

This is an Open Access document downloaded from ORCA, Cardiff University's institutional repository: <https://orca.cardiff.ac.uk/id/eprint/114881/>

This is the author's version of a work that was submitted to / accepted for publication.

Citation for final published version:

Lewis, Philip , White, T., Feneck, Eleanor, Young, Robert and Meek, Keith 2019. Elastin content and distribution in endothelial keratoplasty tissue determines direction of scrolling. *American Journal of Ophthalmology* 197 , pp. 181-182. 10.1016/j.ajo.2018.08.047

Publishers page: <https://doi.org/10.1016/j.ajo.2018.08.047>

Please note:

Changes made as a result of publishing processes such as copy-editing, formatting and page numbers may not be reflected in this version. For the definitive version of this publication, please refer to the published source. You are advised to consult the publisher's version if you wish to cite this paper.

This version is being made available in accordance with publisher policies. See <http://orca.cf.ac.uk/policies.html> for usage policies. Copyright and moral rights for publications made available in ORCA are retained by the copyright holders.



Title

Elastin content and distribution in endothelial keratoplasty tissue determines direction of scrolling. (letter to the editor)

Philip N Lewis¹, Tomas L White², Eleanor M Feneck¹, Robert D Young¹, Keith M Meek¹

Affiliations

1. Structural Biophysics Group, School of Optometry and Vision Sciences, College of Biomedical and Life Sciences, Cardiff University, Maindy Road, Cardiff, CF24 4HQ. Wales. UK.
2. Schapens Eye Research Institute, Massachusetts Eye and Ear, Harvard Medical School, 20 Stanford Street Boston MA 02114.

Authors (in order)

Philip N Lewis¹ Corresponding author (first)

E-mail : lewispn@cardiff.ac.uk

Tel : +44 (0)29 208 70459

Fax : +44 (0)29 208 74859

Address: Structural Biophysics Group, School of Optometry and Vision Sciences, College of Biomedical and Life Sciences, Cardiff University, Maindy Road, Cardiff, CF24 4HQ. Wales. UK

Tomas L White² (second)

Eleanor M Feneck¹ (third)

Robert D Young¹ (fourth)

Keith M Meek¹(last)

Dear Editor,

We welcome the recent publication by Mohammed et al.¹ that demonstrates the surgical implications of the corneal elastic system in scrolling in endothelial keratoplasty. We have pioneered the characterisation of the corneal elastic system in normal human², keratoconic³ corneas and in knock-out mouse models of Marfan's Syndrome.⁴ The current article adds to our knowledge by showing the presence and depth distribution of elastin in the posterior cornea, which provides further confirmation that the corneal elastic system (predominantly elastin and fibrillin) is an integral part of the cornea.

We have previously shown the nanoscopic 3D distribution and arrangement of elastic fibres in the human cornea using an electron microscopy elastic stain for amorphous elastin and fibrillin² and the high resolution technique of serial block face scanning electron microscopy. We also showed that the concentration of elastic fibres, as a function of depth was highest in the 8µm region of the stroma immediately above Descemet's membrane and fell significantly distal to this region. TEM morphological observations in the same study also revealed that true elastic fibres containing fibrillin sheaths and amorphous elastin cores were restricted to the corneal peripheral region, limbus and trabecular meshwork (TM) while thinner, predominantly fibrillin-1 fibres, previously described by Hanlon et al⁵, were only present in low densities in the central posterior cornea. Since our previous studies, we have now characterised the human elastic fibre system using a range of antibodies including elastin and fibrillin-1⁶ and we have clarified the association and distribution of elastin- and fibrillin 1-containing fibres within the corneal elastic fibre system.

We note that in this study by Mohammed et al.¹ a band of homogenous elastin immunofluorescence was identified above Descemet's membrane. We would be interested to know if the authors examined the elastin concentration between the posterior peripheral and central regions and, if so, were any differences detected?

We initially proposed the potential implications of the elastic fibre system in glaucoma² and we have now revealed that the posterior elastic fibres in the corneal stroma are indeed linked with the TM.⁶ The results in the current article fit nicely with our results as the authors show that these fibres contain a high concentration of elastin that is continuous with the TM. Interestingly, it is known that full thickness keratoplasty has been shown to cause high incidence of glaucoma when compared to partial thickness deep anterior keratoplasty. A surgery that preserves the peripheral posterior component of the corneal elastic system would seem to be crucial.

Once again we welcome this article for highlighting the elastic properties of the cornea that has clear surgical implications including the formation of big bubble in keratoplasty and scrolling.

Acknowledgements/disclosures

a. Funding

This work was funded by the UK MRC program and BBSRC project grants.

b. Financial Disclosures

Dr Philip N Lewis None

Ms Eleanor M Feneck None

Dr Tomas L White None

Dr Robert D Young None

Keith M Meek None

c. Other Acknowledgements

Dr Philip N Lewis wrote the letter with Professor Keith M Meek.

Ms Eleanor M Feneck, Dr Tomas White, Dr Robert D Young contributed equally to assistance in editing and approving the letter.

References

1. Mohammed I, Ross AR, Britton JO, Said DG, Dua HS. Elastin content and distribution in endothelial keratoplasty tissue determines direction of scrolling. *Am J Ophthalmol* 2018; 194 16-25.
2. Lewis PN, White TL, Young RD, Bell JS, Winlove CP, Meek KM. Three-dimensional arrangement of elastic fibres in the human corneal stroma. *Exp Eye Res* 2016; 146:43-53.
3. White TL, Lewis PN, Young RD, Meek KM. Elastic microfibril distribution in Cornea: Differences between normal and keratoconic stroma. *Exp Eye Res* 2017; 159: 40-48.
4. White TL, Lewis PN, Hayes S, Meek KM. The Structural Role of Elastic Fibres in the Cornea Investigated Using a Mouse Model for Marfan syndrome Corneal Elastic Fibres in Marfan's Syndrome. *Invest Ophthalmol Vis Sci*; 2017 April; 58; 2106-2116.
6. Hanlon SD, Behzad AR, Sakai, LY, Burns AR. Corneal stroma micro fibrils. *Exp Eye Res*; 132 198-207.
5. Feneck EM, Lewis PN, Ralphs J, Meek KM. A Comparative Study of the Elastic Fibre System within the Mouse and Human Cornea. *Exp Eye Res* 2018; 177; 35-44.