Indications for Penetrating Keratoplasty in a Tertiary Care Hospital in Central Part of Thailand

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การเปลี่ยนกระจกตา หรือ penetrating keratoplsty เป็นการผ่าตัดที่อาจช่วยให้ผู้ป่วยที่มองเกือบไม่เห็นได้กลับมามองเห็นอีกครั้งหนึ่ง โดยมีสาเหตุที่ทำให้เกิดโรคของกระจกตา จนกระทั่งจำเป็นต้องได้รับการผ่าตัดเปลี่ยนกระจกตาได้หลายสาเหตุ

Purpose : To review the leading indications for penetrating keratoplasty (PK) at Mettapracharak Eye Center from January 2002 to January 2007

Design : Retrospective, non-comparative study

Methods : Medical charts of all the patients who had undergone penetrating keratoplasty (PK) at Mettapracharak Eye Center, Nakornpathom, Thailand, from January 2002 to January 2007 were retrospectively reviewed. The indications for penetrating keratoplasty (PK) were categorized into eight diagnostic groups, which included
1. Corneal scars 2. Bullous keratopathy 3. Corneal ulcer 4. Corneal dystrophy 5. Corneal ectasia 6. Regrafts 7. Chemical burns and 8. Other causes

Results : The leading indication categories for PK were
1. Bullous keratopathy (25 cases, 40.3% of all indications); PBK 22 cases (88% of all Bullous keratopathy), ABK 2 cases (8% of all Bullous keratopathy), and Bullous keratopathy after Trabeculectomy 1 case (4% of all Bullous keratopathy).
2. Corneal ulcer and its complication except corneal scar eg. impending perforation (13 cases, 20.96%).
3. Corneal scar (9 cases, 14.5%). The major cause of corneal scarring was post trauma (4 cases 44.4% of total corneal scar). The second cause was post infection corneal scar (3 cases 33.3% of total corneal scar). Other conditions cause (2 cases 22.25% of total corneal scar).

4. Corneal dystrophy: Fuchs' endothelial dystrophy (7 cases, 11.3%).
5. Regrafts (3 cases, 4.8%).
6. Corneal ectesia : Keratoconus (3 cases, 4.8%).
7. Chemical burn 1 case (1.6%)
8. Other cause (ICE syndrome) 1 case (1.6%).

Conclusions : Bullous keratopathy was the most common indication for PK at our hospital. The sufficient eye donors would increase the rate of PK in corneal keratitis and prevent the loss of the patient's eyes from evisceration and enucleation.

Abbreviations : PK = penetrating keratoplasty, BK= bullous keratopathy, PBK= pseudophakic bullous keratopathy, ABK = aphakic bullous keratopathy

Keyword : Penetrating keratoplasty

Corneal diseases are significant causes of visual impairment and blindness in the developing world[1]. Penetrating keratoplasty (PK) is necessary for visual rehabilitation in many such cases. Corneal transplantation has become the most common and successful transplant surgery performed today[2-3]. Its indications had been reported in many countries vary from places and time[4]. In Asia, the leading indications are corneal scarring and corneal ulcer[5-8]. In America and Europe, the leading indications are bullous keratoplasty, keratoconus and Fuchs' endothelial dystrophy.

Mettapracharak hospital is a tertiary eye referral center in the central part of Thailand. The purpose of this study was to evaluate the indications for PK at our institution for health promotion planning in prevention corneal blindness diseases in our country and would enable to compare with the indications for PK reported from the developed world.

Materials and Methods

The surgical case logs for 5 years, between January 2002 and January 2007 at Mettapracharak hospital were accessed and all the penetrating keratoplasty cases during this period were identified. Then the medical records of all the patients undergoing PK during this period were reviewed. The demographic data, the indications for PK were reviewed.

