

## Original Research

# Corneal Transplantation: Main Indications and Evaluation of Epidemiological Profile in a University Hospital

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**Abstract**

Among transplants, the corneal is the most numerically expressive. This is due to the immunological privilege of the cornea which presents reduced rejection rates. In addition, capture, conservation and surgical techniques also contribute to this success.

Keratoconus, leukoma, corneal dystrophy and post-facectomy decompensation are the main causes of optical transplants, having the latter a relationship with the number of preoperative cells and the skill of the surgeon. In hospitals where there are surgeons in training, there is an increase in corneal decompensation after facectomy.

In terms of tectonic transplants in which the purpose is the preservation of the ocular structure, the main etiology is perforation due to trauma.

From the observational and retrospective analysis of about 60 medical records of patients submitted to keratoplasty in the years 2015 to 2020, it is possible to understand the patients' profile and main pathologies that evolve to transplantation in order to have an early diagnosis and to optimize their treatment. According to Sobrinho et al., from 2001 to 2009 it was noticed that patients in the state of Pará waited an average of 1 to 3 years in line for corneal transplantation. 9 In another study, Almeida et al. noticed in a 15-year review of corneal transplants that patients waited from 1 to 6 months for the performance of a keratoplasty in Brazil.10 Thus, because of its heterogeneous extension and distribution of specialized centers, Brazil has different realities in each region.

**INTRODUCTION**

Corneal pathologies are the third most frequent cause of blindness, after cataracts and glaucoma. About 10 million people worldwide have bilateral blindness caused by corneal diseases. [1]

In 1905, Eduard Zirm transplanted a cornea of an enucleated eye to a patient with bilateral opacity due to burns by alkaline substance, which was the first successful corneal transplant. [2]

Among the numerous transplants, the corneal is the most

performed worldwide. [1] According to the Brazilian Registry of Transplants (RBT-2019) between 2015 and 2019, 73,375 corneal transplants were performed. In 2019, 14,943 were performed, among which 5,400 were in the state of São Paulo. Despite the significant number, about 10,741 people still remain in line for corneal transplantation. [3]

In the first semester of 2020, compared to 2019, there was a decrease in the number of corneal transplants (44.3%), due to the suspension of the activities of most of the services during the COVID-19 pandemic. [4]

Currently, Brazil occupies the 2<sup>nd</sup> position in absolute terms of transplantations, but in terms of transplants by millions of people the country falls to the 21<sup>st</sup> position. [5]

Some factors contribute to this numerical success of corneal transplants, including the organization of eye banks, advances in tissue conservation, immunology and surgical techniques. [5]

The main barrier to cornea donation is the lack of information to the potential donors besides logistical, legal and religious issues. [5]

Corneal transplantation can be classified in relation to the biological type. In autologous transplantation the donated cornea and recipient eye are of the same individual; corneal allogeneic is transplanted to individuals of the same species and xenogeneic, in which the cornea is given to individuals of different species. [6]

It can also be classified according to the surgical technique used. The lamellar, which is the replacement of part of the corneal thickness. The penetrating keratoplasty is the replacement of the total thickness of the cornea. [6] The first type is a technique that has been growing in the last 10 years, but penetrating transplantation still accounts for about 80% of keratoplasties performed worldwide. [1]

Transplantation can be performed according to its purpose: optical, tectonic and therapeutic. [7]

Cataract surgery has become popular and is the most performed surgical procedure globally. This increasing performance of facetectomy was accompanied by increased corneal decompensation after the procedure. Thus, contributing to the increasing indication of corneal transplantation in these cases. [8]

According to Sobrinho et al., from 2001 to 2009 it was noticed that patients in the state of Par  waited an average of 1 to 3 years in line for corneal transplantation. [9]

In another study, Almeida et al. noticed in a 15-year review of corneal transplants that patients waited from 1 to 6 months for the performance of a keratoplasty in Brazil. [10]

Thus, because of its heterogeneous extension and distribution of specialized centers, Brazil has different realities in each region.

According to Chua P.Y. et al, there is a relationship between socioeconomic status and the life of corneal transplantation. In his study, conducted in the United Kingdom, it was observed that patients with worse socioeconomic conditions had high rates of graft failure in 5 years. [11]

Jonas, J.B. et al. noticed that in his study evaluating 245 patients submitted to penetrating keratoplasty for different etiologies, there was an improvement from 0.12 to 0.46 in visual acuity. In addition, it was noticed that the patient's corneal disease directly influenced his/her visual acuity after transplantation. According to the study the indications for keratoconus had better visual acuity while those by bullous keratopathy in pseudophakic and aphakic patients had worse visual prognosis. [12]

## MATERIALS AND METHODS

An observational, descriptive and retrospective study was conducted based on the evaluation of about 60 medical records of

patients undergoing corneal transplantation from January, 2015 to December, 2020.

