

Penetrating keratoplasty: Risk factors, indications and visual outcomes

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Abstract

Introduction: Corneal transplantation is the most common form of transplantation with over 2500 grafts in the United Kingdom and 32 000 grafts undertaken in the United States annually. **Aims and Objectives:** To study Penetrating Keratoplasty with respect to Risk factors, Indications and Visual Outcomes. **Maternal and Methods:** A study of 50 cases who were admitted for keratoplasty in our hospital was carried out. A detailed history was elicited regarding the duration and the onset of corneal disease, whether following trauma on foreign body or corneal ulcer. Donor Material: the main source of donor material was voluntary eye donation. The preferred age group of the donor material was from 20-53 years. **Results:** The most of the cases were Males i.e. 70% and 30% were females. Total number of cases that were subjected for penetrating keratoplasty, 70% were males. Most of the cases were between 51- 60 years of age. Majority of the associated risk factors were Leucoma-50% followed by ; Corneal ulcer with abscess-12%,Corneal ulcer-10%; Staphyloma-8%; Perforated corneal ulcer-6%; Adherent leucoma-6%,Hypopyon ulcer-4%; Opaque corneal grafts-4% respectively. Most common indication was Optical 60% followed by Therapeutic 34% and Cosmetic indication was in 6%. The most common complications /Outcome observed were Vascularisation in 52 % followed by Keratitis in 50%; Peripheral anterior synechiae in 30%; Infection in 28%; Wound leak in 20%; Iridocyclitis in 20%; Glaucoma 20%; Shallow anterior chamber in 20%. Graft rejection in 16%. **Conclusion:** Penetrating Keratoplasty is overall an effective long-term treatment for improving visual function in selected patients but the complications some time limits its use so the effective and prompt management of complications is mandatory.


Keywords: Penetrating Keratoplasty, Leucoma, Staphyloma, Hypopyon ulcer, Corneal ulcer, Keratitis, Peripheral anterior synechiae.

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INTRODUCTION

Corneal transplantation is the most common form of transplantation with over 2500 grafts in the United Kingdom¹ and 32 000 grafts undertaken in the United States² annually. Outcomes, including failure and complications of the procedure, are well known and appear dependent on several factors, preoperative

comorbidity, and the health of the donor tissue. Modern-day success in transplantation is attributed to eye banking, storage techniques, ocular pharmacology, equipment, and modern surgical techniques.³ Survival and complication rates of PK have been regularly reported in the developed, and indeed, the developing world. The assessment of improved functional vision following transplantation, particularly for unilateral pathology, is complex. Relatively few analyses of corneal graft outcomes include final visual acuity, considering that the majority of PKs are performed for visual rehabilitation. Brahma *et al*⁴ reported a prospective study evaluating visual function in a series of 18 KC patients. They found continued improvement in LogMar visual acuity, contrast sensitivity, and decreased glare following successful postoperative PK. These were positively correlated with an improved VF-14 score, confirming the efficacy of PK in KCs. In a study, by Rahman *et al*⁷ 48% of patients achieved best-corrected Snellen acuity (BCVA) of 6/12 or

better 5 years postoperatively, compared with 9% achieving the same visual acuity preoperatively. Similarly, the proportion of individuals obtaining counting fingers, hand movement, light perception, or worse reduced from 44% preoperatively to 14% postoperatively and it was encouraging, especially as 35% of grafted patients could be considered high risk, as defined by Vail *et al*,⁵ in this review. In a similar cohort, Beckingsale *et al*⁶ described a BCVA of 6/18 or better in over 50% of high risk patients over 5 years. Although, the goal of corneal grafting is to maximise visual potential of the eye, other than glaucoma. The main donor graft-related factor predisposing to the development of Micro Keratitis in study by Rahman *et al*⁷ were suture-related problems, that is, loose, broken sutures, or suture removal. Siganos *et al*⁸ showed that bacteria are encountered at the site of suture erosion, and if sutures have been eroded for more than 24 h, the risk of bacterial invasion increases. Similarly, manipulation of corneal graft sutures potentially has the risk of infection.⁹

AIMS AND OBJECTIVES

To study Penetrating Keratoplasty with respect to Risk factors, Indications and Visual Outcomes.

