

## Research Article

# Visual outcome in patients undergoing penetrating keratoplasty

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## ABSTRACT

**Background:** Penetrating keratoplasty is the surgical removal of diseased cornea with replacement by full thickness corneal donor tissue. The aim of the study was to know the visual outcome in patients undergoing penetrating keratoplasty.

**Methods:** Thirty patients were selected from department of ophthalmology, Guru Gobind Singh medical college & hospital, Faridkot for penetrating keratoplasty.

**Results:** Visual acuity of 6/12 was seen in 1 case, 6/18 in 4 cases, 6/36 in 5 cases, 6/60 in 5 cases, 3/60 in 4 cases, hand movements in 4 cases, PL+PR+ in 2 cases and no perception of light in 2 cases. Final vision at 6 months of follow up was >6/60 in 10 cases (33.33%). 5 cases (16.67%) had vision between 6/60-4/60. 13 cases (43.33%) had vision of 3/60 or less. While in 2 cases (6.67%) there was no vision at the end of follow up.

**Conclusion:** Penetrating keratoplasty helps patients in regaining vision which makes them able to move independently. Although in our study visual outcome of more than 3/60 was present in only 50% cases.

**Keywords:** Keratoplasty, Transplant, Stevens-Johnson syndrome

## INTRODUCTION

Penetrating keratoplasty is the surgical removal of diseased cornea with replacement by full thickness corneal donor tissue. A successful outcome after penetrating keratoplasty should be measured not by corneal clarity. A clear cornea does not always correspond to improved visual acuity, because of residual regular and irregular astigmatism.<sup>1</sup>

Penetrating keratoplasty can visually rehabilitate many of those who suffer from blindness or visual impairment due to corneal diseases. Corneal scarring is the most common indication for penetrating keratoplasty. Microbial keratitis

and trauma account for majority of the cases of corneal scarring. Aphakic bullous keratopathy, pseudophakic bullous keratopathy and corneal dystrophies are other major indications for penetrating keratoplasty.<sup>2</sup>

The successful visual outcome of penetrating keratoplasty depends upon preoperative condition of recipient eye, condition & processing of donor tissue, surgical technique, postoperative management and postoperative complications. The aim of the study is to evaluate visual outcome in patients undergoing penetrating keratoplasty for various corneal pathologies with follow up for 6 months.

## METHODS

Total 30 eyes of 30 patients were selected in department of ophthalmology, Guru Gobind singh medical college & hospital, Faridkot. Procurement of cornea was done at Bharat Vikas Parishad eye bank, dept. of ophthalmology, G.G.S medical college, Faridkot. All patients with unilateral or bilateral corneal opacity are eligible for corneal transplant, were included in study and patients with Stevens-Johnson syndrome, ocular mucous membrane pemphigoid, severe dry eye, chemical burns, PL -ve patients and active ocular and periocular infection were excluded from study.

### Donor selection criteria

All eyes retrieved within six to twelve hours of death and after clinical assessment of donor's corneal endothelium. There are four grades of donor corneal clarity:

Grade A: donor cornea with healthy epithelium and no stromal oedema and corneal thickness of nearly adult corneal thickness.

Grade B+: Healthy epithelium, stromal oedema less than one third of total cornea and corneal thickness 10 to 25% above normal adult corneal thickness.

Grade B: Normal epithelium or sloughed epithelium, stromal oedema upto one third of cornea and corneal thickness 25 to 33% above normal adult corneal thickness.

Grade B-: Sloughed epithelium, stromal oedema one third to one half of cornea and corneal thickness 33% to 50% above normal adult corneal thickness.

Grade C: Sloughed epithelium, stromal oedema from one half to two third and corneal thickness more than 50% above normal adult corneal thickness.

Grade D: Sloughed epithelium, stromal oedema more than two third of cornea and corneal thickness more than 50% above normal adult corneal thickness.

Cornea grade A and B+ will be used for optical purpose and grade B and below will be used for therapeutic purposes. Grade D cornea will be used for research purposes.

### Donor exclusion criteria<sup>3</sup>

Contraindications for use of donor tissue for penetrating keratoplasty include:

1. Death of unknown cause.
2. CNS diseases, such as Creutzfeldt-Jakob disease, sub-acute sclerosing panencephalitis, rubella, Reye's syndrome, rabies and infectious encephalitis.

