References

1 Macknin JB, Brown A, Marcus RE. Does research participation make a difference in residency training? *Clin Orthop Relat Res* 2014; **472**(1): 370–376.
2 Gill S, Levin A, Djurdjev O, Yoshida EM. Obstacles to residents' conducting research and predictors of publication. *Acad Med* 2001; **76**(5): 477.
3 Olaussen A, Jennings PA, O'Reilly G, Mitra B, Cameron PA. Barriers to conducting research: a survey of trainees in emergency medicine. *Emerg Med Australas* 2017; **29**(2): 204–209.
4 Canadian Plastic Surgery Research Collaborative (CPSRC). Barriers and attitudes to research among residents in plastic and reconstructive surgery: A National Multicenter Cross-Sectional Study. *J Surg Educ* 2017; pii: S1931-7204(16) 30319-1.
5 Ting DSJ, Vrahimi M, Varma D, Steel DHW; North East Trainee Research in Ophthalmology Network (NETRiON). Trainee-led research networks in ophthalmology: is this the way forward? *Eye* 2018; **32**: 168–175

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Eye (2018) **32,** 653–655; doi:10.1038/eye.2017.221; published online 13 October 2017

Sir,
Emergency therapeutic penetrating keratoplasty in a tertiary ophthalmic care facility

Emergency penetrating keratoplasty has been associated with a lower rate of corneal graft survival, and a higher rate of immune reactions compared to scheduled normal risk keratoplasty.[1] High-risk penetrating keratoplaty has a success rate of 50% compared to 90% for a low-risk penetrating keratoplasty.[2] We wished to evaluate our experiences of emergency keratoplasty in a single tertiary ophthalmic care unit in West Scotland.

Table 1 Patient demographics

Patient	*Age*	*Sex*	*Background*	*Previous corneal grafts*	*Indication*	*Systemic immunosupression*
Trauma						
1	61	M	Nil	0	Perforation	Nil
2	74	F	Nil	3	Perforation	Nil
Immunological melt						
3	34	F	Severe atopy	0	Perforation	Prednisolone, Tacrolimus
4	54	F	Steven-Johnson Syndrome	3	Perforation	Prenisolone, Mycophenolate
5	82	F	Sjogren's syndrome, Rheumatoid arthritis, Hypothyroidism	1	Perforation	Prednisolone
6	61	F	Sjogren's syndrome, Rheumatoid arthritis	3	Perforation	Prednisolone, Methotrexate
7	54	F	Sjogren's syndrome, Systemic Lupus Erythematous	1	Perforation	Prednisolone, Azathioprine
Infectious keratitis						
8	70	M	Fuchs' endothelial dystrophy	1	Infectious keratitis	Nil
9	57	M	Alcohol abuse, Self neglect	0	Perforation	Nil
10	32	M	Severe atopy, Eczema	1	Infectious keratitis	Prednisolone
11	72	M	Rheumatoid arteritis, Herpetic keratitis	1	Perforation	Prednisolone
12	73	M	Previous herpetic keratitis	1	Perforation	Prednisolone, Azathioprine
3	34	F	Severe atopy	0	Perforation	Prednisolone, Tacrolimus
13	65	F	Sjogren's syndrome, Rheumatoid arthritis	1	Perforation	Prednisolone
14	61	F	Monthly Soft contact lens wearer	0	Infectious keratitis	Prednisolone

