# Outcome of Therapeutic Keratoplasty in Hopeless Microbial Keratitis Cases Otherwise Advised Evisceration

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**Purpose:** To study the outcome of therapeutic keratoplasty in severe microbial keratitis cases otherwise advised evisceration.

**Methods:** A retrospective, single-center clinical audit included 28 patients with severe microbial keratitis presenting from April 2014 to April 2016. Patients with microbial keratitis either affecting more than 2 quadrants of the limbus and/or cases with infections involving more than 180 $mm^2$ of the cornea who were advised evisceration by more than one ophthalmologist were included. Cases with endophthalmitis were excluded. At 3 months, the outcome was "success" if resolution of infection occurred without recurrence and evisceration was not required. Success was termed "complete" if best vision was 6/24 or better and "partial" otherwise. The outcome was termed a "failure" if infection recurred in the graft or the eye was eviscerated.

**Results:** Mean age of the patients (male:female, 17:11) was 49.5 years, and the mean duration of symptoms before surgery was 28.6 days. Evisceration was required in 2/28 cases. The outcome was "success" in 22/28 cases (78.6%)—complete (10/22); partial (12/22)—and "failure" in 6/28 cases. The outcome was poorer in general in fungal keratitis (n = 16) than bacterial keratitis (n = 7).

**Conclusions:** Primary evisceration is best avoided in infections limited to the anterior segment. Even in hopeless cases, every eye deserves a fair chance.

**Key Words:** microbial keratitis, evisceration, hopeless, therapeutic, penetrating, keratoplasty

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Infectious keratitis is a leading cause of monocular blindness worldwide.[1] The cornerstone of its successful treatment is the prompt institution of effective and appropriate topical antimicrobial therapy. In developing countries, the patients often present late with very large corneal infiltrates usually straddling the limbus, with a dense anterior chamber reaction, perforation, or concurrent endophthalmitis. Hence, they are usually deemed as hopeless cases and advised evisceration.

However, in the setting of a normal posterior segment on B scan ultrasound, the decision to perform destructive surgery like evisceration seems to be overkill. On the contrary, whether investing in these eyes is worthwhile is a question to which there is minimal literature. Hence, we decided to perform this pilot study to know the outcome of therapeutic transplantation in such hopeless microbial keratitis cases.

## MATERIALS AND METHODS

This was a single-center, retrospective, clinical audit. Written informed consent was obtained from all patients for all surgical procedures and investigations that they underwent. Patients with keratitis either affecting more than 2 quadrants of the limbus and/or cases with infections involving more than 180 $mm^2$ of the cornea and who were advised evisceration by more than one ophthalmologist were included. Cases with endophthalmitis on B scan were excluded.

The clinical and microbiological data were retrieved from the medical records. At initial presentation, the clinical data recorded were age, sex, best-corrected visual acuity (BCVA) at presentation, duration of symptoms before surgery, the number of antiinfectious medications the patient was on before presentation, and whether corneal scraping was done before presentation. Subsequently, all patients underwent large therapeutic keratoplasty. Postoperative data at 3 months included the histopathology and microbiology report to ascertain the etiology, BCVA, and whether evisceration was actually required.

All patients underwent therapeutic penetrating keratoplasty within 1 week of presentation. Host trephination was such to include the limbus on all sides. A 1-mm graft–host disparity was chosen in all cases such that the donor was oversized by 1 mm over the host. Intraoperative complications most commonly seen were bleeding from the inflamed iris tissue and a high positive pressure. All measures to protect the lens from expulsion were taken during surgery.