The Indications for PK were categorized into

1. Corneal ulcer and its cause : bacteria, fungus, and herpes
2. Corneal scarring and its cause : traumatic, post infection and other causes

3. Bullous keratopathy and its cause : aphakic or pseudophakic bullous keratopathy
4. Corneal dystrophy and its cause
5. Corneal ectasia and its cause
6. Regrafts from any causes
7. Chemical burn
8. Other causes

Results

During January 2002 to January 2007, there were 78 eyes of 75 patients from the surgical case logs underwent PK at Mettapracharak (Wathraiking) hospital. Most of the patients (60/75) obtained corneal tissue from the Thai Red Cross eye bank. Other (15/75) obtained corneal tissue from the eye banks of other countries (USA and Sri Lanka). The available documentations for the revision were just 62 eyes of 60 patients. We found that the proportion between male and female underwent PK was nearly equal, 51.7% and 48.3%, respectively. All of them were Thai. Their ages ranged from 20–94 years and their average age was 60.26 years. The leading ages, 28% of total patients, were 61–70 years old and the major group of the patients (66.6%) were 51–80 years old (Table 1)

Table 1 Demographical Characteristics of the Studied Population

Table 1.1 Distribution of sex

Sex	Patients Number (%)
Male	31 (51.71)
Female	29 (48.29)
Total	**60 (100)**

Table 1.2 Distribution of age

Age (year)	Number (%)
21–30	6 (10)
31–40	4 (6.6)
41–50	5 (8.3)
51–60	8 (13.3)
61–70	17 (28.3)
71–80	15 (25)
>81	5 (8.3)
Total	**60 (100)**

Mean ± SD = 60.10 ± 18.61, Median = 64.50 (range 74 min 20.0 maximun 94.0)

SD = standard deviation.

Table 2 Indications of PK in Mettapracharak Hospital

Indication Category	No. of surgeries (eyes)	% of total PK	Specific indication	No. of surgeries (eyes)	% of the indication catagory
Bullous Keratoplasty	25	40.3	PBK (post IOL) PBK (AC IOL) ABK Post trabeculectomy	20 2 2 1	80% of BK 8% of BK 8% of BK 4% of BK
Corneal ulcer	13	20.96	Fungus Pseudomonas Other	9 3 1	69.2% of ulcer 23% of ulcer 7% of ulcer
Corneal scar	9	14.5	Post trauma Post ulcer Other	4 3 2	44.4% of scar 33.3% of scar 22.2% of scar
Corneal dystrophy	7	11.3	Fuchs'	7	100% of corneal dystrophy
Regraft	3	4.8	Graft rejection	3	
Corneal ectasia	3	4.8	Keratoconus	3	100% of Corneal ectasia
Chemical burn	1	1.6	Alkali burn with impending perforate	1	
Other cause	1	1.6	ICE syndrome	1	
Total	**62**	**100**			

Post IOL = posterior chamber intraocular lens
AC IOL = anterior chamber intraocular lens
ABK = aphakic bullous keratopathy

The most common indications for PK were bullous keratopathy (40.3%), corneal ulcer (21%), corneal scar (14.5%), corneal dystrophy (11.3%), regraft (4.8%), keratoconus (4.8%), chemical burn (1.6%), and other cause which was ICE syndrome (1.6%) respectively (Table 2). The most common indication for PK was bullous keratopathy (25 cases, accounting for 40.3% of total PK cases). Among these 25 cases, 22 cases were PBK, another two were ABK, and the last one was bullous keratopathy after trabeculectomy. Amount of 20/22 cases of PBK had posterior intraocular lens, and the last two cases had anterior intraocular lens. Fifteen cases (60% of total BK cases) had underlying diseases which were six cases with hypertension, four cases with diabetes and five cases with multiple diseases. The age range of this group was 60–94 years.

The second most common indication was corneal ulcer (13 cases, accounting for 20.96% of total PK cases). Of these 13 corneal infection cases, fungal corneal ulcer was the major cause (9 cases, accounting for 69.2% of total corneal infection), three cases were Pseudomonas corneal ulcer (23% of total corneal infection), and one case could not be identified for the microbial cause. The age range of this group was 20–65 years.