The medical records for data collection were obtained through the written request from the coordination of the outpatient clinic of PUC-Campinas Hospital.

Age, laterality, indication of the type of transplant and corneal pathology.

Indications were classified as: keratoconus, bullous keratopathy, corneal dystrophy, leukoma, corneal perforation, post-facetectomy decompensation, graft failure and corneal ulcer.

The Microsoft Excel 2019 program was used ® to organize and analyze the data.

## RESULTS AND DISCUSSION

From the 60 transplants performed during this period, 30 patients were female (50%) and 30 males (50%). The age of the patients ranged from 20 to 90 years old, with an average age of 61.

Regarding the indications of transplants: the bullous keratopathy was responsible for 14 cases (23.3%), previous transplant failure for 11 cases (18.3%), leukoma for 10 cases (16.6%); keratoconus for 9 cases (15%); Fuchs dystrophy for 6 cases (10%), corneal ulcer for 3 cases (5%), perforation for 3 cases (5%), band keratopathy for 1 case (1.7%), macular dystrophy for 1 case (1.7%), granular dystrophy for 1 case (1.7%), and sequelae of trachoma for 1 case (1.7%).

As for the surgical technique used, the main one was the penetrating technique, being responsible for 38 of the cases (63.3%), followed by the penetrating technique combined with phacoemulsification surgery, also called triple transplantation, responsible for 14 cases (23.3%). The Lamellar technique DMEK was performed in 4 cases (6.6%), and in 1 of these cases phacoemulsification surgery was combined. The DALK technique was performed in 1 case (1.7%). Tectonic transplantation was performed in 2 cases (3.3%). Penetrating transplantation combined with IOL fixation was performed in 1 case (1.7%).

In this study, a series of non-comparative, retrospective and descriptive cases were evaluated. Thus, the relationship between causes and results is restricted.

The bullous keratopathy as the main indication of transplantation found in the study is in line with data from the literature, which ranges from 20-30% which can be justified by the popularization of phacoemulsification and intraocular implants. [13-14]

In addition, the studied Service receives patients from other Services which do not carry out this type of procedure. Although PUC-Campinas Hospital is a medical residency service with surgeons in training, none of the cases came from this hospital.

The results differed from the study by Flores et al. which was performed in the same city, but in another hospital. In this study the main indication was keratoconus responsible for about 49.82% of the cases. [7]

Most of the patients are attended for a long period in our outpatient clinics. According to Coster et al., under favorable

conditions, the half-life of a transplant is 12 years. However, in adverse conditions, such as inflammation, the duration drops to 2 to 5 years. [15]

Zare et al. evaluated 1,859 eyes of 1,624 transplanted patients and observed that the main indication was keratoconus, followed by bullous keratopathy and previous transplant failure. In this same study, it was noticed that the main technique used in about 70.9% of the surgeries was penetrating keratoplasty, followed by DALK (deep anterior lamellar keratoplasty), DMEK (Descemet Membrane Endothelial Keratoplasty) and DSAEK (Descemet Stripping Automated Endothelial Keratoplasty). Although lamellar transplants are still numerically smaller, mainly due to technical difficulties in relation to penetrating transplantation, there is a considerable increase in lamellar transplants due to the advantages of the technique. [16]

Kymionis et al. in a review about lamellar keratoplasty, discuss about the advantages of lamellar in comparison to penetrating keratoplasty. The lower rate of graft rejection, less endothelial cell loss, faster visual rehabilitation and enhanced resistance to closed injury are some examples of these advantages. [17]

Matthaei et al. in a review of the main indications of penetrating keratoplasty noticed that Keratoconus was the predominant indication in South America. Pseudophakic bullous keratopathy or aphakic bullous keratopathy was the second most common indication. [18]

## CONCLUSION

In this study the average age was 61 years old and the main causes of indication for transplantation were bullous keratopathy, previous transplant failure and leukoma. This study contributed to a better knowledge of the patients treated in our ophthalmology service.

More important than knowing the main causes and types of keratoplasty surgeries, it is necessary to evaluate what led the patient to low visual acuity. Also, to apply some individual and collective measures aimed at preventing the patient from requiring a transplant surgery. As stated in the review on Corneal Blindness in analogy with Plato's Cave from Barbosa et al. Al, we must leave the cave to be able to properly analyze and face blindness of corneal etiology. [19]

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