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## Penetrating Keratoplasty a boon in different corneal diseases to improve social life

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### Abstract

PKP can visually rehabilitate many of those who suffer from visual impairment due to corneal diseases so the primary objective of this study was to report treatment results of patients, who received a total penetrating Keratoplasty for various corneal diseases.

**Purpose:** Review the surgical treatment, anatomical and functional results, and complications of treatment in this group of patients at our institution in terms of graft survival and visual acuity.

**Methods:** This was a hospital based prospective study done in 70 patients admitted in ophthalmology ward, department of Ophthalmology, Basaveshwar teaching general hospital, M.R. Medical college, Kalaburagi over a period of two years. Patients diagnosed with non-healing corneal ulcer, corneal perforation, bullous keratopathy, infectious keratitis, autoimmune disease, injury of the eyeball (mainly chemical burns), and other combined disorders were indicated for total penetrating Keratoplasty After a complete ocular examination, total penetrating Keratoplasty (diameter  $\geq 10.0$  mm) was performed. The surgical technique involved dissection of affected tissues with a margin of minimum 1.0 mm of non-affected tissue. The size of the corneal graft ranged from 10.0 to 14.0 mm,

**Results:** This group consisted of 36 females, whose mean age was  $66.13 \pm 9.94$  (range 39 to 80 years), and 34 males, whose mean age was  $63.69 \pm 14.48$  (range 32 to 92 years). There was no statistically significant difference with respect to gender and age between both groups. The main cause of surgical treatment failure was persistent epithelial defect, observed in 28 (40%) operated eyes, resulting from decreased corneal sensitivity and impaired tear production.

**Conclusion:** Our study confirms that Full Thickness Penetrating Keratoplasty: Surgical boon and effective tool in management of chronic non-healing microbial corneal ulcer refractory to medical therapy, corneal dystrophy and degenerations and various other corneal diseases at my geographical area. It not only eliminates infection but also maintain globe integrity and improve visual acuity and thus improving social life.

**Keywords:** Keratoplasty, surgical treatment, Basaveshwar teaching

### Introduction

Corneal opacity is common cause of ocular morbidity. Prevalence of corneal blindness varies from country to country and from population to population. There is even variation within the developing countries India. In South India, Prevalence of corneal Blindness in both eyes is 0.10% and in 0.56% in one eye. Corneal blindness remains a liability to the family and community as well. The prevalence is multifactorial. The common causes of corneal opacities such as trauma, keratitis, post-surgical, congenital, developmental, degenerative and dystrophic are avoidable. As the disease is more in rural set up where people are ignorant, often present with complications. Nearly 90% of corneal blindness is avoidable<sup>[1]</sup>. Corneal transplantation is one of the most common types of human transplant surgery. By removing a scarred or damaged host cornea and replacing it with a clear and healthy donor transplant, this procedure helps to restore vision in a variety of corneal diseases. The traditional technique for corneal transplantation, penetrating keratoplasty (PKP), is a full-thickness corneal transplantation, which is a well-established technique; however, long-recognized complications such as postoperative infection, corneal and macular edema, astigmatism, retinal detachment, and high rates of immune reactions and graft failure remain significant concerns<sup>[2, 3]</sup>. The primary goal after corneal transplantation is preservation of a clear graft which is maintained with the help of corneal endothelium. PKP can visually rehabilitate many of those who suffer from visual impairment due to corneal diseases so the primary objective of this study was to report treatment results of patients, who received a total penetrating keratoplasty for various corneal diseases. We review the surgical treatment, anatomical and functional results, and complications of treatment in this group of patients at our institution in terms of graft survival and visual acuity.

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## Materials and Methods

This was a hospital based prospective study done in 70 patients admitted in ophthalmology ward, department of Ophthalmology, Basaveshwar teaching general hospital, M.R.Medical college, Kalaburagi over a period of two years. Patients diagnosed with non-healing corneal ulcer, corneal perforation, bullous keratopathy, infectious keratitis, autoimmune disease, injury of the eyeball (mainly chemical burns), and other combined disorders were indicated for total penetrating keratoplasty. The main goal of the surgical treatment was the total removal of the infected or destroyed cornea and restoration of ocular integrity. After a complete ocular examination, total penetrating keratoplasty (diameter  $\geq 10.0$  mm) was performed. The surgical technique involved dissection of affected tissues with a margin of minimum 1.0 mm of non-affected tissue. The size of the corneal graft ranged from 10.0 to 14.0 mm, depending on the extent of corneal necrosis or melting and infiltration of corneal stroma or adjacent ocular tissues. Great care was taken to avoid affecting any structures of the irido-corneal angle while preparing the recipient tissues. Data from the medical records included demographics, medical history, preoperative and postoperative best spectacle-corrected visual acuity (BSCVA) measured using the Snellen visual acuity (VA) chart, cure of the disease, visual outcome, structural globe integrity outcome and complications of surgery, results of accessory examinations (microbial tests),

postoperative intraocular pressure, graft clarity, graft failure, graft rejection, graft dehiscence traumatic and other comorbidities and complications. All patients signed the informed consent form before any surgical procedure and permission was taken from institutional ethics committee.

## Results

Seventy eyes of seventy patients were operated over a period of two years using the total penetrating keratoplasty technique. This group consisted of 36 females, whose mean age was  $66.13 \pm 9.94$  (range 39 to 80 years), and 34 males, whose mean age was  $63.69 \pm 14.48$  (range 32 to 92 years). There was no statistically significant difference with respect to gender and age between both groups. All primary causes of corneal opacity requiring PKP are presented in Table 1. The main cause of this condition was non-healing corneal ulcer.