The third most common indication was corneal scar (9 cases, accounting for 12.9% of total PK cases). Of these nine cases, four were after trauma (44.4% of total corneal scar), three were post infection (33.3% of total corneal scar), and two were from other causes (22.2% of total PK cases).

The fourth most common indication was corneal dystrophy which caused from Fuchs' endothelial dystrophy (7 cases, accounting for 11.29% of total PK cases).

Other indications including keratoconus and regraft were each found in three cases (each accounting for 4.8% of total PK cases)). The indication for regraft was graft rejection. Chemical burn was found in one case (1.6% of total PK cases). ICE syndrome was found in one case (1.6% of total PK cases).

Discussion

In this study, the author evaluated the indications of PK in five years duration in 62 eyes of 60 patients at Mettapracharak hospital which was a tertiary eye care hospital in central part of Thailand. The hospital treated all the cases that were referred from different parts of Thailand, especially from the rural central part. The most common indication was Bullous keratoplasty. The incidence of Bullous keratoplasty was about 40% of total PK cases. In North America, PBK became a leading indicator for PK in some series[9–11,17–18,21]. But the incidence average was just around 20%–30%. So, the result 40% of total PK is slightly high compared with other studies, including the study from Chiangmai Thailand[20]. This might be caused by pooling of cases. The pooling of cases was the result from having few corneal transplant surgeons in central rural area of Thailand and lack of donor tissue. The shortage of donor corneas is a serious problem in Thailand. Patients must wait for several years before undergoing corneal

transplantation. Even in emergency cases, they have to wait for donor tissue. Because of the improvement of surgical technique and IOL design, the number of aphakia or AC IOL patient has waned. In 1991, aphakic bullous keratopathy was the fourth most common indication and represented 9% of PK performed in USA[12], but has rapidly decreased to 2.5% over the past 14 years[12]. In this study, we found two cases of PBK (AC IOL; 8% of BK) and two cases of ABK (8% of BK). We found that the people in this age group were elderly (60-94 years). 60% of total bullous keratopathy cases were associated with underlying diseases such as diabetes, hypertension, ischemic heart disease. (unpublished data) These conditions may cause poor dilatation of pupil and increase surgical time and risk surgical trauma to endothelium. The second most common indication was corneal ulcer (20% of total PK cases) and the most common microbial cause for corneal ulcer was fungal ulcer (11 cases, accounting for 84% of total ulcer). This could be found in the studies from warm climate countries such as India, China and Ghana[6-8, 13-15]. The reason for this might arise from many factors such as the climate and geographical location of Thailand, the agriculture occupation of the majority of population, the abuse of antibiotic and steroid among the citizens, and the lack of effective antifungal drug. Other causes of corneal ulcer were from Pseudomonas corneal ulcer (3 cases) and culture negative corneal ulcer (1 case). In our hospital, corneal ulcer were the most common cause for evisceration in the time that this study was done (unpublished data). If we added the cases of corneal infection of which infection could not be controlled by medication and they had to undergo evisceration or enucleation because of lack of donor tissue, the number of surgical cases would increase dramatically. The incidence of this indication was higher in Asia[13-15] than in Europe and America. Many institutions in several countries reported the increasing trend of corneal ulcer and its complication[6-7, 13-14]. In contrast with bullous keratopathy, the age group was mostly of young adults that may affect the productivity with consequent economic loss more than other groups. Additionally, this study showed no case of active viral keratitis as an indication for primary PK. This probably reflected better medical management of Herpetic keratitis, including systemic acyclovir. Corneal scar was the third most common indication (12.9%). The proportion of corneal scar was found lower than the reports performed in other developing countries (28%-58%)[5-8]. Post-traumatic corneal scar was the most common cause, accounting for 44.4% of total corneal scar. Trauma especially related with car accident and working was the common causes. Even post ulcerative corneal scar usually has the history of minor trauma as a predisposing factor. Hence, the public education about self protection during working time or how to prevent eye injury should be done. Post ulcerative corneal scar was accounted for 33.3% of total corneal scar while 22.2% of total corneal scar resulted from other causes. Primary corneal endotheliopathies, Fuchs' endothelial dystrophy, was found in our study was 11.2% of total PK cases.

