PENETRATING KERATOPLASTY RESULTS OF A-TWO-YEAR STUDY

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ABSTRACT

Objective: The aim of this study was to analyse the conditions of the penetrating keratoplasties (PK) performed at Haydarpaşa Numune Hospital over 2 years time, and to compare the outcome with previous studies.

Method: Forty-five eyes of 40 patients were investigated retrospectively. Donor corneas were trephined to 7.00-7.50 mm sized buttons. In 30 eyes continuous, and in 15 eyes interrupted sutures were used. Eight procedures were combined with extracapsular cataract extraction. Postoperative treatment consisted of topical antibiotic, corticosteroid, mydriatic, and artificial tear drops. If required, additional treatment was initiated.

Results: Thirty-nine procedures were primary PK, 6 were rekeratoplasties. The most frequent indication for PK was corneal leucoma. No serious intraoperative complication was observed. A clear corneal graft was obtained in 77.8% after a follow-up of 4-31 months. Visual acuity increased in 35 eyes. The most frequent postoperative complication was glaucoma. Primary graft failure was observed in 2, and immunologic graft failure in 5 eyes. Rekeratoplasty was performed in 3 eyes.

Conclusion: The results of our study are comparable to previous studies. Even with the inclusion of high-risk PK, the frequency of obtaining a clear corneal graft is high, and is likely to increase further with rigid eyebanking procedures and ABO blood group-matching.

Key Words: Penetrating keratoplasty, Graft rejection, Eyebanking.

INTRODUCTION

Penetrating keratoplasty (PK) is the most frequently performed and the most successful form of tissue transplantation. Due to ameliorations in donor banking, microsurgical equipment, and rejection therapy; postoperative results are constantly improving (1,2). PK can be performed in combination with cataract extraction, with or without intraocular lens (IOL) implantation (3-6). Although preoperative risk factors have been established, graft rejection remains a serious problem (6-10).

The aim of this study was to analyse the preoperative conditions and the postoperative results of our keratoplasty cases, to compare possible risk factors for graft failure and postoperative complications, and the outcome with previous studies.

MATERIALS AND METHODS

All the cases of PK (n=45), performed at the Ophthalmology Clinic I of Haydarpaşa Numune Hospital, have been enrolled in the study.

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Preoperatively, anamnesis was obtained, and all patients had a full ophthalmologic examination, including preoperative best-corrected visual acuity (BCVA), biomicroscopy, and fundoscopy. Intraocular pressure (IOP) was measured by applanation tonometry if possible. In eyes with medium opacities, B-scan ultrasonography was performed.

All operations were performed by 3 surgeons under general or subtenon anesthesia. Donor corneas were harvested under sterile conditions within 1/2-6 hours (mean 3.8 hours) of death. Mean donors age was 46.5 years (range 16-70 years). Donor corneas with a surrounding scleral ring of approximately 1 mm were preserved in Optisol solution for a duration of 1-7 days at +4°C, and fashioned from the endothelial side with a disposable hand-hold vacuum punch to 7.00-7.50 mm buttons. Recipient beds were trephined with a disposable vacuum trephine. For keratoconus (KC), the donor button and the recipient bed were of the same size, whereas for the other cases, graft-host disparity was 0.25-0.5 mm. After placement of four cardinal sutures at the 12, 3, 6, and 9 o'clock positions, the donor cornea was fixed on the recipient bed with a single continuous 10/0 monofilament nylon suture in 30 eyes. In 15 eyes with vascularized corneas, interrupted 10/0 nylon sutures were used. We routinely used viscoelastic material during fixation of the donor cornea. In 8 eyes, the procedure was performed in combination with extracapsular cataract extraction (ECCE), without IOL implantation (n=2), with posterior-chamber IOL implantation (n=5) (triple procedure), and with IOL repositioning (n=1). At the end of the procedure, a single dose of gentamycine and dexamethasone was injected subconjunctivally.

