Clinical Indications for Penetrating Keratoplasty in Maharaj Nakorn Chiang Mai Hospital, 1996-1999

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Abstract

Purpose : To determine the leading indication for penetrating keratoplasty.

Material and Method : The authors retrospectively performed a chart review of the hospital records of all patients who underwent penetrating keratoplasty at Maharaj Nakorn Chiang Mai Hospital between January 1996 and December 1999.

Results : A total of 45 corneal transplants were performed. The leading indications for penetrating keratoplasty, in order of decreasing frequency, were bullous keratopathy (28.9%), corneal scar (22.2%), corneal dystrophy and degeneration (20.0%), corneal ulcer (17.8%), regraft (8.9%), and trauma (2.2%).

Conclusion : Bullous keratopathy was the leading indication for penetrating keratoplasty at Maharaj Nakorn Chiang Mai Hospital from 1996 to 1999, followed by corneal scar. The major cause of bullous keratopathy was associated with posterior chamber intraocular lens implantation.

Key word : Penetrating Keratoplasty, Bullous Keratopathy

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Penetrating keratoplasty is one of the most successful tissue transplantations worldwide[1]. Continued improvement in microsurgical techniques, surgical instrument technology, corneal storage, eye banking, and ocular pharmacological advances has made it a highly successful surgical procedure[2]. Because of the dramatic increase in success attained with penetrating keratoplasty during the past few decades, the evolution in indications for penetrating keratoplasty has been of particular importance to

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ophthalmologists. The leading indications for penetrating keratoplasty varied not only from country to country, but also institution to institution in the same country[3-5].

The objective of this study was to determine the leading indications for penetrating keratoplasty during the past 4 years at Maharaj Nakorn Chiang Mai Hospital. The authors retrospectively reviewed the clinical indication for penetrating keratoplasty and compared these results to our previous report and other studies on the same subject[1,2,5-8].

MATERIAL AND METHOD

All charts of the patients, who underwent penetrating keratoplasty at Maharaj Nakorn Chiang Mai Hospital, Department of Ophthalmology, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand during the four-year period from January 1, 1996 through December 31, 1999, were reviewed. Information obtained included patient age, sex, date of surgery, and pre-operative clinical diagnosis, for which penetrating keratoplasty was performed.

To facilitate a comparison with previous reports[1,2,5-7], the authors used the nomenclature as in our previous report[8]. In the case of corneal ulcer, the etiologic causative agents were recorded. The previous underlying diagnosis was also identified when regraft procedure was performed. In the case of pseudophakic bullous keratopathy, the type of intraocular lens was recorded. Information was also obtained regarding surgical procedures associated with penetrating keratoplasty.

Descriptive statistical analysis was used to analyze the data.

RESULTS

Of the 45 corneal transplantations, 42 patients were involved comprising 25 (59.5%) male and 17 (40.5%) female. Three patients had penetrating keratoplasty in both eyes. The mean age of patients with