3. Infections such as HIV, hepatitis, septicaemia, syphilis and endocarditis.
4. Eye diseases such as retinoblastoma, malignant tumor of anterior segment and active ocular inflammation).
5. Prior ocular surgery (although pseudophakic eyes may be used).
6. Congenital or acquired anterior segment abnormalities such as keratoconus and Fuchs' endothelial dystrophy.

### Surgical technique

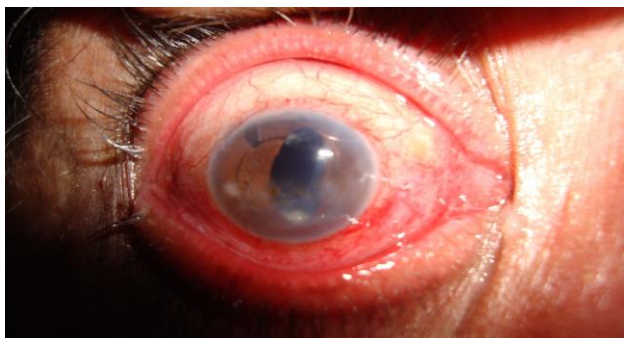
Full thickness donor corneal tissue will be used for transplantation. Circular trephine blades ranging from 7.5 mm to 8.00 mm in diameter will be used to punch the donor lenticule. The host graft disparity will be kept at 0.5mm with donor graft being larger than the host. The donor lenticule will be placed over the recipient bed with 16 10-0 monofilament nylon interrupted sutures.



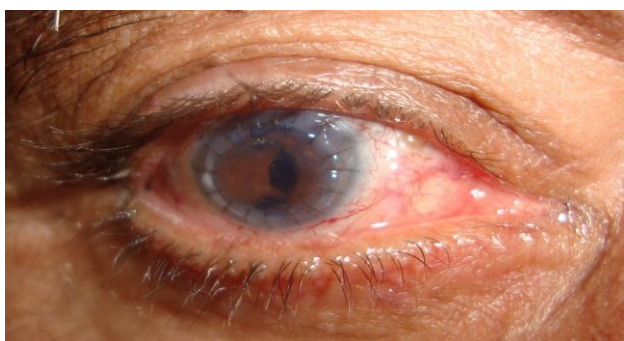
Figure 1: Preoperative picture showing traumatic corneal opacity.



Figure 2: Postoperative picture of same patient at 1 week of follow up.



**Figure 3: Preoperative picture showing healed viral keratitis.**

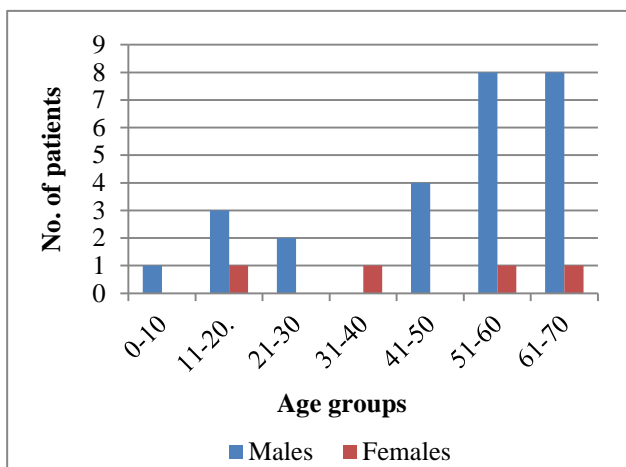


**Figure 4: Postoperative picture of same patient 3 days after penetrating keratoplasty, pupilloplasty is also seen in the picture.**

**RESULTS**

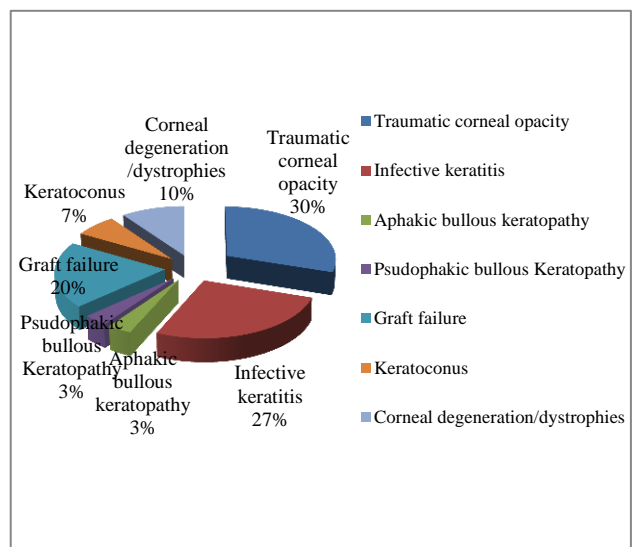
The cases in present study are post-operative cases of penetrating keratoplasty of all age & both sexes operated at G.G.S. medical college, Faridkot. Total number of cases which were taken up for study was thirty.