Routine postoperative therapy consisted of topical antibiotic, corticosteroid, mydriatic, and artificial tear drops. Patients were followed-up with the same preoperative tests daily during hospitalization, then routinely at 3 daily intervals for 15 days, weekly for the following month, monthly for 3 months, 3-monthly for 1 year, and yearly thereafter. Primary graft failure was defined as graft edema that did not resolve at any time after PK. Immunologic graft reaction was diagnosed by the appearance of an endothelial and/or epithelial rejection line, and/or corneal edema with anterior chamber inflammation, that could not be attributed to any evident disease. Graft failure was defined as irreversible corneal edema with or without corneal vascularisation. In cases of secondary glaucoma (IOP exceeding 21 mmHg), antiglaucomatous therapy was administered. Some cases required systemic corticosteroid and cyclosporin A therapy, and systemic acyclovir was administered in eyes with a history of herpetic keratitis. Suture adjustment was performed in accordance to computerized corneal topography. Problemless sutures were removed after a period of 3 months-1 year.

RESULTS

Forty-five eyes of 40 subsequent PK patients were investigated retrospectively. Twenty patients were male, and 20 female. Patient age ranged from 5-85 years (mean 45.3 years). Preoperatively, trabeculectomy had been performed in 1 eye, cataract extraction with or without IOL implantation, in 7 eyes, and repair of corneal penetrating injury in 6 eyes. Two patients had been operated on both eyes. Thirty-nine procedures were primary keratoplasties, 6 were rekeratoplasties (3 rekeratoplasties had been performed in other centers before, and 3 rekeratoplasties were performed for graft failure in this series), In 1 of these eyes transplantation have been performed for the 3rd time. Indications for operation are shown in Table I. Mean preoperative BCVA was 0.07 (range light perception (LP)-0.4) (Table II).

No serious intraoperative complication was observed.

Mean follow-up period was 9.8 months (range 4-31 months). At the end of the follow-up period, a clear graft was obtained in 35 eyes (77.8%). Mean postoperative BCVA was 0.26 (range LP-0.8) (Table II). In 35 eyes (77.8%) BCVA increased, in 9 eyes (20%) it remained at the same level, and in 1 eye (2.2%) it decreased. Low BCVA despite clear cornea was observed in 6 eyes (13.3%). This was due to posterior capsule opacification (n=2), high astigmatism (n=1), cataract (n=1), macular edema (n=1), and preexisting glaucoma (n=1). Iris prolapse,

which required additional suture placement, occurred in the early postoperative period in 1 eye. In 13 eyes (28.9%) glaucoma developed during the postoperative period; twelve of these eyes responded to topical antiglaucomatous medication. In 1 eye IOP stabilized after trabeculectomy. In 6 eyes (13.3%) peripheral anterior synechiae (PAS) developed. In 2 eyes (4.4%) amnion membrane transplantation was successfully performed for persistent epithelial defects. Arcuate astigmatic keratotomy was performed in 1 eye. Primary graft failure (PGF) was observed in 2 eyes (4.4%). One of these eyes also had endophthalmitis. Immunologic graft rejection episodes responding to medical therapy were observed in 3 eyes (6.7%). In another 5 eyes (11.1%) with immunologic graft rejection, graft failure occurred. Three of these eyes received a regraft, and in 1 of the regrafts, immunologic graft rejection was once more observed. All immunologic graft failures were observed after single procedures, and all the cases were male. Indications for primary keratoplasty in the immunologic graft failure group were as follows: bullous keratopathy (n=2), central corneal leucoma after penetrating corneal injury (n=1), and acute perforation in 1 eye (re-rejection).

Table I: Indications for penetrating keratoplasty.

Indication for penetrating keratoplasty	Number of cases (%)	
Corneal leucoma	20	44.5
Regraft	6	13.4
Pseudophakic bullous keratopathy	5	11.1
Keratoconus	5	11.1
Tectonic	5	11.1
Aphakic bullous keratopathy	2	4.4
Corneal dystrophy	2	4.4
Total	**45**	**100**

Table II: Distribution of best-corrected visual acuity before and after penetrating keratoplasty.

Best-corrected visual acuity	Preoperative	Postoperative
Light perception	3	1
Hand motions	10	2
Counting Fingers	18	11
0.1-0.4	14	20
≥0.5	0	11
Total	**45**	**45**

DISCUSSION

Our rate of 77.8% postoperative clear corneal graft including high risk cases, is comparable to previous studies' (11,12). Whereas in PK performed for KC, clear graft rates range from 90.5% to 100% (13-15), this rate is much lower if PK is performed for tectonic aim or as regraft (1,7).

