

Original Research Article

Analysis of causes and outcomes of corneal transplantation in al-zahra eye hospital in southeast of Iran from 2011-2016

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ABSTRACT

Background: Corneal transplantation is known as the most successful and common type of organ transplant, but it calls for more intensive and long-term care. Given the lack of adequate information on this important surgery in this province and the differences between indications and causes of corneal transplantation, the present research was carried out to examine the causes and outcomes of corneal transplant in patients visiting Al-Zahra eye hospital who had received donated cornea in the past five years.

Methods: In a retrospective analytical-descriptive study 135 files of 149 eyes that had gone through corneal transplantation were examined. Information on the age, gender, residence, indications, and surgery consequences was extracted and was analyzed in SPSS 19 statistical software with descriptive statistics (percentage, frequency, mean, and standard deviation).

Results: The highest transplant indication was keratoconus with a frequency of 39.9% followed by bullous keratopathy, corneal opacity, and transplant rejection with frequencies of 16.1, 12.7, and 10.1%, respectively. Other indications were corneal scar (9.4%), corneal perforation (2.7%), trauma (2.7%), and Fuchs' corneal dystrophy (1.3%) in the order mentioned. Concerning postoperative complications in this research, 57.7% of the eyes (86 cases) showed no complication. Moreover, complications were mostly related to astigmatism with a frequency of 30.8% (46 cases).

Conclusions: In general, the most common indication in this research was keratoconus. Most surgeries were also complication-free and most complications were associated with astigmatism.

Keywords: Corneal transplantation, Indication, Transplantation outcomes

INTRODUCTION

The cornea is connective avascular tissue that is considered the first protection against spread of infection in the eyeballs and components of the eye walls. On the other hand, the tear film covering the cornea creates the frontal refractive surface of the eyes.

Cornea transparency results from several factors such as structural and physiological anatomy of its cellular

components.¹ The cornea is generally composed of 5 membranes including cellular membranes (epithelium, stroma, and endothelium) and two intermediate membranes (Bowman's membrane and Descemet's membrane).¹

Following the first phacoemulsification surgery, which was carried out in 1960 by Coleman, the number of intraocular surgeries escalated quickly and cornea transparency during and following surgery also increased.

Nothing is worse than an unsuccessful surgery carried out to correct the vision of patient suffering preventable corneal damage and opacity. Hence, eye surgeons must fully understand the important causes of corneal damage and treatment methods.²

PK (penetrating keratoplasty) is not generally used for all corneal disorders. With development of methods of selective corneal transplantation, only the abnormal membrane is replaced with a natural tissue (lamellar keratoplasty). This optional method considerably reduces complications of full-thickness cornea replacement or penetrating keratoplasty. For instance, complications such as significant post-grafting astigmatism and scar opening with an impact have reduced using DSAEK (Descemet's stripping automated endothelial keratoplasty) and no endothelial transplant rejection is observed following DALK (deep anterior lamellar keratoplasty). However, the refractive errors following DALK and PK are equal.^{3,4} Moreover, the post-DSAEK increase in cornea thickness can have negative effects on precision of measurement of intraocular pressure.⁵

In the studies of consequences of corneal transplantation, a successful transplantation is a surgery that yields transparency (from the optics point of view) and proper vision. However, failed transplantation occurs when no clear image forms on the retinal. Transplantation failure occurs in the early and serotinous forms. Early failure refers to cases in which the transplanted cornea becomes opaque from early on and lacks the required transparency. Serotinous failure occurs when following a period of transparency, the transplanted cornea becomes opaque. One of the most common causes of serotinous transplant failure is rejection of the graft by the immune system of the recipient.⁶ Prevalence of rejection of graft varies between 2.3 and 68% according to different research results.⁷

Hence, given the differences between indications and reasons of corneal grafting reported in different studies and the importance of following patients, tracking post-grafting results, and examining long-term complications, we decided to conduct this research with an aim to study the causes and results of corneal transplantation in patients visiting Al-Zahra Eye Hospital who had received corneal graft in the past five years.