Figure 5 shows age: Patients in this study belonged up to 70 years of age. Most of the patients were in 41-70 years of age group. Sex: Out of 30 cases 26(86.67%) were male and 4 (13.33%) were females.



**Figure 5: Age and sex distribution.**

Figure 6 shows that out of 30 cases 9 cases (30%) had traumatic corneal opacities. 8 (26.67%) had healed infective keratitis. 1 (3.33%) was of aphakic bullous keratopathy. 1 (3.33%) had pseudophakic bullous keratopathy. 6 (20%) were of graft failure. 2 (6.67%) had keratoconus. 3 (10%) were of corneal dystrophies/degenerations.



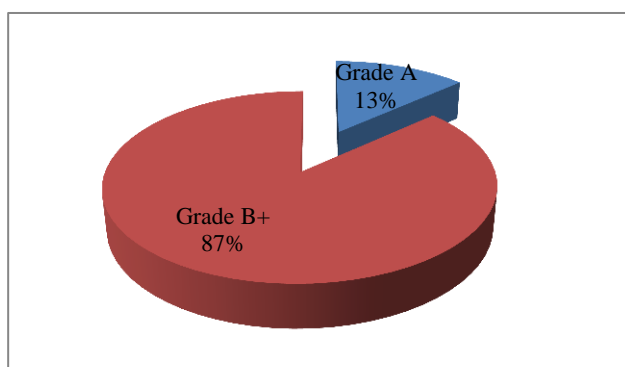
**Figure 6: Indications of keratoplasty.**

**Table 1: Preoperative observations.**

Condition of the eye	No. of cases	%age
<b>Anterior synechiae</b>		
Not present	14	46.67
Present	16	53.33
<b>Vascularisation</b>		
Normal	15	50
Present	15	50
<b>Condition of the lens</b>		
Aphakic	7	23.33
Cataract	11	36.67
Pseudophakia	1	3.33
Normal	11	36.67
<b>Intarocular tension</b>		
Normal	20	66.67
Raised	9	30
Low	1	3.33
<b>Vision</b>		
PL+ PR+	6	20
Hand movements	14	46.67
Finger counting at 1 m	10	33.33
<b>Condition of the eye</b>		
Phthisical	1	3.33
Absolute	1	3.33
Enucleated	-	-
Similar pathology	5	16.67
Normal	23	76.67

Table 1 shows that anterior synechiae were present in 16 (53.33%) cases, vascularisation was present in 15 (50%) cases. In 8 (26.67%) cases lens had already been removed; 7 (23.33%) patients were aphakic while 1 (3.33%) patient was pseudophakic and in 11 (36.67%) cases lens was normal. Intraocular pressure was found raised preoperatively in 9 (30%) cases, low in 1 (3.33%) and normal in 20 (66.67%) cases. Preoperative vision was PL+PR+ in 6 (20%) cases, while in 14 (46.67%) cases hand movements were present and in 10 (33.33%) patients it was finger counting at 1 meter. In 1 (3.33%) patient other eye was phthisical, absolute in 1 (3.33%) patient while in 5 (16.67%) patients similar pathology was found and other eye was normal in 23 (76.67%) cases.

Figure 7 shows that the donor cornea was of grade A in 4 (13.33%) cases with healthy epithelium and no stromal oedema and corneal thickness of nearly adult corneal thickness, while in 26 (86.67%) cases donor cornea was of grade B+ with healthy epithelium, stromal oedema less than one third of total cornea and corneal thickness 10 to 25% above normal adult corneal thickness.



**Figure 7: Condition of donor cornea.**

### Operative observations

#### Anaesthesia

Out of total 30 cases, 29 were operated under local anaesthesia. One patient (6 years old child) was operated under general anaesthesia. Facial and retrobulbar blocks were given with 2% xylocaine with adrenaline + hyaluronidase + bupivacaine.