Outcome assessment was done at 3 months. At 3 months, the outcome was termed a "success" if resolution of

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**TABLE 1.** Demographic and Clinical Characteristics

| Demography | | | Preoperative | | | | | | Postoperative | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Case No. | Age | Sex | History, d | Antiinfectious Drugs | Corneal Scraping | Advised Evisceration | BCVA | Graft Size, mm | Outcome (3 mo) | Evisceration | HPE Report | BCVA —3 mo | Cataract |
| 3 | 44 | M | 43 | 4 | No | 2 | PL | **10** | Complete success | No | Bacteria | 6/9 | No |
| 6 | 23 | M | 54 | 3 | Yes | 3 | PL, PR | 10.5 | Partial success | No | Bacteria | 6/36 | Yes |
| 11 | 56 | M | 26 | 6 | No | 3 | PL | 11 | Partial success | No | Bacteria | FC 3 m | Yes |
| 14 | 30 | F | 35 | 4 | No | 2 | PL, PR | 10.5 | Partial success | No | Bacteria | FC 2 m | No |
| 18 | 54 | F | 32 | 4 | No | 2 | PL | **10.5** | Complete success | No | Bacteria | 6/18 | No |
| 19 | 43 | M | 11 | 5 | Yes | 2 | PL, PR | **10** | Complete success | No | Bacteria | 6/24 | No |
| 27 | 54 | F | 16 | 5 | No | 2 | PL, PR | **10.5** | Complete success | No | Bacteria | 6/9 | No |
| 1 | 46 | M | 23 | 4 | No | 3 | PL | **10.5** | Complete success | No | Fungus | 6/12 | No |
| 2 | 54 | F | 4 | 5 | No | 3 | PL, PR | **11** | Failure | No | Fungus | PL, PR | Yes |
| 4 | 69 | F | 56 | 3 | No | 4 | PL, PR | 11 | Partial success | No | Fungus | 6/60 | Yes |
| 5 | 79 | M | 32 | 4 | No | 2 | PL, PR | **10.5** | Failure | No | Fungus | PL, PR | No View |
| 7 | 45 | M | 23 | 4 | No | 3 | PL | **10.5** | Complete success | No | Fungus | 6/12 | No |
| 9 | 31 | M | 32 | 5 | No | 2 | PL, PR | **10** | Complete success | No | Fungus | 6/18 | No |
| 10 | 65 | F | 22 | 5 | No | 2 | PL, PR | 10 | Partial success | No | Fungus | 6/36 | Yes |
| 12 | 66 | M | 53 | 4 | No | 3 | PL | **10.5** | failure | Yes | Fungus | No PL | NO PL |
| 13 | 67 | F | 42 | 5 | No | 2 | PL, PR | 10.5 | Partial success | No | Fungus | PL, PR | No |
| 15 | 43 | F | 31 | 6 | No | 3 | PL, PR | 10.5 | Partial success | No | Fungus | HMCF | Yes |
| 17 | 35 | M | 43 | 5 | Yes | 3 | PL, PR | 11 | Partial success | No | Fungus | HMCF | Yes |
| 20 | 44 | F | 20 | 6 | No | 2 | PL | 10.5 | Partial success | No | Fungus | HMCF | Yes |
| 21 | 45 | M | 14 | 5 | No | 2 | PL, PR | **11** | Failure | Yes | Fungus | No PL | No PL |
| 22 | 65 | M | 21 | 4 | No | 3 | PL, PR | 10.5 | Partial success | No | Fungus | FC 1 m | No View |
| 23 | 43 | M | 23 | 6 | No | 2 | PL, PR | 10 | Partial success | No | Acanthamoeba | HMCF | Yes |
| 26 | 76 | M | 21 | 5 | No | 3 | PL | **10.5** | Failure | No | Fungus | 6/60 | Yes |
| 28 | 77 | M | 34 | 4 | Yes | 4 | PL, PR | **10.5** | Failure | No | Fungus | PL, PR | No |
| 8 | 32 | F | 11 | 4 | No | 3 | PL, PR | 10 | Partial success | No | No growth | HMCF | No |
| 16 | 21 | M | 54 | 6 | Yes | 2 | PL, PR | **10.5** | Complete success | No | No growth | 6/24 | Yes |
| 24 | 33 | M | 9 | 5 | No | 2 | PL, PR | **10.5** | Complete success | No | No growth | 6/12 | No |
| 25 | 45 | F | 18 | 4 | No | 2 | PL | **10.5** | Complete success | No | No growth | 6/9 | No |
| Mean | 49.46 | M:F | 28.68 | 5.00 | Yes:no | 2.54 | | **10.48** | Success: failure | Yes:no | | | |
| SD | 16.28 | 17:11 | 14.62 | | 05:23 | 0.64 | | 0.32 | 22:06 | 2/26 | | | |
| Median | 45 | | 24.5 | | | 2.00 | | 10.5 | | | | | |

