

Original Research Article

Clinical indications of penetrating keratoplasty in a tertiary care centre of North India

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ABSTRACT

Background: Corneal diseases are one of the major causes of blindness and visual impairment in developing countries. Penetrating keratoplasty is a surgical procedure where a damaged or diseased cornea is replaced by donor corneal tissue. Aim was to determine the indications of penetrating keratoplasty (PK) in a tertiary health care centre of North India.

Methods: A retrospective analysis of the records of 288 patients, who underwent penetrating keratoplasty (PK) from January 2016 to December 2018 at Regional Institute of Ophthalmology, PGIMS Rohtak were included in this study. All patients who underwent PK during this time period were included in our study except those who underwent re-grafting.

Results: A total of 288 patients who underwent penetrating keratoplasty (PK) surgery were included in our study. Out of 288, 184 (63.88%) were males and 104 (36.11%) were females. In our study, 162 (56.25%) patients underwent optical PK, 76 (26.38%) had tectonic PK and 50 (17.36%) underwent therapeutic PK. Most common indication for optical PK was bullous keratopathy followed by corneal opacity. Most common reason for tectonic PK was found to be corneal perforation while for therapeutic PK was sloughing corneal ulcer followed by recalcitrant fungal keratitis.

Conclusions: Though bullous keratopathy (BK) was the most common indication for penetrating keratoplasty in North India, but in our study 27% patients had tectonic PK and 17% patients underwent therapeutic PK which is significantly higher than documented data from South India and developed countries. It can be because of low literacy level, lack of awareness and late presentation to ophthalmologist in North India.

Keywords: Bullous keratopathy, Corneal opacity, Penetrating keratoplasty

INTRODUCTION

Corneal diseases are one of the major causes of blindness and visual impairment in developing countries.¹ The visual impairment study (2010) estimated that 285 million people are visually impaired, out of which 39 million people are blind. Corneal blindness accounts for 12% of the world's blind and India accounts for the majority, thus making it a global priority.^{2,3} Corneal blindness is due to scarring or clouding of the normally transparent cornea. Keratoplasty or corneal transplantation is the sight restoring surgery for corneal blindness. It is a surgical

procedure where the damaged or diseased cornea is removed and replaced by a healthy cornea from a deceased donor. This surgery is presently totally dependent on eye donation after death. Despite the establishment of the hospital cornea retrieval program and modern eye banking models in India, the current cornea procurement rate in India is only 63256 per year with utilization rate ranges between 25% and 60%, while annual requirement of corneas is around 100,000.⁴ Therefore, to increase the procurement of corneas, raising the level of public awareness for eye donation is of utmost importance.

Keratoplasty was first performed by Edward Konrad Zirm in 1905. Although newer modalities of keratoplasty have come into play but penetrating keratoplasty (PK) still remains the gold standard in corneal conditions involving full thickness of the cornea. Corneal transplantation has two major types, penetrating keratoplasty (PK) and lamellar keratoplasty (LK). The term penetrating keratoplasty (PK) commonly refers to surgical replacement of the opaque cornea with that of a donor eye. Lamellar keratoplasty surgery consists of placing a partial thickness donor corneal graft in a recipient corneal bed that is prepared by lamellar dissection of diseased anterior stromal corneal tissue.^{5,6}

Indications for penetrating keratoplasty:⁷

Optical keratoplasty: is performed to improve vision. It is most common indication of PK and comprises more than 90% of total penetrating keratoplasties performed in majority of the countries. A corneal pathology causing a reduction in visual acuity of <6/18 is an accepted norm for optical PK. Common indications include bullous keratopathy, keratoconus, dystrophies, degenerations and scarring.

Tectonic/reconstructive keratoplasty: is carried out to restore or preserve corneal integrity in eyes with severe structural changes such as stromal thinning and descemetocoele.

Therapeutic keratoplasty: is mainly indicated in cases of recalcitrant infectious keratitis to eliminate the infectious load.

Cosmetic keratoplasty: is rarely performed to improve the appearance of eye.