MATERNAL AND METHODS

A study of 50 cases who were admitted for keratoplasty in our hospital was carried out. A detailed history was elicited regarding the duration and the onset of corneal disease, whether following trauma on foreign body or corneal ulcer. Slit lamp examination was carried out in each case to find out the state of the cornea, vascularization, ciliary injection and signs of iridocyclitis. Tonometry was carried out in each case to know the tension of the eye and if found high, tension was lowered medically or surgery for glaucoma was done on the table. The state of the lens also determined by slit lamp, whenever possible by dilating the pupil and fundus examination was also done. Pre-operative vision was recorded and prognosis was given accordingly, any pathological condition likely to be unfavorable and to endanger the success of the operation or which may lead to opacification of the graft was adequately treated. A systematic course of antibiotic either tetracycline, chloramphenicol or ampicillin was given at least two days prior to the operation. The occlusive power of the lids was tested for, because if there is any exposure, transparency of the graft is affected. Entropion, ectropion and distichiasis required surgical intervention. Whenever anterior synechiae was found before grafting they were divided by a capsulotomy knife, needle or synchiaetome or larger synechiae were removed by passing an iris reposer or cyclo-dialysis spatula, through the sclera

incision three mm from the limbus and air injection into the anterior chamber. When iris was found to be extensive adherent to the posterior corneal surface as in anterior staphyloma, entire iris adherent to the cornea was also removed, when posterior synechiae was found, iridectomy was done prior to the operation or on the table. Vascularisation of the cornea was either treated pre-operatively by beta-radiation or by performing peritomy and in some cases beta-radiation was also given post operatively.

Donor Material

The main source of donor material was voluntary eye donation. As far as possible it was seen to it that the donor was free from: HIV infection, HbsAg infection, Death due to unknown cause, Death from central nervous system disease of unknown etiology, Rabies. Septicemia, Intrinsic eye disease-retinoblastoma, glaucoma and malignant tumors of the anterior segment, Hodgkin's disease. The success of the full thickness corneal transplant was determined by the viability of the endothelium. The preferred age group of the donor material was from 20-53 years. Specific immunologic rejection may take place after transplantation and therefore at the time of the operation the corneal epithelium was scraped in a few cases. While excising the donor cornea, great care is taken to prevent drying or damage of the cornea.

RESULTS

Table 1: Gender wise Distribution of the Keratoplasty Patients

Keratoplasty	
Males	35 (70%)
Females	15 (30%)
Total	50 (100%)

The most of the cases were Males i.e. 70% and 30% were females.

Table 2: Age wise distribution of the Keratoplasty Patients

Age Group in years	Males	Females	Total
00-10	1	1	2
11-20	5	5	10
21-30	9	1	10
31-40	7	1	8
41-50	3	3	6
51-60	7	4	11
61-70	3	0	3
Total	35	15	50

Table 2 shows that amongst the total number of cases that were subjected for penetrating keratoplasty, 70% were males. Most of the cases were between 51- 60 years of age.

Table 3: Distribution of the Patients as per the associated risk factors

Name of the Disease	No of patients	Percentage (%)
Leucoma	25	50%
Corneal ulcer with abscess	6	12%
Corneal ulcer	5	10%
Staphyloma	4	8%
Perforated corneal ulcer	3	6%
Adherent leucoma	3	6%
Hypopyon ulcer	2	4%
Opaque corneal grafts	2	4%
Total	50	100%

From above table it is clear that majority of the associated risk factors were Leucoma-50% followed by ; Corneal ulcer with abscess-12%, Corneal ulcer-10%; Staphyloma-8%; Perforated corneal ulcer-6%; Adherent leucoma-6%, Hypopyon ulcer-4%; Opaque corneal grafts-4% respectively.