BCVA, best corrected visual acuity; F, female; FC, finger counting—cases with "PL only" had inaccurate PR and cases with "PL PR" had accurate projection of rays; HMCF, hand movements close to face; M, male; PL, perception of light; PR, projection of rays.

infection occurred without recurrence and evisceration was not required. Success was termed "complete" if BCVA was 6/24 or better and "partial" otherwise. The outcome was termed "failure" if infection recurred in the penetrating graft or the eye was eviscerated. All the descriptive parameters were noted in the form of mean and standard deviation if the data were parametric or in the form of median if the data were nonparametric.

## RESULTS

During the study period, April 2014 to April 2016, the total number of patients following the inclusion criteria managed at our center was 39. Of these, 6 presented with concurrent endophthalmitis and 5 were lost to follow-up. Hence, they were excluded from the study. Of the entire cohort of 39 cases, 28 cases fitting the inclusion criteria and with a minimum follow-up of 3 months after surgery were included.

Demographic data, preoperative data, and postoperative outcomes are summarized in Table 1. Mean age of the patients was 49.5 +/− 16.3 (median 45, range 21–79) years and the male:female ratio was 17:11. The mean duration of symptoms before presentation was 28.7 +/− 14.6 (median 24.5, range 4–56) days. At presentation, all patients were using more than 3 antiinfectious topical drugs (median 5, range 3–6) but only 5/28 had a history of corneal scraping. All the patients had been advised evisceration by at least 2 (median 2, range 2–4) ophthalmologists. Visual acuity at presentation was light perception only in 9/28 cases and light perception along-with accurate projection of rays in 19/28 cases. The most common graft size used was 10.5 mm in 17/28 cases. All patients underwent a B scan to rule out endophthalmitis cases. They were then subjected to surgical therapeutic keratoplasty.

Assessment was done at 3 months. The outcome was a "success" in 22/28 cases (78.6%). Success was complete in 10/22 (Fig. 1) and partial in 12/22 cases (Fig. 2). The outcome was failure in 6/28 cases (Fig. 3); of these, the infection recurred in 4 cases. Evisceration was ultimately required in 2/28 cases.

The histopathology or microbiology report from the excised corneal specimen revealed that the etiology was bacterial (7/28), fungal (16/28), or acanthamoeba (1/28). It could not be ascertained in 4/28 cases. Subgroup analysis revealed that the graft survival was better in bacterial keratitis cases (7/7) than fungal keratitis cases (11/16) or the acanthamoeba (1/1) case. All the cases that had a failed outcome were of fungal etiology in our cohort. Final visual acuity at 3 months was varied and ranged from no perception of light in cases that were eviscerated to 6/9. Two eyes were eviscerated, and these two had a poor view of the anterior segment to note the findings. The most common cause of decreased vision in cases with a good outcome was development of significant cataract (14/24). Other complications noted were peripheral anterior synechiae in 1 quadrant (4/24), 2 quadrants (6/24), more than 2 quadrants (6/24), rise in the intraocular pressure requiring medication (11/26), rise in the intraocular pressure requiring surgery (1/26), and a shallow anterior chamber with intumescent cataract (3/24).