Donor tissue should be removed within 6 hours of death. Corneas from infants are usually not used, being floppy and likely to result in high astigmatism. Corneas from donors over the age of 70 years may also be inappropriate due to low endothelial cell counts. Preoperative evaluations of donor tissue include slit lamp examination and specular microscopy.⁸

There are many factors which may adversely affect the prognosis of a corneal graft and should be addressed prior to surgery. Therefore, abnormalities of eyelids like blepharitis, ectropion, entropion and trichiasis should be corrected before surgery. Recurrent or progressive forms of conjunctival inflammation such as atopic conjunctivitis, tear film dysfunction, anterior synechiae, uncontrolled glaucoma and uveitis also affect the visual prognosis of the patients.⁹

The Pub-med search showed numerous reports about leading indications of penetrating keratoplasty published from different countries in the world which varied significantly. Therefore, we carried out a retrospective study in our institute to determine the leading indications

for penetrating keratoplasty (PK) in a tertiary health care center of North India and compared the leading indications with the recently published data from South India and developed countries.

METHODS

A retrospective analysis of the records of 288 patients, who underwent penetrating keratoplasty (PK) from January 2016 to December 2018 at Regional Institute of Ophthalmology, PGIMS Rohtak were included in our study. The following details were taken for analysis which included age, gender, best corrected visual acuity, lid abnormalities, anterior and posterior segment evaluation, indication for surgery, timing and nature of surgery.

Inclusion criteria: All patients who underwent PK during this time period were included in the study.

Exclusion criteria: Patients who underwent regranting were excluded.

The data was collected and entered in patient's proforma. Then collected data was analyzed and entered in Microsoft excel spread sheet. Statistical analysis of data was done with SPSS (Statistical Package for Social Sciences) ver. 21.0.

RESULTS

In our study, out of 288 patients who underwent penetrating keratoplasty, 184 (63.8%) were males and 104 (36.1%) were females with significant male preponderance. Out of 288 PK, 162 (56.25%) were optical PK, 76 (26.38%) were tectonic PK and 50 (17.36%) were therapeutic PK. In a study conducted by Suresh et al in a tertiary care centre of South India, 79.64% patients underwent optical keratoplasty, 12.40% patients underwent therapeutic keratoplasty and 7.96% patients underwent tectonic PK.¹⁰ In a retrospective analysis of clinical indications of PK in UK, 91% underwent optical PK, 8.3% had therapeutic PK and only 0.7% underwent tectonic PK (Figure 1).¹¹

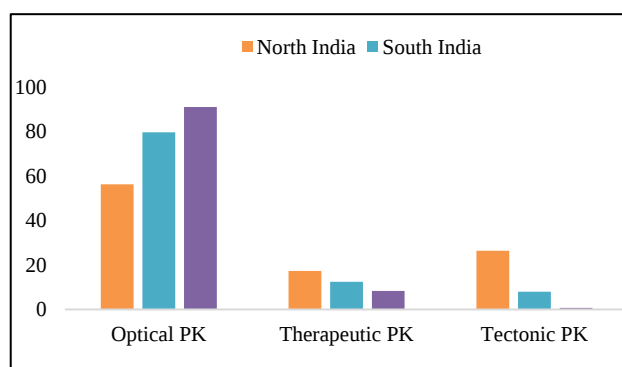


Figure 1: Regional differences in Indications of Penetrating Keratoplasty.

In our study, most common indication for optical PK (56.25%) was bullous keratopathy in 72 patients (25%) followed by corneal opacity in 58 patients (20%), corneal degeneration in 28 patients (9.7%) and corneal dystrophy in only 1 patient out of 288 patients. In a study conducted in South India, leading indications for optical penetrating keratoplasty (PK) were bullous keratopathy (BK) in 50.44% patients followed by corneal opacity in 36.28%, corneal degeneration in 3.54% and corneal dystrophy in 0.88% patients, while as per study conducted in UK, most common indication of optical PK was keratoconus (33.5%), Fuch's endothelial dystrophy (19.3%), bullous keratopathy (19.2%), corneal degeneration (10%) and corneal opacity (9%).¹⁰

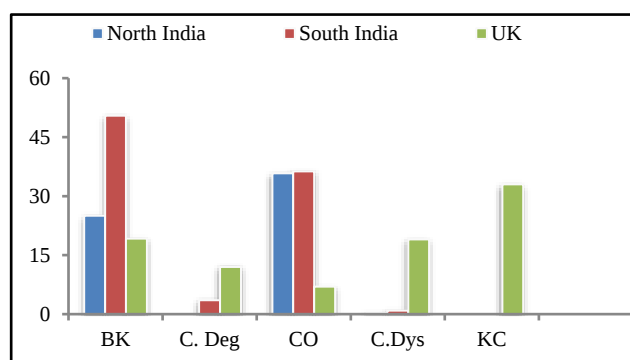


Figure 2: Comparative analysis of indications of optical PK.