Table 4: Distribution of the Patients as per the Indications

Indications	Males	Females	Total	Percentage (%)
Optical	20	10	30	60 %
Therapeutic	13	4	17	34 %
Cosmetic	2	1	3	6 %
Total	35	15	50	100%

The most common indication was Optical 60% followed by Therapeutic 34% and Cosmetic indication was in 6%.

Table 5: Distribution as per the Post-operative Outcome (complications)

Complications	Number of patients	Percentage (%)
Vascularisation	26	52 %
Keratitis	25	50%
Peripheral anterior synechiae	15	30%
Infection	14	28%
Wound leak	10	20%
Iridocyclitis	10	20%
Glaucoma	10	20%
Shallow anterior chamber	10	20%
Graft rejection	8	16%
Hypopyon	5	10 %
Sloughing of graft	4	8%
Graft bulging	3	6%
Iris prolapsed	3	6%
Hyphaema	3	6%

The most common complications observed were Vascularisation in 52 % followed by Keratitis in 50%; Peripheral anterior synechiae in 30%; Infection in 28%; Wound leak in 20%; Iridocyclitis in 20%; Glaucoma 20%; Shallow anterior chamber in 20%. Graft rejection in 16%.

DISCUSSION

In the present series, 50 cases were subjected for penetrating keratoplasty. This stuffy was undertaken with a view to study the results of penetrating keratoplasty with respect to their visual improvement and post-operative complications.

Age and Sex

In the present series, 70 percent of cases were males, whereas 30 percent were females. Male of females ratio is M:F=7:3. Ninety percent of cases were lying in 11-60 years age group.

Pre-operative diagnosis

Among 50 cases, 50 percent had leucomatous corneal opacity whereas rest of the cases were having adherent leucomas(6%) staphylomas(8%) corneal ulcers (10%) perforated corneal ulcers(6%) corneal ulcers with abscess(4%) opaque graft(4%). The cases studied by were having corneal degeneration and phlyctenular keratitis in 31 percent of cases. Interstitial keratitis and corneal infection in 45 percent of cases and leucomatous corneal opacity after severs injury in 24 percent of cases.

Indications

In the present series, optical keratoplasty was performed in 60 percent of cases with fresh donor material. Whereas in 34 percent of cases, therapeutic keratoplasty was performed. Out of these cases 35 percent showed pseudomonas pyocyaneus infection, 30 percent of staphylococcus albus and 35 percent of fungal type such as aspergillus and candida. Comparing this with the study carried out by S.R. kmalik and gurbansingh¹⁰, out of 185 cases of therapeutic keratoplasty, 73 percent of cases had pseudomonas pyocyaneus infection.

Outcome / Complications

Among the cases, which were subjected for penetrating keratoplasty, good results were seen in the optical group. In this 47 percent of cases showed clear graft with visual improvement ranging from finger counting few feet to 6/12, where as one case improved to 6/6 with correction (+2.0 cyl at 150). In these cases clear grafts were seen in cases of central corneal opacity with normal peripheral cornea, absence of pre-operative vascularisation, normal intra-ocular tension and absence of peripheral anterior synechiae. In our present series, 40 percent of the grafts became hazy. This could be because of the pre-operative vascularisation of the cornea, raised intra-ocular tension, extensive peripheral anterior synechiae, and corneal opacity of full thickness without any clear cornea peripherally and also following chemical burns, with symblepharon. Also the lack of better instrumentation such as operating microscope, in this donor material contributes to the post-operative clarity of the graft. In these cases vision improved to only moving body. These studies confirm the significance of corneal vascularisation, additional surgical procedures, glaucoma,

and rejection as significant risk factors in eventual failure.^{11,12,13} Most rejection episodes occur in the first 3 years following keratoplasty. All dredge *et al* and Peleyer *et al*^{14,15} who noted that the rejection appeared most frequently over the first 12 months, 29 and 43%, respectively.

CONCLUSION

Penetrating Keratoplasty is overall an effective long-term treatment for improving visual function in selected patients but the complications some time limits its use so the effective and prompt management of complications is mandatory.

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