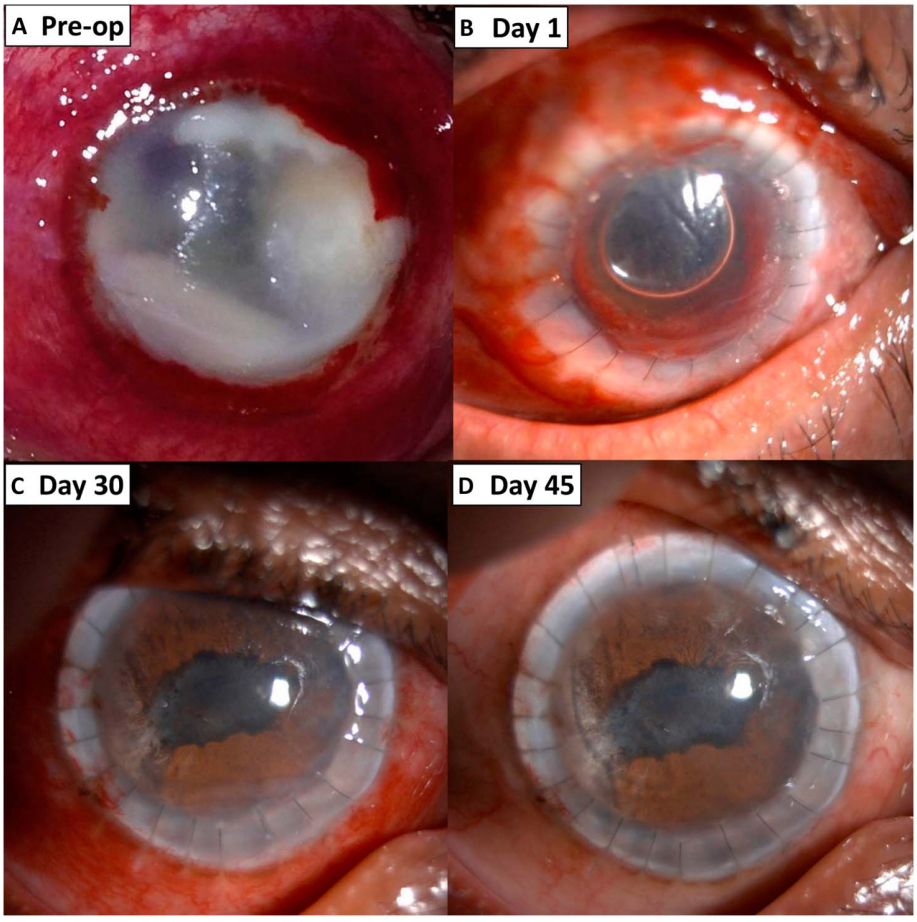


**FIGURE 1.** A, Composite showing the clinical outcome of case 7, who presented with a dense infiltrate straddling the limbus in 3 quadrants. B, Postsurgery day 1 shows a large graft in situ with a formed anterior chamber with hyphema and a small air bubble. Subsequent follow-up reviews reveal no recurrence of infection at day 30 (C) and after 1 month (D). Posterior synechiae are seen all around. Histopathology revealed infection caused by filamentous fungi. Species identification could not be done. Pre-op, preoperative.