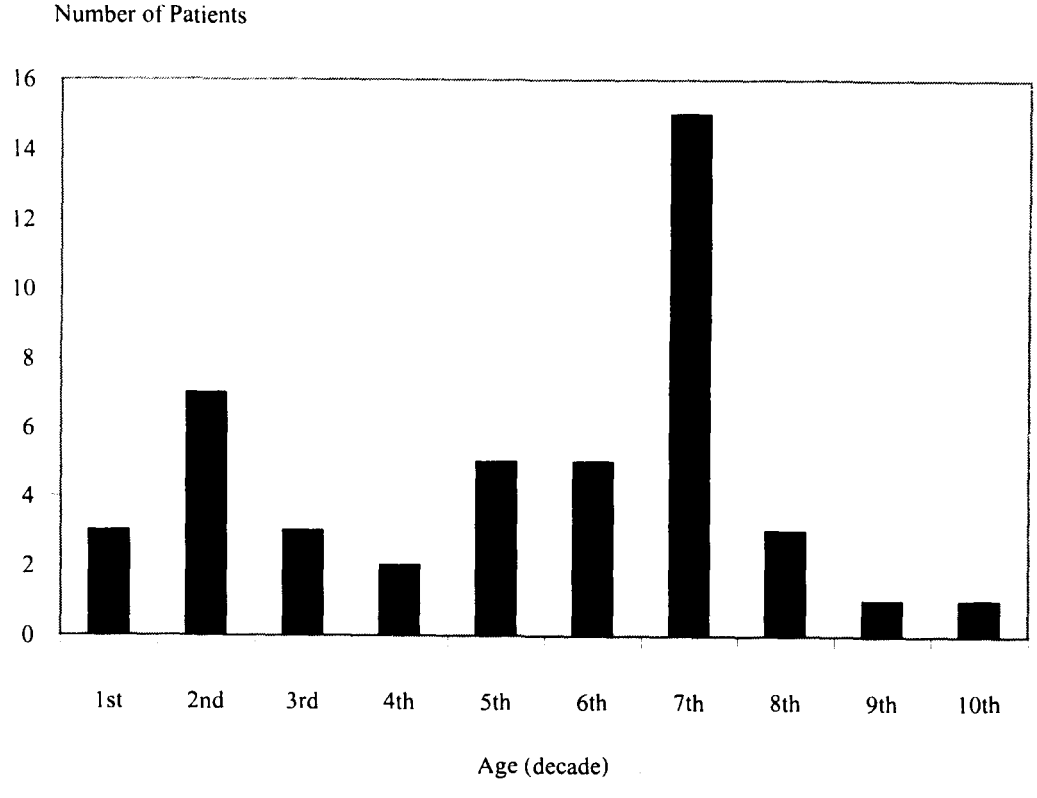

Fig. 1. Total number of penetrating keratoplasties plotted against decade of age.

Table 1. Clinical indications for penetrating keratoplasty by year.

Indication	1996	1997	1998	1999	Total	Percentage
Bullous keratopathy	4	4	3	2	13	28.9
Pseudophakic	3	1	2	1	7	15.5
Aphakic	-	2	1	-	3	6.7
Toxic	1	1	-	1	3	6.7
Corneal scar	4	-	2	4	10	22.2
Corneal ulcer	2	-	1	5	8	17.8
Corneal dystrophy, degeneration	2	4	-	3	9	20.0
Regraft	3	1	-	-	4	8.9
Trauma	-	-	-	1	1	2.2
Total	15	9	6	15	45	100

Table 2. Etiologic causes of corneal ulcer.

Organism	Eyes	Percentage
Bacteria	3	37.5
Streptococcus pneumoniae	1	12.5
Pseudomonas aeruginosa	2	25.0
Fungus	3	37.5
Fusarium solani	2	25.0
Aspergillus fumigatus	1	12.5
Undetermined	2	25
Total	8	100

penetrating keratoplasty was 48.3 years (range 2 years to 94 years), with a standard deviation of 23.8 years. The age range of patients showed a bimodal distribution, with a peak at the second decade and another one at the seventh decade (Fig. 1).

Bullous keratopathy was the most common indication of penetrating keratoplasty and it accounted for 13 (28.9%) cases (Table 1). Of these 13 bullous keratopathy cases, 7 (15.5%) were associated with pseudophakic bullous keratopathy, 3 (6.7%) with aphakic bullous keratopathy, and 3 (6.7%) with bee

Table 3. Previous diagnosis in regrafts.

Diagnosis	Eyes	Percentage
Regraft related to allograft rejection	1	25
Regraft not related to allograft rejection	3	75
Recurrence of gelatinous drop-like dystrophy	3	75
Total	4	100

Table 4. Procedures associated with penetrating keratoplasty.

Associated procedures	Eyes	Percentage
Extracapsular lens extraction with intraocular lens implantation	9	52.9
Scleral fixated intraocular lens implantation with anterior vitrectomy	7	41.2
Trabeculectomy	1	5.9
Total	17	100

sting toxic keratopathy. Of the 7 pseudophakic bullous keratopathy cases, 6 (85.7%) were related to posterior chamber intraocular lens and 1 (14.3%) to closed-loop anterior chamber intraocular lens.