METHODS

This retrospective descriptive research was carried out on all patients visiting Al-Zahra eye hospital who had been operated for corneal grafting from 2011 to 2016. The research inclusion criteria included patients who underwent corneal grafting from 2011 to 2016 and had been followed for at least 6 months. The patients also had to lack any background disease. Exclusion criteria included existence of other eye diseases such as cataracts, retinal diseases, glaucoma, and active spring conjunctivitis. In addition, patients who had not used

regular follow-ups were excluded. The census sampling method was used to collect data. All patients visiting Al-Zahra Eye Hospital who underwent corneal transplantation surgery from 2011 to 2016 were included in this research based on the inclusion and exclusion criteria. Information was collected using the information checklist. Afterwards, demographic information of patients as well as information on pre- and post-surgery vision and refractive errors, corneal transplantation method, transplantation transparency and other complications was written on the checklist of each patient. Based on the general ethics guide for medical research on human participants codes 1 to 31 were applied. Data was entered into SPSS 19 and was analyzed using descriptive statistics (including frequency, mean, and standard deviation).

RESULTS

In this research information on 189 patients who underwent surgery from 2011 to 2016 was studied. Of these patients, 54 cases were excluded from this research because of incomplete information or incompliance with inclusion criteria. Therefore, this study was conducted on 135 patients (149 eyes).

The average age of the patients under study was 44.52 ± 22.84 years. Concerning gender, 54.1% of the patients were male (73 patients) and 45.9% were female (62 patients). In addition, 39.3% (53 cases), 50.4% (68 cases), and 10.4% (14 cases) of patients had received right eye grafting, left eye grafting, and grafting of both eyes, respectively.

Table 1: Frequency of corneal grafting by transplant indication.

Transplant indication	Quantity	Percentage
Keratoconus	58	38.9
Bullous keratopathy	24	16.1
Cornea opacity	19	12.7
Transplant rejection	15	10.1
Corneal scar	14	9.4
Corneal perforation	4	2.7
Trauma	4	2.7
Fuchs' corneal dystrophy	2	1.3
Others	9	6
All patients	135	-
All eyes	149	100

Based on results of the present research, the highest transplant indication was related to keratoconus with a frequency of 38.9%, which was followed by bullous keratopathy, corneal opacity, and transplant rejection with frequencies of 16.1, 12.7, and 10.1%, respectively. On the other hand, Fuchs' corneal dystrophy (with a frequency of 1.3%) showed the lowest transplant indication in this research. Results are presented in Table 1 for each transplant indication.

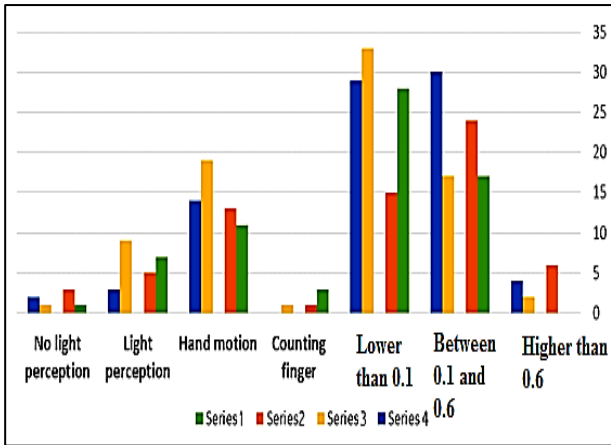


Figure 1: Visual acuities before and after grafting (series 1= before OD; series 2= after OD; series 3= before OS; and series 4= after OS).

As seen, in the pre-operative examination carried out using the Snellen chart, in 35 cases the right eye had a visual acuity of higher than counting fingers (CF) (17 cases were between 0.6 and 0.1 and 28 cases were lower

than 0.1), whereas following the surgery the number of these cases increased to 45 (6 cases over 0.6, 24 cases between 0.6 and 0.1, and 15 cases lower than 0.1).

The same also applied to the left eyes of the patients. In other words, in the pre-operative examination, 52 cases had a visual acuity of higher than counting fingers (CF) (2 cases were above 0.6, 17 were between 0.6 and 0.1, and 33 were lower than 0.1), whereas following the surgery the number of the cases reached 63 (4 cases over 0.6, 30 cases between 0.6 and 0.1, and 29 lowers than 0.1) (Figure 1).

Concerning postoperative complications, 57.5% of the eyes (86 cases) showed no complication. The most frequent complication was astigmatism with a frequency of 30.8% (46 cases).

The second most common complication was transplant rejection with a frequency of 29.5%, which was mainly caused by astigmatism. The least frequent complication was suture abscess and corneal scar (each with a frequency of 1.3%). Other results are presented in Table 2 by complication.

Table 2: Frequency of astigmatism before and after transplantation.