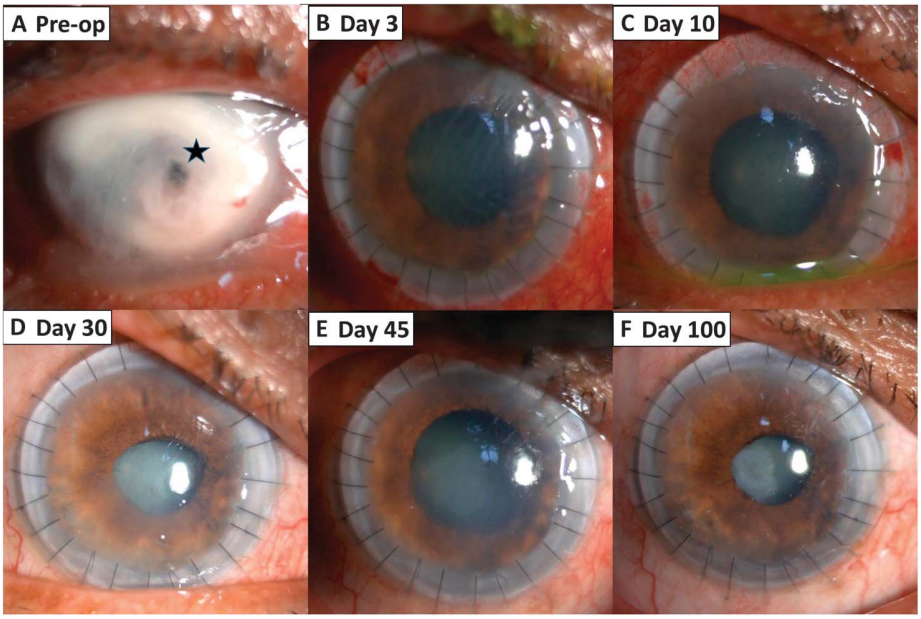


**FIGURE 2.** Composite showing the clinical outcome of case 11. A, The patient presented with a dense limbus–limbus infiltrate and central perforation (black star). B and C, Postsurgery days 3 and 10 show a large graft in situ with a formed anterior chamber. D–F, Subsequent follow-up reviews reveal a quiet eye with progression of cataract at and no recurrence of infection; histopathology revealed infection caused by gram-positive bacteria; culture report revealed *Staphylococcus aureus* sensitive to routine antibiotics. Pre-op, preoperative.

## DISCUSSION

Therapeutic keratoplasty is indicated in cases in which infectious corneal disease progresses despite maximal medical therapy and the globe integrity is compromised.[1–3] We report the outcome of therapeutic keratoplasty in cases with severe microbial keratitis including those straddling the limbus in more than 2 quadrants. The existing literature looking particularly at this subset of patients is sparse. However, because of presumed lower probability of a successful outcome and minimal hope of eye salvation, these patients