Corneal scar was the second most common indication (22.2%). Corneal dystrophy and degeneration ranked as the third most common indication and accounted for 9 (20.0%) cases. Of these 9 cases, 5 (55.6%) were associated with gelatinous drop-like dystrophy, and 4 (44.4%) with Fuchs' endothelial dystrophy.

Corneal ulcer was the fourth leading overall indication for penetrating keratoplasty in this study, accounting for 8 (17.8%) cases. The etiologic causes of corneal ulcer are demonstrated in Table 2.

Regraft was the fifth most frequent indication for penetrating keratoplasty, accounting for 8.9 per cent of them. The previous diagnosis in regraft is shown in Table 3. The least common indication in this report was traumatic ruptured cornea (2.2%).

The procedures associated with penetrating keratoplasty are demonstrated in Table 4. Table 5 demonstrates pre and post-operative results.

DISCUSSION

In the present study, the authors reported the clinical indications for penetrating keratoplasty and associated procedures at our hospital during a 4-year period from 1996 to 1999. The age distribution of patients who underwent penetrating keratoplasty by decade fitted well with other descriptions of bimodal spread[8,9]; the larger peak in the study represented bullous keratopathy, and the second one, corneal dystrophy and degeneration. When compared with our previous report[8], the numbers of penetrating keratoplasty had decreased because these was still a limited quantity of corneal donors. In the authors' previous study[8], corneal ulcer was the most common indication for penetrating keratoplasty. The present study showed that bullous keratopathy was the leading indication for penetrating keratoplasty, accounting for 28.9 per cent of all the transplants carried out. It was found to be more common in the posterior chamber intraocular lens (6 in 13 cases). The possible contributing factors that explained this increase in bullous keratopathy cases included the increased number of cataract extraction performed with posterior chamber intraocular lens implantation, increased percentage

Table 5. Pre-operative and post-operative visual acuity in eyes after penetrating keratoplasty.

Visual acuity	Pre-operative	Percentage	Post-operative	Percentage
6/6 to 6/12	0	0	4	8.9
6/18 to 6/36	0	0	10	22.2
6/60 to 1/60	20	44.5	20	44.5
Count fingers to no light perception	24	53.3	10	22.2
Cannot evaluate	1	2.2	1	2.2
Total	45	100	45	100

Table 6. Comparison reviews of indication for penetrating keratoplasty.

Diagnosis	1996-1999[a]	1990-1995[b]	1981-1992[c]	1978-1987[d]	1987-1999[e]	1989-1993[f]	1992-1996[g]
Bullous keratopathy	28.9	15.5	18.3	22.2	17.6	31.2	17.0
Corneal scar	22.2	24.2	17.1	13.5	27.9	11.1	20.4
Corneal ulcer	17.8	37.9	38.3	12.5	17.9	5.8	17.9
Corneal dystrophy, degeneration	20.0	11.7	4.0	30.9	8.7	14.2	8.6
Regraft	8.9	8.7	9.7	12.1	21.0	21.3	21.0
Others	2.2	2.0	12.6	8.8	6.9	16.4	15.1
Total	100	100	100	100	100	100	100

Data from references [a]present study, [b]8, [c]7, [d]5, [e]1, [f]2, and [g]6

of cataract extraction associated with secondary intraocular lens implantation, and the learning curve of phacoemulsification with intraocular lens implantation. Sugar et al recently reviewed a number of large series of graft by decade and combined the results. It was evident that corneal edema after cataract surgery was the main cause for corneal dysfunction requiring penetrating keratoplasty[10]. Corneal scar was the second most common indication. The corneal scar was generally a long-term complication that developed after various ocular insults, such as previous corneal ulcer, previous ocular trauma, or eyelid problems secondary to trauma[1]. This condition remains the second most common indication in our previous study[8]. Corneal dystrophy and degeneration ranked as the third most common indication for penetrating keratoplasty. Gelatinous drop-like dystrophy was more common among these indications, since the authors found this abnormality in 3 patients (5 eyes) who were in the same family. Interestingly, keratoconus was not found in the present study, while others[6,11] reported it as the second most common indication for penetrating keratoplasty.