Our rate of immunologic graft rejection 17.8% including the high risk cases, was comparable to previous reports. It can be as low as 2.2-15% for KC (13,15), and has been reported as between 16.7% and 37.1% for tectonic PK (7,8). In contrast to our previous report (11), where all immunologic graft rejections responded to medical therapy, we observed 5 (11.1%) graft failures due to immunologic graft rejection, despite medical therapy. Graft failure was defined as irreversible corneal edema. It has been reported as 0-8% before (1,15), and is more frequent with regrafts, in aphakia, with anterior chamber IOL, active inflammation, postoperative rise in IOP, and predescemetal or perforated ulcers (6,9,10). In our study, 4 of the 5 immunologic graft failure cases had the above risk factors, and they were all males. Jonas et al. (9) also reported a higher frequency of graft failure in males, especially if the donor was female. Neither HLA- nor ABO blood group-matching were performed in our study. ABO blood group-matching however, may reduce the risk of immunologic graft failure (16,17). The frequency of immunologic graft failure is known to increase with lengthening of the follow-up period (9). Our study included some eyes with a follow-up of only 4 months, and should thus be regarded with care.

PGF was defined as graft edema that did not resolve at any time after PK, and was infrequently observed in our study (4.4%). This is in accordance with the literature (13), and was less than our previous study's result (11). This may reflect the fact that, in contrast to our previous study, some of the donor eyes in this study were provided from an eyebank. With meticulous investigation of the donor corneal endothelium, PGF is likely to decrease.

An increase in BCVA after PK was observed in 77.8%. This is similar to our previous study (11),

where an increase in BCVA had been observed in 72.2% of the eyes. Other studies report increase in visual acuity (VA) between 45% for repeated PK and 90% for primary PK (1,8). Our results, including primary and repeated procedures, thus reflect the results of previous studies.

In our triple procedures, a significant increase in BCVA was observed in 60% of the eyes achieved . In both eyes that had no improvement of BCVA despite clear corneal graft, the reason was posterior capsule opacification. One graft was not clear in the postoperative period, and glaucoma and pseudophakic bullous keratopathy developed, but the postoperative BCVA was superior to the preoperative BCVA. Increase in BCVA of 86.7% and 86.5% have been reported before (3,6). A clear corneal graft can be obtained between 72% and 83.9% in these eyes (4,5), with graft failure rates between 2.6% and 18.3% (3,4). Main complication after triple procedure has been reported as secondary glaucoma (3,5). Jonas et al. (9) found no difference in immunologic graft reaction rate, whether PK was performed alone or in combination with lens surgery.

From our 5 eyes with tectonic PK, 2 resulted in graft failure. In the remaining 3 eyes BCVA increased. It has been reported previously that VA may increase in 48.7% of these eyes, and PK is mainly successful in keeping the tectonic aim (7).

PAS formation is the result of inflammation and perforation, and an important risk factor for post-keratoplasty glaucoma (1,18). In our study we observed PAS in 13.3% of eyes, but only 1 of these eyes developed glaucoma.

The main postoperative complication in our study was secondary glaucoma (28.9%). Glaucoma rates between 3.5% and 14% have been reported before (1,12,13,18,19), however this can be as high as 36% in PK after chemical burns (20). In contrast to the study of Özkurt et al. (12), all but 1 of our cases responded to medical therapy. Risk factors for post-PK glaucoma have been recorded as aphakia, rekeratoplasty, and PK combined with other procedures (12,18,19). In our study, only 4 eyes developing glaucoma had such risk factors; aphakia in 1, rekeratoplasty in 1, rekeratoplasty and triple procedure in 1, and triple procedure in 1 case. One eye had preexisting glaucoma. Incidence of post-PK glaucoma is variable, because of different patient populations, and the difficulty in detecting glaucoma in these patients. To avoid post-PK glaucoma, Zimmerman et al. (21) proposed increasing the graft size by 0.5 mm.

In our study, the main indication for PK was central corneal leucoma for different reasons with or without corneal vascularization, followed by regraft. Recently, PK is not anymore as frequently required for aphakic or pseudophakic bullous keratopathy, due to the ameliorations made in cataract surgery (1). In several studies, corneal opacity and regraft are the main indications for PK (6,12,22), and since 1992, an increase in PK for KC is noted (1,20,23).

The results of our study are in accordance with previous studies in regard to PK indication and outcome. Although high-risk cases were included, the frequency of obtaining a clear corneal graft postoperatively was high. If performed with rigid eyebanking procedures and ABO blood group-matching, this frequency is likely to increase further.

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