMonnies CW, Boneham GC. Keratoconus, allergy, itch, eye-rubbing and hand-dominance. Clin Exp Optom 2003 ;86(6):376–84.
[88] Jafri B, Lichter H, Stulting RD. Asymmetric keratoconus attributed to eye rubbing. Cornea 2004 ;23(6):560–4.
[89] Ioannidis AS, Speedwell L, Nischal KK. Unilateral keratoconus in a child with chronic and persistent eye rubbing. Am J Ophthalmol 2005 ;139(2):356–7.
[90] Weed KH, MacEwen CJ, Giles T. The Dundee University Scottish keratoconus study : demographics, corneal signs, associated diseases, and eye rubbing. Eye Lond Engl 2008 ;22(4):534–41.
[91] McMonnies CW. Mechanisms for acute corneal hydrops and perforation. Eye Contact Lens 2014 ;40(4):257–64.
[92] Buddi R, Lin B, Atilano SR. Evidence of oxidative stress in human corneal diseases. J Histochem Cytochem 2002 ;50:341–51.
[93] Squadrito GL, Pryor WA. Oxidative chemistry of nitric oxide : the roles of superoxide, peroxynitrite, and carbon dioxide. Free Radic Biol Med 1998 ;25:392–403.
[94] Kenney MC, Brown DJ. The cascade hypothesis of keratoconus. Cont Lens Anterior Eye 2003 ;26:139–46.