Table 2 shows that Grafts of 7.5 mm size were used in 5 (16.67%) cases. Grafts of 8.0 mm were applied in 18 (60%) cases and grafts of 8.5 mm were used in 7 (23.33%) cases. Average size of the graft applied in this study was 8.03 mm. All the grafts used were 0.5mm larger than recipient bed opening, except in two cases of keratoconus in which it was of same size. In all cases of adherent leucoma, synechiae were excised and anterior chamber reconstructed. In patients with cataract, cataract extraction was done. Intraocular lenses were placed in six cases.

**Table 2: Distribution of patients according to the size of the graft.**

Graft size (in mm)	Total No. of cases	%age
6.5	-	-
7.0	-	-
7.5	5	16.67
8.0	18	60
8.5	7	23.33
9.0	-	-
10.0	-	-
<b>Total</b>	<b>30</b>	<b>100</b>

Table 3 shows that in this study, 6 cases (20%) were operated for cataract extraction & intraocular lens implantation along with penetrating keratoplasty.

Four cases (66.67%) had final improvement in vision while in rest 2 cases there was pre-existing diabetic retinopathy.

**Table 3: Visual outcome in cases with triple procedure.**

Total No. of cases	Type of cataract		Postoperative
	Mature cataract	Immature cataract	Visual outcome >6/60
6 (20%)	3 (50%)	3 (50%)	4 (66.67%)

Table 4 shows that one case had developed recurrence of attack of viral keratitis.

This case had preoperative vascularisation. Keratitis started on 7<sup>th</sup> postoperative day. There was final improvement in vision after treatment with oral and topical acyclovir.

**Table 4: Recurrence of host disease.**

No. of cases	H/o attacks of viral keratitis	Pre-operative vascularisation	Day of appearance	Visual improvement
1 (3.33%)	1 attack	1 (100%)	7 <sup>th</sup> day	1 (100%)

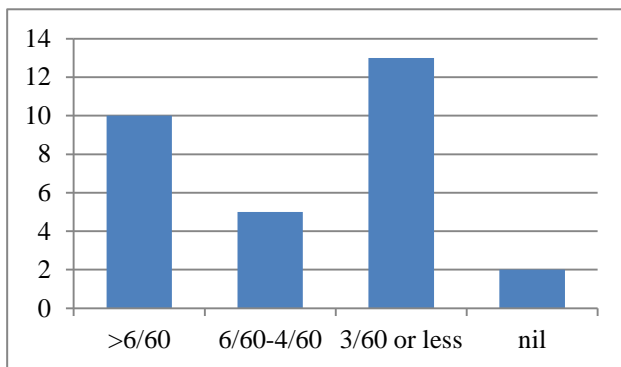
Table 5 shows that visual acuity of 6/12 was seen in 1 case, 6/18 in 4 cases, 6/36 in 5 cases, 6/60 in 5 cases, 3/60 in 4 cases, hand movements in 4 cases, PL+PR+ in 2 cases and no perception of light in 2 cases.

Table 6 shows that final vision at 6 months of follow up was >6/60 in 10 cases (33.33%). 5 cases (16.67%) had vision between 6/60-4/60.

13 cases (43.33%) had vision of 3/60 or less. While in 2 cases (6.67%) there was no vision at the end of follow up.

**Table 5: Post-operative vision at 6 months.**

Visual acuity with glasses	No. of cases
6/6	-
6/9	-
6/12	1
6/18	4
6/24	-
6/36	5
6/60	5
5/60	-
4/60	-
3/60	4
2/60	2
Finger counting at 1 meter	1
Hand Movements	4
PL+PR+	2
No PL	2

**Figure 8: Final visual outcome.****Table 6: Final improvement in vision.**

Final vision	No. of cases	%age
>6/60	10	33.33%
Between 6/60-4/60	5	16.67%
3/60 or less	13	43.33%
NIL	2	6.67%

## DISCUSSION

Corneal blindness is the third most common cause of irreversible blindness in India and accounts for 0.9% of all causes of irreversible blindness.<sup>4</sup> Corneal transplant is the only available treatment to visually rehabilitate the patient with corneal opacity. Now a days due to better instrumentation trend is shifting towards lamellar keratoplasty because of less incidence of graft rejection and better visual outcome.<sup>5</sup>