Table 2 Penetrating keratoplasty survival and complications

Patient	*Eye*	*Corneal graft survival*	*Time to failure (months)*	*Follow up (months)*	*Further procedures*	*Complications*
Trauma						
1	Left	Clear graft	—	27	Nil	Cataract, Secondary glaucoma
2	Left	Failure- Trauma	37	43	Repair of globe rupture	Nil
Immunological melt						
3	Left	Failure- Infection	1	36	PK	Nil
4	Left	Failure- Infection	9	26	Evisceration 10 months	Nil
5	Right	Failure- Immunological	11	21	PK	Nil
6	Left	Failure- Infection	5	10	PK	Nil
7	Left	Failure- Immunological	4	36	3 further PK	Nil
Infectious keratitis						
8	Left	Clear graft	—	9	Ahmed valve, Cyclodiode	Secondary glaucoma
9	Left	Failure- Rejection	8	18	Nil	Nil
10	Right	Clear graft	—	22	Nil	Nil
11	Right	Clear graft	—	19	Nil	Nil
12	Right	Clear graft	—	11	Nil	Cataract
3	Right	Failure- Infection	2	26	3 further PK	Nil
13	Right	Failure- Endothelial	15	15	Amniotic membrane graft	Osteoporosis
14	Left	Clear graft	—	18	Nil	Cataract, Pupillary membrane

A retrospective case series is presented of 15 eyes in 14 patients who received therapeutic keratoplasty for corneal perforation or impending perforation, from January 2014 to December 2016. Anatomical success was defined by eradication of infection and or preservation of the globe. Corneal graft survival was defined by the presence of a clear graft at last follow up.

Mean age was 61 (±14) years. Indications for emergency keratoplasty were infectious corneal melt which was unresponsive to medical management in 8 eyes, non-infectious immunological corneal melt in 5 eyes and trauma in 2 eyes. The follow up period ranged from 7 to 43 months, mean follow up of 22 months. The mean diameter of the donor corneal disc was 8.2 (±1.1) mm, 0.5 mm larger than the recipient bed.

There was anatomical success in 14 of 15 eyes. Evisceration was required for one eye, due to recurrent non- infectious corneal melt. The corneal graft survived in 9 of 15 eyes. Five eyes underwent repeat keratoplasty.

The corneal graft survival rate for 2 eyes following trauma was 50%, at follow up of 27 and 43 months. One graft failed at 37 months due to further trauma. The graft survival rate for the 8 patients with infective corneal melt was 62.5%, with mean follow up of 17 months. Mean time to graft failure was 8 months. Interestingly 2 of the 3 patients who experienced graft failure, also had underlying immunological conditions (Table 1).

Five patients had non-infectious immunological corneal melt. The associated systemic conditions are detailed in Table 1. The corneal graft failed in all these patients. Three failed due to infection, and two failed due to immunological melt. The mean time to failure was 6 months. All five patients were prescribed systemic immunosuppression (Table 1).

Cataract and secondary glaucoma were the most common complications (Table 2). 5 patients required repeat penetrating keratoplasty, 2 patients required 3 further penetrating keratoplasties (Table 2).

There is relative paucity of data in the literature describing emergency penetrating keratoplasty. A recent study found that infectious keratitis lead to 74% of emergency keratoplasty, with perforation evident in 53% of cases.[3] In this group, infection was the major indication for an emergency keratoplasty followed by immunological melt. Judicious use of pre, intra and postoperative antibiotic usage is crucial for graft survival in infectious aetiology.

Despite newer immunosuppressants, the outcome for immunological melt is dismal. Systemic immunosuppression has been shown previously to improve corneal graft survival, due to improved control of the underlying systemic disease.[1]

Larger multicentre studies are needed for better understanding variables affecting corneal graft outcome in an emergency context.

Conflict of interest

The authors declare no conflict of interest.

References

1 Maier P, Bohringer D, Reinhard T. Clear graft survival and immune reactions following emergency keratoplasty. *Graefes Arch Clin Exp Ophthalmol* 2007; **245**(3): 351–359.

2 Szaflik JP, Major J, Izdebska J, Lao M, Szaflik J. Systemic immunosuppression with mycophenolate mofetil to prevent corneal graft rejection after high-risk penetrating keratoplasty: a 2-year follow-up study. *Graefes Arch Clin Exp Ophthalmol* 2016; **254**(2): 307–314.
3 Cruz GK, da Silva SB, de Azevedo IC, Carvalho DP, Meireles PF, Junior MA *et al.* Epidemiological Profile of Patients Undergoing Urgent Corneal Transplant in a Referral Center in Northeastern Brazil. *Transplant Proc* 2016; **48**(7): 2366–2370.