In our study, out of total 50 (17.36%) therapeutic PK, 26 (9.02%) had sloughing corneal ulcer, 20 (6.94%) had recalcitrant fungal keratitis and 4 (1.38%) had *Acanthamoeba* keratitis. As per a study conducted in South India, 6.40% patients had sloughing corneal ulcer and 6% had recalcitrant fungal keratitis which is almost similar to our data.¹⁰ In UK, only 7.3% patients underwent therapeutic PK for sloughing corneal ulcer and 1.1% had *Acanthamoeba* keratitis.¹¹

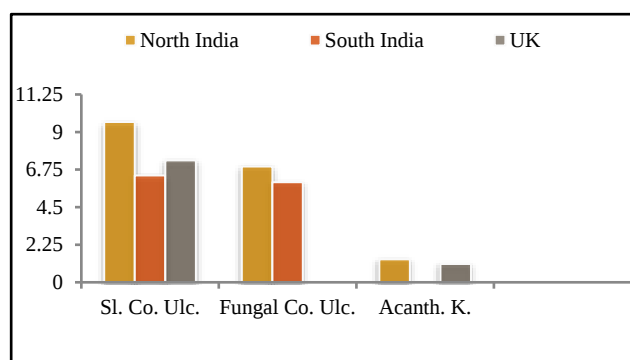


Figure 3: Comparative analysis of indications of therapeutic PK.

In our study, out of 76 (26.38%) tectonic PK, 62 patients (21.52%) had corneal perforation, 10 (3.47%) had descematocele, 2 (0.7%) had chemical injury while 2 (0.7%) had anterior staphyloma. As per study conducted

in South India, only 7.96% patients underwent tectonic PK for perforated corneal ulcer which is significantly lower than our study.¹⁰ As per data from developed countries like UK, only 0.7% patients underwent tectonic PK for perforated corneal ulcer.¹¹

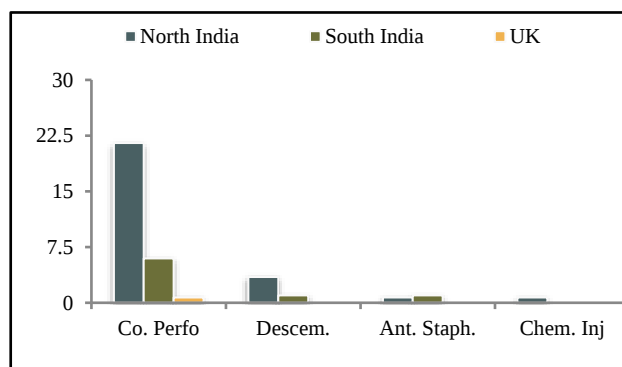


Figure 4: Comparative analysis of indications of tectonic PK.

DISCUSSION

It is observed that 12% of the world's blind population is affected by corneal blindness, a visual impairment that is amenable to treatment. Corneal transplantation remains the mainstay of treatment for restoring vision in such patients. As there is no medical cure for corneal blindness, the ophthalmologists solely depend on eye donations. Current corneal procurement rates are inadequate to meet transplantation needs in India. Thus proper health care education and awareness regarding eye donation is essential.

In our study, only 56.25% were optical PK while 26.38% were tectonic PK and 17.36% were therapeutic PK. On the other hand in South India, 79.64% patients underwent optical keratoplasty, 12.40% patients underwent therapeutic keratoplasty and only 7.96% patients underwent tectonic PK. This can be due to low literacy level, lack of awareness and late presentation to Ophthalmologist in North India in comparison to South India. While in developed country like UK, 91% underwent optical PK, 8.3% had therapeutic PK and only 0.7% underwent tectonic PK because of better health care infrastructure, awareness and early presentation.

