OUTCOME OF THERAPEUTIC PENETRATING KERATOPLASTY IN R.M. KEDIA EYE HOSPITAL - A RETROSPECTIVE STUDY

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ABSTRACT

Infectious keratitis is the major cause of vision threatening condition and the leading cause of corneal blindness in developing countries. Therapeutic keratoplasty is the procedure for terminating or improving an actively infectious corneal disease. This study was carried out to determine the outcome of therapeutic keratoplasty for infective keratitis at R.M. Kedia eye hospital. This was retrospective study where all cases that underwent TPK for active infective keratitis from May 2019 to April 2020 were included in the study. Data were collected about demographic parameters, indication for surgery, details of donor tissue in terms of donor size, graft size and endothelial density. The outcome of TPK was measured in terms of anatomic stability, eradication of disease, graft clarity and development of cataract and glaucoma. 30 eyes of 30 patients underwent TPK for infective keratitis. 73.3% were male. Average age of the patients was 42. In 60% of patients organisms were isolated as follows: 11 cases of fungus, 3 cases of bacteria and 4 cases of mixed bacteria and fungus. Two surgeries (6.6%) were combined with extracapsular cataract extraction without posterior chamber intraocular lens. The eradication of infection after primary TPK was 23 (76.8%). Twelve eyes (40%) had documentation of variable grades of cataract. One case had secondary glaucoma. Six cases (20%) had graft failure. Therapeutic keratoplasty is the procedure for terminating or improving an actively infectious corneal disease. It helps to save the eye and preserve vision in severe infective keratitis. There is a high incidence of postoperative glaucoma, cataract, and graft failure in such a surgery.

KEYWORDS

Therapeutic penetrating keratoplasty, infective keratitis

***Received on**: December 03, 2021*
***Accepted for publication**: June 24, 2022*

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DOI: https://doi.org/10.3126/nmcj.v24i3.48591

INTRODUCTION

Infectious keratitis is the major cause of vision threatening condition and the leading cause of corneal blindness in both childhood and adulthood in developing countries.[1] Delayed or inappropriate treatment, not responding microbes to therapy and lack of accessibility of eye care may result in large or perforated ulcer.[2] Such cases often require an emergency surgical intervention such as therapeutic penetrating keratoplasty.[3] Therapeutic keratoplasty is the procedure which uses corneal graft for terminating or improving an actively infectious corneal disease. TPK also repairs an anatomic defect in the cornea secondary to infectious keratitis.[4]

This procedure is usually performed in emergent or semi emergent cases. It is also performed in those where the primary goal is to reestablish globe integrity and visual rehabilitation is a secondary condition.[5]

In Asia and developing countries, TPK constitutes a significant proportion of keratoplasty.[2] In Nepal, the first keratoplasty surgery was performed in 1967. TPK accounted for 41% of all graft performed in a tertiary center for cornea services in Nepal.[6] TPK carries higher risk of graft infection and graft failure.[7,8] It also avoids the risk of developing endophthalmitis and sclera involvement.[5,9] It has higher incidence of complication like postoperative uveitis, glaucoma, synechiae and cataract.[10] This study helps to find out the outcome of TPK and provide information for prospective studies.

MATERIALS AND METHODS

This was retrospective study of all cases who underwent TPK for active infective keratitis in R.M. Kedia eye hospital from May 2019 to April 2020. The surgery was performed by a single surgeon in this study to avoid surgical bias.

All the patients with perforated corneal ulcer, non healing corneal ulcers were included in the study where as patients with amniotic membrane graft or conjunctival flap, corneal ulcer with associated endophthalmitis were excluded.

Data were collected about demographic parameters, indication for surgery, details of donor tissue in terms of donor size, graft size, endothelial density. The baseline characteristics included age, gender, laterality, lens status, organisms identified and preoperative best corrected visual acuity (BCVA). The outcome of TPK was measured in terms of anatomic stability, eradication of disease, graft clarity and development of cataract and glaucoma. The donor tissue was collected in MK media from eye bank Tilganga Institute of Ophthalmology.

Surgical technique and postoperative management: Preoperatively intravenous mannitol was given in all cases to achieve hypotony. The TPK was performed under retrobulbar block, except in children. In children general anesthesia was performed. In all cases, the donor size was exceeded by 0.5 mm. The donor cornea was incised using a handheld trephine and the recipient cornea was incised with freehand dissection after initial marking with a trephine. Anterior chamber entry was done with a 15-degree side port knife carefully and gently in perforated corneas. After putting viscoelastic from side port, spatula was used to sweep the adherent and incarcerated iris from the site of perforation. Excision of recipient bed was done with Castroviejo's right and left corneal scissors. Excised recipient corneal tissue was sent for both microbiological and histopathological investigations. Special care was taken not to injure or touch the crystalline lens even if cataractous. Irrigation of AC was done with a balanced salt solution. Inflammatory membranes over iris and angles were peeled off gently. Angles were opened by sweeping with the iris repositor 360 and viscoelastic to keep the iris away from the peripheral cornea. Anterior and posterior synechia were released. One or two iridectomies were performed to prevent pupillary block glaucoma. Cataract extraction was done when there was infection extending to the lens, iatrogenic trauma to lens, or when lens was extruded itself. Anterior vitrectomy was done in cases of spontaneous lens extrusion. Sixteen interrupted sutures were applied with 10-0 nylon suture.

Postoperatively, the duration of antimicrobial treatment as well as initiation and frequency of steroids were titrated based on severity of infection, type of infection, associated epithelial defect, and postoperative inflammation. Fungal keratitis required longer treatment than bacterial. Steroids were started almost immediately in bacterial keratitis but in fungal, it was delayed by 1 to 2 weeks postoperatively. In case of recurrence of the infection, steroids were avoided. Other postoperative problems including formation of synechia, shallowing of AC, secondary glaucoma, non-healing epithelial defect, and loose sutures were managed with supportive medications and/or with procedures such as AC reformation, synechiolysis, tarsorrhaphy, and resuturing of the wound.