**Table 1:** Showing various causes of the corneal opacity

Causes of the corneal opacity	Total (n=70) 100%	Female (n=36) 51.4%	Male (n=34) 49.6%
Non Healing Corneal Ulcer	36	15	21
Infectious Keratitis	14	10	4
Autoimmune Disease	10	6	4
Corneal Perforation	8	4	4
Bullous Keratopathy	2	1	1

**Table 2:** Postoperative complications of total penetrating keratoplasty (% in brackets).

Postoperative complications of total penetrating keratoplasty	Non-healing Corneal Ulcer n (%) (n=36)	Infectious Keratitis n (%) (n=14)	Autoimmune Disease n (%) (n=10)	Corneal Perforation n (%) (n=8)	Bullous Keratopathy n (%) (n=2)
Persistent epithelial defect	20 (55.5)	2 (14.28)	3 (30)	2 (25)	1 (50)
Reinfection	8 (22.2)	5 (35.71)	1 (10)	3 (37.5)	0 (0)
Graft melting	3(8.33)	4 (25.57)	3 (30)	1 (12.5)	0 (0)
Graft rejection	3(8.33)	3 (21.4)	0 (0)	2 (25)	1 (50)
Glaucoma	2 (5.55)	0 (0)	3 (30)	0 (0)	0 (0)

The main cause of surgical treatment failure was persistent epithelial defect, observed in 28 (40%) operated eyes, resulting from decreased corneal sensitivity and impaired tear production. Repeated total penetrating keratoplasty, penetrating keratoplasty, or corneo-scleral patch graft was performed where the tectonic approach was necessary more than twice. Reinfection was observed in 17 (24.28%) of eyes that received TPK surgery. Despite vigorous antimicrobial topical and general treatment and repeat tectonic surgery. Graft melting, reported in 11 eyes (15.7%) and frequently preceded by loosening of the sutures and tissue necrosis resulting from infection or immunological mechanisms, was another important complication of TPK. Early graft rejection, characterised by a whitish, sterile ring or diffuse infiltrates, was present in 9 eyes (12.85%) and treated for infectious corneal ulcerations. Intensive topical and systemic immunosuppressive and anti-inflammatory treatment was administered, leading to scarring and thinning of the peri-limbal tissue. No urgent surgical approach was necessary. Subsequent consecutive glaucoma or ocular hypertension occurred despite surgically performed iridectomy during tectonic PKP. Peripheral iridectomy was reported in 5 eyes (7.14%).

## Discussion

The main purpose of PKP is restoration and maintenance of ocular integrity. Postoperative visual acuity and graft clarity are related to many complex immunological and physiological conditions. Anatomical integrity of the globe

does not guarantee improvement of vision. Recent advances in corneal graft technology, including donor tissue retrieval, storage and surgical techniques, have greatly improved the clinical outcome of corneal grafts. Despite these advances, immune mediated corneal graft rejection remains the single most important cause of corneal graft failure [4].

In our study, we assessed, like Burk and Jousen *et al.* [5], that the most frequent indication for rapid tectonic treatment was infection. However, despite maximum broad-spectrum medical and surgical multistage treatment, even when repeated, the final outcome remained frequently unsatisfactory and was considered a therapeutic failure. Endophthalmitis refractory to antimicrobial and anti-inflammatory treatment required the final procedure of evisceration.<sup>6</sup>

Large grafts often are regarded as a risk factor for immunologic graft failure [7]. Our results agree with those reported by Ti *et al.* [8] Corneal graft melting, frequently observed in autoimmune disorders complicated by corneal perforations and usually preceded by loosening of the sutures, is also comparable in frequency, according to the foregoing author's reports.

The present study observed that main cause of surgical treatment failure was persistent epithelial defect, observed in 28 (40%) operated eyes, resulting from decreased corneal sensitivity and impaired tear production delayed epithelialisation or persistent epithelial defect determined a significant graft failure rate and contributed to the higher rate of ocular surface complications [6].

Surgical interventions with large corneal perforations frequently result in consecutive glaucoma. Our results for this complication present less frequently than in some studies<sup>[9]</sup>. Total penetrating keratoplasty is still not a standard procedure for the treatment of corneal perforations. Penetrating keratoplasty, lamellar keratoplasties, and corneoscleral patch grafts remain the more frequently used surgical approach. Systemic immunosuppression, and often multidrug therapy, is necessary to minimize the risk of graft rejection and the necessity of repeat tectonic surgical treatment<sup>[10]</sup>.

The sequential, frequently multistage, and combination surgical approach is necessary to achieve final visual acuity improvement<sup>[11]</sup>. We demonstrated in this study that results of large corneoscleral grafts are unpredictable. In our opinion, this is frequently the only surgical procedure, PKP can be able to restore ocular integrity with simultaneous removal of infectious material, inflammatory membranes, necrotic tissues, and direct drug administration. Such an approach minimizes the risk of endophthalmitis and the spread of disease to the globe, while simultaneously increasing the probability of graft survival and potential improvement of visual acuity.

### Conclusion

Our study confirms that Full Thickness Penetrating Keratoplasty: Surgical boon and effective tool in management of chronic non-healing microbial corneal ulcer refractory to medical therapy, corneal dystrophy and degenerations and various other corneal diseases at my geographical area. It not only eliminates infection but also maintain globe integrity and improve visual acuity and thus improving social life.

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