The fourth most common indication for penetrating keratoplasty was corneal ulcer. It was the most common indication in our previous study[8]. Fungal and bacterial corneal ulcer appeared to be equal in number in the present study. Maharaj Nakorn Chiang Mai Hospital is a tertiary referral center in northern Thailand. This may reflect the improvement of primary and secondary eye care or many effective and commercially available antibiotics. However, the patients in the present study mostly came with advanced stage disease, so most of them were treated with therapeutic penetrating keratoplasty.

Regraft was the fifth most frequent indication for penetrating keratoplasty, accounting for 8.9 per cent. Recurrent gelatinous drop-like dystrophy was more common and this disorder usually developed a recurrence in the transplanted graft[12]. In Taiwan, regraft was reported as the second most common indication for penetrating keratoplasty in one study[1]. The least common indication in this report was traumatic ruptured cornea. The authors usually sutured the cornea as much as possible and performed penetrating keratoplasty later when it became a corneal scar. Because one corneal button was available at that time, the patient had emergency corneal transplantation.

The procedures associated with penetrating keratoplasty were extracapsular lens extraction with intraocular lens implantation, scleral fixated intraocular lens implantation with anterior vitrectomy, and trabeculectomy. Table 6 compares the indications of the present study with other reports[1,2,5-8] from different continents over the last decade. Of the 45 grafts in the present study, 88.9 per cent (40) had a clear graft. Eighty-five per cent of these clear grafts (34 of 40) had a best-corrected visual acuity of 1/60 or better.

In conclusion, bullous keratopathy was the most common indication for penetrating keratoplasty at our hospital. Most of these cases were associated with posterior chamber intraocular lens implantation.

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ข้อบ่งชี้ทางคลินิกของการปลูกถ่ายกระจกตาในโรงพยาบาลมหาราชนครเชียงใหม่ ระหว่าง พ.ศ. 2539 ถึง พ.ศ. 2542

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จุดมุ่งหมาย : เพื่อทราบถึงข้อบ่งชี้หลักทางคลินิกของการปลูกถ่ายกระจกตา

วิธีการ : เป็นการศึกษาย้อนหลังของผู้ป่วยที่ได้รับการปลูกถ่ายกระจกตาในโรงพยาบาลมหาราชนครเชียงใหม่ระหว่างเดือนมกราคม 2539 ถึงเดือนธันวาคม 2542จากบันทึกเวชระเบียน

ผลการศึกษา : จากการปลูกถ่ายกระจกตา 45 ครั้ง พบว่าข้อบ่งชี้ของการปลูกถ่ายกระจกตาเรียงลำดับจากมากไปหาน้อยมีดังนี้ กระจกตาบวม (281%), แผลเป็นที่กระจกตา (22.2%), กระจกตาเสื่อม (20.0%), แผลติดเชื้อที่กระจกตา (17.8%), การผ่าตัดปลูกถ่ายกระจกตาซ้ำ (8.9%) และกระจกตาได้รับอุบัติเหตุ (2.2%)

สรุป : กระจกตาบวมเป็นข้อบ่งชี้หลักของการปลูกถ่ายกระจกตาในโรงพยาบาลมหาราชนครเชียงใหม่ระหว่างปี พ.ศ. 2539 ถึง 2542 รองลงมาได้แก่แผลเป็นที่กระจกตา ซึ่งส่วนใหญ่ของกระจกตาบวมจะสัมพันธ์กับฝังเลนส์แก้วตาเทียมชนิดช่องตาด้านหลัง

คำสำคัญ : การปลูกถ่ายกระจกตา, กระจกตาบวม

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