In our study, we found a significant difference in indications of PK in developing and developed countries. Most common indication for optical PK in our study was bullous keratopathy in 25% patients followed by corneal opacity in 20% patients, corneal degeneration in 9.7% patients, while in UK, most common indication of optical PK is keratoconus in 33.5% patients followed by Fuch's endothelial dystrophy in 19.3% and bullous keratopathy in 19.2% cases.¹⁰

In our study, 21.52% cases had tectonic PK for corneal perforation while in South India, only 7.96% patients

underwent tectonic PK for perforated corneal ulcer which is significantly lower than our study. As per data from developed countries like UK, only 0.7% patients underwent tectonic PK for perforated corneal ulcer.¹¹

In our study, 17.36% patients underwent therapeutic PK and sloughing corneal ulcer was the most common cause in 9.02% patients while 6.94% participants had recalcitrant fungal keratitis and only 1.38% cases had *Acanthamoeba* keratitis. While in a study conducted in South India, 6.40% patients had sloughing corneal ulcer and 6% had recalcitrant fungal keratitis which is almost similar to our data.¹⁰ In UK, only 7.3% patients underwent therapeutic PK for sloughing corneal ulcer and 1.1% had *Acanthamoeba* keratitis. As India is an agriculture based country and vegetative matter injury is mostly preceding factor for fungal keratitis, that can be the reason for significant number of recalcitrant fungal keratitis cases in India. Due to low education level and poor awareness, agriculture based workers do not use protective eye wear at workplace and present late to ophthalmologist which accounts for significant number of therapeutic PK for recalcitrant fungal keratitis in India.

CONCLUSION

In our study, we conclude that bullous keratopathy (BK) was the most common indication for penetrating keratoplasty which was similar to South India while in developed countries like UK, keratoconus was the most common indication in 91% cases. In North India, 27% had tectonic PK and 17% had therapeutic PK which is significantly higher than documented data from South India and developed countries. There is not only significant difference in developing and developed countries, but also a significant regional difference of indications of penetrating keratoplasty in India. Therefore, we should aim at building a better infrastructure of health facilities in our region and make our population more aware regarding ophthalmic diseases and importance of early presentation to an ophthalmologist so that burden of therapeutic and tectonic PK can be significantly reduced in our country. It will not only save their sight, but also more cornea can be used for optical purpose.

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REFERENCES

1. Pascolini D, Mariotti SP. Global estimates of visual impairment 2010. *Br J Ophthalmol.* 2012;96:614-8.
2. Oliva MS, Schottman T, Gulati M. Turning the tide of corneal blindness. *Indian J Ophthalmol.* 2012;60:423-7.
3. Eze BI, Okoye O, Eze JN. Knowledge and attitudes regarding eye donation and corneal transplant: Medical versus nonmedical university students in a developing Country in Africa. *Exp Clin Transplant.* 2014;12:454-61.
4. National Programme for the Control of Blindness. Available at <http://pbhealth.gov.in/pdf/Blindness.pdf>. Accessed on 12 June, 2020.
5. Bowling B. Kanski's Clinical Ophthalmology: a systematic approach. 8th edition. China: Elsevier; 2015.
6. Reddy SC, Tajunisah I. Indications for penetrating keratoplasty in west Malaysia. *Int J Ophthalmol.* 2008;1(2):125-8.
7. Saldanha M, Mendonca N. Penetrating keratoplasty - indications and post operative visual outcome in a South Indian population. *IOSR J Dent Med Sci.* 2013;5:18-20.
8. Wang JY, Xie LX, Song XS, Zhao J. Trends in the indications for penetrating keratoplasty in Shandong, 2005-2010. *Int J Ophthalmol.* 2011;4(5):492-7.
9. Reddy SC, Tajunisah I. Indications for penetrating keratoplasty in west Malaysia. *Int J Ophthalmol.* 2008;1(2):125-8.
10. Suresh K, Karthick J. Clinical indications of penetrating keratoplasty in South Indian population. *Int J Ophthalmol.* 2013;8:51-3.
11. Yousuf N, Mavrikakis I, Daya M. Penetrating keratoplasty: indications over a 10 year period. *Br J Ophthalmol.* 2014;88:998-1001.

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