There is a statistically significant increase in the trend of Fuchs' over time[12]. In Thailand, improving of health promotion program has made the people's life span much longer and the distribution of ophthalmologists in the rural areas is better than in the past. Thus Fuchs' endothelial dystrophy should be diagnosed and referred for PK more than ever. Keratoconus were found in three cases. Although keratoconus was the first indication for PK in New Zealand, France, Israel, Brazil (Sao Paolo)[23-25] even in the same country different cities (Brazil: Sao Paulo state and Pernambuco)[25-26]. in the same period, the indications were different. Therefore, specific local factors such as genetic, climate, or even a referral bias should be kept in mind. In our series and similar preponderance that has been reported previously in Asia,[5-8,20] the proportion of keratoconus was low.

Regrafting was found in three cases accounting for 4.8% of all PK, the same number as Keratoconus. Regrafting was also one of the leading indications at a number of institutions in Europe and North America[12,19-20,22]. All cases in this study were graft failure from endothelial failure, similar to other report. Many reports has found, regrafts, both related and unrelated to allograft rejection, has had a slow and steady increase in incidence since the early 1990s[12], which has similarly been found in other studies in the United States and all around the world[9,19-20]. Thus, regrafting can be expected to remain a leading indication for PK and endothelial failure was a leading cause of graft failure.

At present, the shortage of donor cornea is the important problem for corneal transplantation in Thailand. The average waiting time for therapeutic and tectonic PK was 1.5-2 months and for optical indication was 3-4 years. Surgeons had to perform other kinds of surgery instead of PK such as enucleation or evisceration. This is in contrast with the data from Europe and North America where shortage of the cornea is not a serious problem. In Canada, patients have to wait for an average of just 30-50 weeks[21]. Although donor corneas are acquired from two sources, local donations and foreign tissue obtained from USA and Sri Lanka, most of corneas are usually obtained from the Thai Red Cross eye bank. The waiting time of the foreign donors that come from overseas are much shorter than from the Thai Red Cross eye bank, but the expense is much more. Only a few patients can afford them. The number of organ donation in Thailand is limited by the people's belief, attitude, longevity of the donors and a little knowledge about organ transplantation. Another important factor is inadequate healthcare professionals to encourage corneal donation. Lamellar techniques, both manual and automated, are interesting because one donor can donate to two or more recipients. If the surgeries can be performed successfully, pooling of the patients and the waiting time will certainly decrease. However, these new surgical techniques need learning curve and following up for the long term outcomes.

A limitation of our study was that the model did not compare other data such as visual acuity,

long tern outcome, astigmatism etc. Further studies should be performed to examine these questions.

Conclusions

Bullous keratopathy was the most common indication for PK followed by corneal ulcer, corneal scar, and Fuchs' endothelial dystrophy respectively. Shortage of corneal donors distorted the rank of the indications. If donors had been adequate, there would have been more therapeutic and tectonic indications. More funds should be allocated to educate the public and train the professionals to encourage corneal donation. More regional eye bank should be established. The study of the indications for PK is important because they can be changed by multiple factors such as time, location, longevity of donors and recipients. Monitoring of the changing leading PK indications can help medical staffs in planning to cope with serious eye problems.