Present study on visual outcome after penetrating keratoplasty consisted of 30 postoperative cases from eye department of G.G.S. medical college, Faridkot. In this

study effort has been made to identify the common indications leading to penetrating keratoplasty, preoperative and postoperative factors which govern the visual prognosis and complications associated with penetrating keratoplasty. Age of the patients ranged from 10-70 years. 26 (86.67%) patients were males and 4 (13.33%) patients were females. Donor material used was cadaver eyes stored in MK media and all eyes were used within 24 hours. Preoperatively, 7 (23.33%) patients were aphakic, 11 (36.67%) patients had cataract, 1 (3.33%) was pseudophakic and 11 (36.67%) patients had normal lens. All patients were followed for a period of six months. Visual outcome and factors affecting it were noted and analyzed which have been discussed one by one.

### Indications for penetrating keratoplasty

In this study most common indication for penetrating keratoplasty was found to be traumatic corneal opacity (30%), followed by healed corneal ulcer (26.67%) and graft failure (20%). Sony P et al. (2005) reported that healed infectious keratitis (19.83%) and traumatic corneal scars (16.71%) are common indications for penetrating keratoplasty.<sup>6</sup> Common indications in this study correspond with the above mentioned study. In our study best visual prognosis is obtained in cases of keratoconus with visual outcome of >6/18. Sutton G et al. (2008) found that in patients of keratoconus by 3 months almost all patients were able to achieve a best corrected visual acuity of 6/12 or better with progressive improvement over time.<sup>7</sup>

### Final visual improvement

In our study final vision at the end of six months with pinhole was more than 6/60 in 10 cases (33.33%), in range of 4/60 to 6/60 in 5 cases (16.67%). So, overall 50% patients achieved vision of 4/60 or more. Vision is 3/60 or less in 13 cases (43.33%). Negative perception of light is there in 2 cases (6.67%). In a study on penetrating keratoplasty after ocular trauma, Doren GS et al. (1990) found that, of the 39 patients who were on follow up for one year, 20 patients (51%) achieved visual acuity of 6/60 or more.<sup>8</sup> Another study done by Rao SK et al. (1999) concluded that 50% patients had visual acuity of >6/60.<sup>9</sup> The final visual outcome in our study corresponds with the visual outcome in above mentioned studies. In our study, one patient achieved vision of 6/12 and four cases achieved visual outcome of 6/18. Out of this, in 2 cases indication was keratoconus, 2 cases had healed keratitis and 1 case had traumatic corneal opacity. Similarly, the study done by Tay KH et al. (1997) in patients with keratoconus undergoing penetrating keratoplasty, showed that final improvement in vision was 6/12 in 70% cases.<sup>10</sup> In our study, 7 patients were of regrafting, out of which only 1 case (14.28%) had achieved visual acuity of 6/60 and 2 cases (28.57%) had visual acuity of 3/60. Insler MS et al. (1986) found that, out of 11 cases of multiple grafts, only 1 case (9.09%)

had visual acuity of 6/30.<sup>11</sup> Patients with re-grafting have poor visual outcome due to increased risk of allograft rejection and increased incidence of secondary glaucoma.

#### **Visual outcome in patients with triple procedure**

In our study, out of 6 patients who underwent triple procedure, 4 cases (66.67%) had achieved final visual outcome of 6/60. Studies done by Lindstrom RL et al. (1981) and Hunkeler JD et al. (1983) found that final visual acuity in cases of triple procedure was 6/15 in 61% cases and 6/12 in 89% cases.<sup>12,13</sup> In our study the final Snellen's visual acuity was 6/36 in two cases and 6/60 in two cases. Decreased visual outcome in our study is due to the fact that 3 patients in our study were diabetic and 2 patients were of re-grafting.

#### **CONCLUSION**

Blindness due to corneal opacity results in significant morbidity both in terms of loss of vision and socio-economic reasons. Penetrating keratoplasty is the only method to visually rehabilitate the patients with corneal opacity. The results of this study shows that penetrating keratoplasty helps patients in regaining vision which makes them able to move independently. Although in our study visual outcome of more than 3/60 was present in only 50% cases. This can improve further, if complication rate decreases. But as in our study it was not possible as many cases in our set up have corneal blindness due to healed corneal ulcers and associated with many preoperative complications, also most of the cases belonged to poor socio-economic strata and with both eyes blind. So, inspite of knowing poor visual outcome we have to do it so that some useful vision could come in these cases.

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