RESULTS

Overall, 30 eyes of 30 patients had undergone TPK for infective keratitis. There were male 22 (73.3%) and female 8 (26.6%). The different age of the patient were 3 to 72 and the average age of the patients was 42. Among all, 23 patients were from Bihar India, 6 were from Parsa, Nepal and 1 from Rautahat Nepal.

Average age of donor cornea was 53.3 and endothelial cell count was 2528 cells/mm^2 respectively. Main recipient rim size was 7.73mm.

Out of 30 eyes of TPK, 18 (60%) were positive for organisms of which 11 cases showed pure fungus, 3 cases showed pure bacteria and 4 mixed bacteria and fungus. Culture negative cases were treated according to the clinical diagnosis.

Table 1: Etiology of corneal ulcer

1.Types of fungus	**n**
Aspergillus	0
Fusarium	0
Candida	1
Others	10
2. Types of bacteria	**n**
Staphylococcus aureus	3
Pseudomonas	0
3. Mixed ulcer (Fungus / Bacteria)	**4**
4. Culture negative	**12**

Table 2: Recurrence of infection

Type of infection	**Recurrence of infection n (%)**
Fungal	2
Bacterial	0
Bacterial and fungal	0
Culture negative ulcers	3
Total	**5**

Table 3: Anatomic stability and graft clarity

Type of infection	**Anatomic stability**	**Clear graft**
Fungus	10/11	6/11
Bacteria	3/3	2/3
Mixed	4/4	3/4
Culture negative	10/12	7/12
Total	**27/30**	**18/30**

All patients had undergone full thickness keratoplasty. Out of 30 TPK, 2 surgeries (6.6%) were combined with extracapsular cataract extraction without posterior chamber intraocular lens. In the early postoperative period 1 patient underwent synechiolysis and AC deepening procedure. Resuturing was done in 1 patient.

Overall eradication of infection after primary TPK was 23 (76.8%). Recurrence of infection occurred in 5 cases. The recurrence of infection was detected by the presence of epithelial defect with infiltration with hypopyon and not resolving with medicines. One eye was eviscerated and one eye became phthisical.

On follow-up of 12 eyes (40%) had documentation of variable grades of cataract. 1 case had secondary glaucoma. 6 cases (20%) had graft failure. The causes of graft failure could be either endothelial decompensation or graft rejection due to irregular follow up.

Anatomic stability was more in TPK performed for bacterial ulcer than for fungal ulcers and graft clarity was less in case of fungal ulcer than in bacterial ulcer.

DISCUSSION

The mean age group of our patients were 42 years which is similar to that in Northern India, but varies with other Asian where the mean age is more than 55 years.[11-14] Male preponderance of the patients was seen in India, Singapore and Iran[11,12,14] which was similar to this study.

Corneal ulcer presenting to our institute are already perforated or impending to perforate. So most of the patients who underwent TPK were for perforated corneal ulcer where as Bajracharya and Gurung[10] reported 71% of TPK for perforated corneal ulcer. Similarly, Sedghipour *et al*[12] and Sukhija and Jain[15] reported 76% -88%.

The commonest organism causing infective keratitis in this study were bacterial and fungal. In our study there are large number of culture negative cases. This could be because patients were already treated with antimicrobial agents before they came to our hospital. The ratio of fungal corneal ulcer is more than bacterial ulcer undergoing TPK. *Candida* was the commonest fungus needing TPK in our study whereas *Aspergillus* was commonest in North India and Taiwan and *Fusarium* was commonest in Singapore. The commonest bacteria isolated in our study were *Staphyloccous aureus* and pseudomonas which was similar to study in Taiwan, Singapore and India.[11,13,14]

Fungal corneal ulcer undergoing TPK have higher rate of infection than bacterial in our study. In other study, the recurrences rate varies from 7.3-10%.[16] The cure rate of bacterial corneal ulcers lies within 90-100% which was similar to the study done by Sharma *et al*.[17]

In this study anatomic stability after primary TPK was 90% which was similar to the study reported by Cristol *et al*[17] and Sukhiya and Jain.[15] Anatomic stability was more in TPK performed for bacterial ulcer than for fungal ulcers. Sharma *et al*[11] and Chen *et al*[13] reported 90% - 92% anatomical success rate for bacterial and 84.6% – 88.5% for fungal ulcer. In our study, graft clarity was less in case of fungal ulcer than in bacterial ulcer, Sharma *et al* reported that the range of clear graft varied from 69% - 100% in bacterial ulcers and 51% - 84 % in fungal ulcers.[2]

Cataract is a common complication of corneal ulcer, inflammation and surgical procedure. In this study 40% of the patient develop cataract after TPK where as 51% - 77% of incidence of cataract reported in TPK done for active viral keratitis.[16]

Graft rejection was present in 6/30 (20%) cases in our study. Sony *et al* reported 14.6% - 52.1% rejection rates in TPK.[16] Secondary glaucoma occurs mostly due to extensive peripheral anterior synechia. We noted only 1 case of secondary glaucoma where as 43.4% noted by Bajracharya *et al*.[10] Sharma *et al*[11] and Sukhija and Jain[15] reported 25% and 22% respectively.

There are some limitation in our study. The follow up of the patients was irregular which may be due to distance problem. We did not assess the details about donor tissues and post op visual acuity.

In conclusion TPK plays an important role in the management of perforated, impending perforation and severe infective keratitis. It helps to provide structural stability of the eyeball and can preserve potentiality of vision.

Conflict of interest: None

Source of research fund: None

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