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ข้อบ่งชี้ของการผ่าตัดเปลี่ยนกระจกตาที่โรงพยาบาลระดับตติยภูมิทางจักษุวิทยาในภาคกลางของประเทศไทย

แพทย์หญิงสายจินต์ อิสีประดิฐ
แพทย์หญิงพิชญา ประไพพานิช
ศูนย์การแพทย์เฉพาะทางจักษุวิทยา โรงพยาบาลเมตตาประชารักษ์ (วัดไร่ขิง) นครปฐม

จุดมุ่งหมาย : เพื่อศึกษาข้อบ่งชี้ที่เป็นสาเหตุนำในการเปลี่ยนกระจกตาโดยรวบรวมข้อมูลย้อนหลังจากเวชระเบียน ตั้งแต่เดือนมกราคม 2545-มกราคม 2550

วิธีศึกษา : Retrospective, non-comparative study

วัสดุและวิธีการ : เป็นการศึกษาย้อนหลัง โดยการทบทวนเวชระเบียนผู้ป่วยที่ได้รับการผ่าตัดเปลี่ยนกระจกตาที่โรงพยาบาลเมตตาประชารักษ์ (วัดไร่ขิง) ตั้งแต่เดือนมกราคม 2545-มกราคม 2550 โดยแบ่งกลุ่มข้อบ่งชี้ตามการวินิจฉัยเป็น 8 กลุ่มคือ 1.กระจกตาดำเป็นแผลเป็น (corneal scars) 2. Bullous keratopathy 3. กระจกตาดำอักเสบ 4. กระจกตาเสื่อม (corneal dystrophy) 5. กระจกตาโป่ง (corneal ectasia) 6. การเปลี่ยนกระจกตาซ้ำ (regrafts) 7. สารเคมีเข้าตา (chemical burns) 8. สาเหตุอื่นๆ (other causes)

ผลการศึกษา : มีผู้ป่วย 60 คน 62 ตาได้มาเปลี่ยนกระจกตาที่โรงพยาบาลในช่วงเวลาดังกล่าวโดยพบว่ามีข้อบ่งชี้โดยเรียงลำดับจากมากไปน้อยคือ

1. Bullous keratopathy 25 ตา (40.3 % ของการผ่าตัดทั้งหมด) ; PBK 22 ตา (88% ของ Bullous keratopathy), ABK 2 ตา (8 % ของ Bullous keratopathy) และ Bullous keratopathy หลังการทำ trabeculectomy 1 cases (4% ของ Bullous keratopathy)
2. กระจกตาอักเสบและโรคแทรกซ้อนยกเว้นกระจกตาดำเป็นแผลเป็น เช่น กระจกตาอักเสบใกล้จะทะลุ เป็นต้น ภาวะกระจกตาอักเสบพบได้ 14 ตา (22.58% ของการผ่าดัดทั้งหมด)
3. กระจกตาเป็นแผลเป็น 9 ตา (14.5% ของการผ่าตัดทั้งหมด) สาเหตุของกระจกตาดำเป็นแผลเป็นคือ 3.1 หลังการบาดเจ็บ (44.4%) 3.2 หลังกระจกตาอักเสบ (33.3%) 3.3 สาเหตุอื่นๆ (22.2%).

4. Corneal dystrophy : Fuchs' endothelial dystrophy พบได้ 7 ราย (11.3% ของการผ่าตัดทั้งหมด)
5. การเปลี่ยนกระจกตาซ้ำ 3 ราย (4.8% ของการผ่าตัดทั้งหมด)
6. Ectesia : keratoconus 3 ราย (4.8% ของการผ่าตัดทั้งหมด)
7. Chemical burn 1 ราย (1.6% ของการผ่าตัดทั้งหมด)
8. สาเหตุอื่นๆ ICE syndrome 1 ราย (1.6% ของการผ่าตัดทั้งหมด)

สรุป : Bullous keratoplasty เป็นข้อบ่งชี้ที่พบมากที่สุดในการเปลี่ยนกระจกตา หากมีการดวงตาบริจาคเพียงพอ มีแนวโน้มว่าการเปลี่ยนกระจกตาจากข้อบ่งชี้กระจกตาอักเสบและการเปลี่ยนกระจกตาซ้ำจะมากขึ้น

ตัวย่อ : PK = penetrating keratoplasty, BK = bullous keratopathy, PBK = pseudophakic bullous keratopathy, ABK = aphakic bullous keratopathy