Astigmatism	Before surgery				After surgery			
	Right eye		Left eye		Right eye		Left eye	
	Quantity	Percent	Quantity	Percent	Quantity	Percent	Quantity	Percent
Lower than 2	11	18.1	6	7.8	19	30.1	10	12.8
2 to 5	32	52.4	26	33.8	30	47.6	43	55.1
Higher than 5	18	29.5	45	58.4	14	22.3	25	32.1
Total	61	100	77	100	63	100	78	100
Incomplete file information	6	-	5	-	4	-	4	-

DISCUSSION

In this research, causes and outcomes of corneal grafting in patients treated in Al-Zahra eye hospital from 2011 to 2016 were studied. Research results indicated that approximately 19 to 33 grafting operations were carried out each year. Of these operations, 66.7% were conducted in city patients and 33.3% in villagers. In addition, PK (penetrating keratoplasty) was the method most commonly used in these operations with a frequency of 80.7%, followed by DSAEK and DALK with frequencies of 10.4% and 8.1%, respectively.

Transplant indications were studied based on research goals, and it was found that the highest indication was keratoconus with the frequency of 38.9%, followed by bullous keratopathy, corneal opacity, and transplant rejection with frequencies of 16.1, 12.7, and 10.1%, respectively. Other indications were corneal scar (9.4%), corneal perforation (2.7%), trauma (2.7%), and Fuchs’

corneal dystrophy (1.3%) in the order mentioned. In addition, 6% of indications were caused by other reasons. In this regard, in the research by Davari et al. on corneal transplantation surgeries carried out from 2000 to 2002 in Birjand it was found that corneal transplantation indications were cornea opacity (62.5%), keratoconus (20%), and others in the order mentioned.⁸ Since prevalence of cornea opacity was higher in the research by Davari et al, his findings are not in line with results of the present research, which reflect higher frequency of keratoconus in this province. This discrepancy might have been caused by special conditions of Birjand, prevalence of corneal traumas and infections caused by barberry thorns and development of glaucoma. In the research by Randle et al, which was carried out from 1997 to 2001 in Atlanta the indications were transplant rejection (29.1%), bullous keratopathy (21.5%), keratoconus (23%), corneal scar (19%), infection-induced perforation (6.3%), and Fuchs’ corneal dystrophy (3.8%).⁹ The higher prevalence of transplant rejection in

the research by Randle et al. (29.1%) as compared it is 10.1% prevalence in this research can be attributed to the higher number of transplantations in Atlanta or higher quality of surgeries and post-operative controls in this province.

Moreover, the relatively high frequency of keratoconus in both studies complied with the 38.9% frequency of keratoconus in the present research.^{8,9} In another study carried out by Anthony et al. in 2003 it was found that the most common cause of surgery was keratoconus (76.5%)¹⁰ which was higher than the frequency obtained in the present research. Examinations of visual acuities of patients, which were carried out based on research goals, it was found that a large number of patients had visual acuities higher than CF (counting fingers) following surgery as compared to the results obtained from both eyes before surgery.

This finding reflects improvement of visual acuity of patients following corneal transplantation. Moreover, in approximately 60% of transplants corneal transparency was obtained following the surgeries. In the study by Anthony et al, after a follow-up it was found that the highest visual acuity was 0.29 with a standard deviation of 0.38.¹⁰ In the present study, 8.9% of right eyes and 4.9% of left eyes had visual acuities higher than 0.6 following surgery.

In the exploration by Randle et al, it was generally found that 51 transplants (64.6%) remained clear, which complied with results of our research.⁹ Concerning postoperative complications in the present research 57.7% of the eyes (86 cases) showed no complication. The most prevalent complication was associated with astigmatism with a frequency of 30.8% (46 cases). Therefore, other complications were transplant rejection (29.5%), intraocular pressure (4%), and cataract (2%). The least frequent complications were associated with development of astigmatism, suture abscess, and corneal scar (each with a frequency of 1.3%).

CONCLUSION

Based on the present research results, the most common transplant indication was keratoconus, followed by bullous keratopathy, corneal opacity, and transplant rejection. Results of assessing visual acuity of patients showed improved visual acuity following corneal grafting. Concerning complications most eyes were without any complication and the recorded complications were mostly related to astigmatism.

It is recommended to plan loner and several-year follow-ups for corneal transplantation patients to be able to

obtain information on long-term consequences of cornea surgery in this province.

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