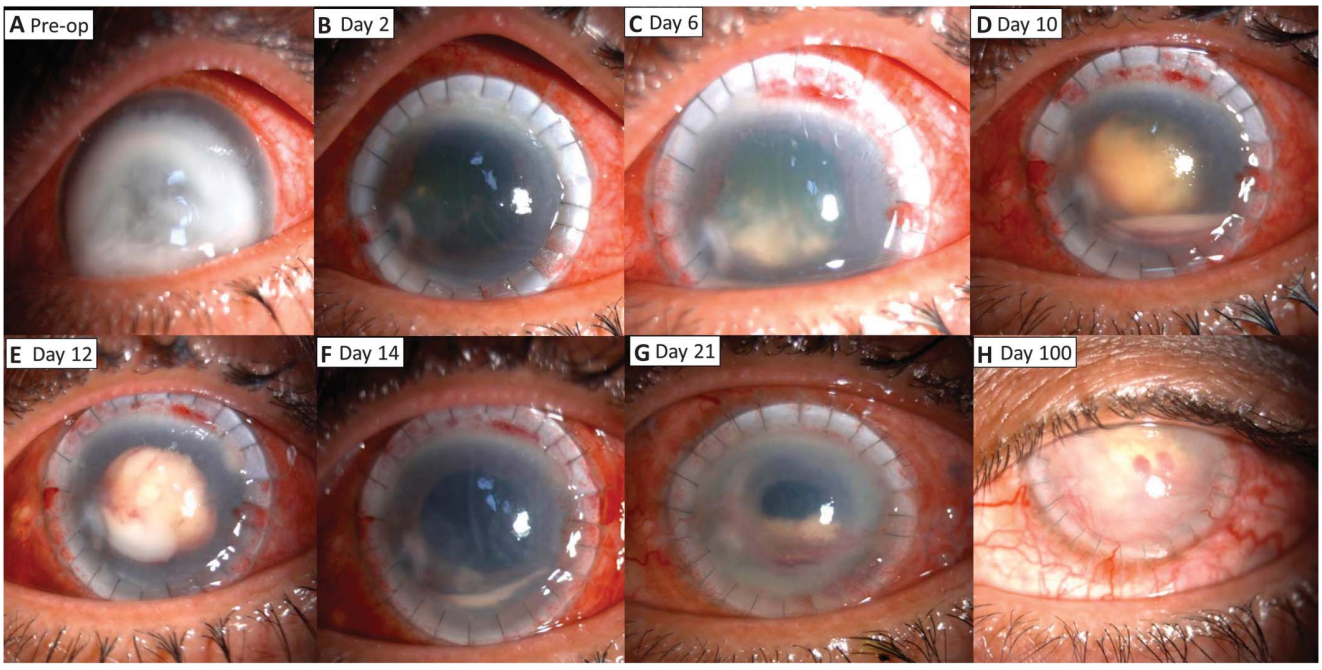


**FIGURE 3.** Composite showing the clinical outcome of case 28 with failure of the outcome. A, The patient presented with a dense corneal infiltrate reaching the limbus in the inferior half with a history of only 3 days. B, He underwent therapeutic keratoplasty immediately the next day. Recurrence was seen from the anterior chamber on day 6 (C), which rapidly progressed (D and E) with development of endophthalmitis; pars plana lensectomy with vitrectomy with intracameral antibiotics was done on day 14 (F); inflammatory pupillary membrane developed (G). At 3 months, the patient has a vascularized graft, accurate projection of rays with a normal intraocular pressure (H); microbiology proved it to be *Fusarium sp.* Pre-op, preoperative.

are often advised evisceration as a measure of quick pain relief. Chaudhary et al reported the current indications of evisceration as a blind painful eye, endophthalmitis, phthisis bulbi, severe traumatic injury, and glaucoma.[4,5] We hereby report our results of therapeutic keratoplasty in such "hopeless" microbial keratitis cases.

The findings of our study indicate that microbial keratitis affects the young population and is more common in males, findings similar to those published earlier.[6,7] This is important because destructive surgery like evisceration had been advised to our cases, all in the productive age group. Hence if any other alternative was present, it would be an ideal alternative to these patients. It was also noted that although all patients were on multiple antibacterial, antifungal, and antiviral drugs, an attempt to find the microbial etiology was made only in 5/28 cases.

In our cohort, anatomic integrity of the eye was restored, infection eradicated, and vision saved for potential enhancement in the future in 22/28 cases. This was much better than was expected at the time of admission. Of these, 10/22 cases had complete success with good postoperative vision of 6/24 or better at 3 months. However, 12/22 cases had partial success with a relatively poor visual outcome. The causes of decreased vision were development of significant cataract (9/12) or an edematous graft (3/12). Evisceration surgery was finally required because of recurrence of microbial keratitis in the penetrating graft only in 2 cases. Only in one other case was vision lost and the eye became no perception of light.

It was noted in our study that the outcome of cases of fungal keratitis was poorer than those of bacterial keratitis cases or the isolated acanthamoeba case. Sharma et al[8] have mentioned a cure rate (absence of recurrence) of 69% to 90% in fungal ulcers and 90% to 100% in bacterial ulcers. Anatomic stability, anatomic success, and graft clarity have also been noted to be more in surgery performed for bacterial ulcers than for fungal ulcers.[7–9] Other causes of a poor prognosis in fungal keratitis are delayed diagnosis, deeper involvement, fewer antifungal drugs, and resistance to available medical therapy.

Despite a successful outcome, these patients require multiple surgical procedures before reasonable vision is offered. In our study, 14/28 (50%) patients had a Snellen BCVA of 6/60 or better. This was different from the visual outcome reported earlier wherein 14.8% patients had a visual acuity 6/60 or better.[8] The probable difference in the outcome in these 2 studies could be due to the difference in the follow-up period, which was 3 months in our study and 1-year in the latter. It is noteworthy that such operated eyes with large grafts are more likely to eventually develop immune rejection and also be complicated by glaucoma. Hence, all these patients require multiple exhaustive counseling sessions at every step for them to understand that each decision in such cases is difficult and is most often out-of-the-book.

Finally, as is evident from our study, primary evisceration is best avoided in infections limited to the anterior segment. Although the presence of infection and severe inflammation at the time of surgery makes the postoperative course challenging, surgery provides structural stability, ambulatory vision, and can preserve potentiality of vision. Even in the hopeless cases, every eye deserves a fair chance.

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