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Eye (2018) **32,** 655–657; doi:10.1038/eye.2017.216; published online 20 October 2017

Sir,
Repetitive stress injury and thyroid eye disease

Thyroid eye disease (TED) is an integral part of the clinical presentations of thyroid disease. The clinical manifestations of TED are due to inflammation, oedema, and fibrotic changes within the soft tissues of the orbit resulting in a variety of clinical manifestations.

Extra-ocular muscles (EOMs) involvement in TED is characterised inflammation and swelling of the EOMs. This will eventually lead to tightening of the some EOMs resulting in limitation of eye movements and diplopia.

The most common motility abnormality is limitation of elevation owing to fibrosis and tightness of the inferior rectus muscle. This followed by medial rectus, superior rectus, and the lateral rectus in that order.

A valid question is why the inferior recti are the most commonly involved muscles, followed by the medical recti, superior recti, and lateral recti in that order. There are two variables in this situation—the degree of involvement of a particular EOM involvement in the pathological process and its function. Given that all EOMs are more or less involved to a variable degree in the pathological process underlying TED, the second variable may explain why certain EOMs are more commonly involved by fibrosis than others. The most common gaze in humans, as upright creatures, used in the daily activities such as walking, eating, desk work, and so on, is looking downwards. The second most common gaze used is convergence looking at close objects followed by looking up and looking laterally in that order.

From the above, we may deduce that a frequently contracting/used muscle, which is involved by the pathological process of TED, is more likely to undergo fibrotic changes. Thus, thickened and inflamed muscle fibres may undergo fibrotic changes when used 'excessively'.[1] A pre-existing latent or manifest deviation that results in increased tone/contraction of a particular muscle(s) might also have an influence on which muscle involved by contracture, particularly, in the case of the lateral recti. Such injury could be classified as small repetitive stress injury (RSI) leading eventually to fibrotic changes. This RSI is analogue to what is seen in xantholasma of the upper eyelids and keloids at the tips of the elbows.

Xanthelasma is characterised by yellowish plaques deposits that occur commonly in the medical canthus areas of the upper and less commonly the lower eyelids. It mostly occurs in patients with hyperlipidemia. Perhaps the eyelid blinking, squeezing the eye, and frequent opening and closure of the eyelids, may result in leakage of the micro vessels and deposition of lipids and the inner corner of the eyelids, the area with the thin skin with less adherent tissue. Similarly, the blinking mechanism (along with frequent closing and opening of the eyelids), which results in frequent contraction of the levator muscle, may have a role in the tightening of the levator muscle in patients with TED resulting in lid retraction, a common feature in TED.

Another possible example of minor trauma and irritation in predisposed individuals may produce keloids. The trauma may be trivial, for example, pressure on the tips of the elbows can produce fibrotic changes resulting keloids in susceptible patients perhaps analogue to what is seen in the frequently contracting EOMs in TED.

Conflict of interest

The author declares no conflict of interest.

Reference

1 Assaf A, Heywood A, Eyre J, Jones D. Repetitive stress injury (RSI) and thyroid myopathy. In: Spiritus M (ed). *TA of the 24th European Strabismological Association Meeting*, Vilamoura, Portugal, 1997, pp 375–380.

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Eye (2018) **32,** 657; doi:10.1038/eye.2017.236; published online 27 October 2017

Sir,
When is the best stage of training to sit the Fellowship of the Royal College of Ophthalmologists Examinations

The Royal College of Ophthalmologists (RCOphth) offers examination deadlines, therefore leaving when to best sit these examinations to trainees. The Fellowship