SciMedCentral

JSM Ophthalmology

Research Article

Observational Study of 10 Cases of Lamellar Corneal Transplants Performed at a Tertiary Hospital

Isabella Silva Aquino dos Santos*, Marcelo Vicente de Andrade Sobrinho, Larissa Batista Pegorin Ribeiro dos Santos, Juliana Camargo Mazin, and Murilo Mantoan Calegari

PUC Campinas Hospital, Brazil

***Corresponding author**

Isabella Silva Aquino dos Santos, PUC Campinas Hospital, Brazil, Tel: 5598982890000

Submitted: 08 February 2024

Accepted: 06 March 2024

Published: 09 March 2024

ISSN: 2333-6447

Copyright

© 2024 dos Santos ISA, et al.

OPEN ACCESS

Keywords

- Corneal Transplants
- Corneal disorders
- Ocular pathologies
- Intraocular lens

Abstract

Introduction: In recent decades, with the advancement of research, lamellar corneal transplants have gained an increasingly significant role in the treatment of corneal disorders. However, as this technique becomes more popular, also observe an increase in descriptions of associated complications.

Objectives: This study aims to analyze ten cases of lamellar transplants in Pontifical Catholic University Campinas Hospital. The study will report indications for lamellar corneal transplants, associated ocular pathologies, and prior surgeries. It includes an evaluation of pre and post-operative visual acuity describe complications, graft rejection and failure. As a secondary objective, the study aims to analyze and quantify patient data for potential future approaches and strategies in this specific service and context.

Materials and methods: The study was conducted in a descriptive and retrospective manner, utilizing secondary data obtained from ophthalmological medical records of patients undergoing lamellar corneal transplants at PUC-Campinas Hospital. Patient details, including gender and age, eye laterality, preoperative diagnosis, type of lamellar transplant, and any previous ocular surgeries were analyzed. Visual acuity was assessed both pre and post-transplant, while intra and post-operative complications, the presence of rejection, and the progression to graft failure were monitored.

Results: Ten lamellar corneal transplants performed in the department were analyzed. Gender: 60% male (M), 40% female (F); 30% left eyes (OS), 70% right eyes (OD); diagnosis: 70% preoperatively diagnosed with pseudophakic bullous keratopathy (PBK), 20% with Fuchs' endothelial dystrophy, 10% with macular dystrophy; previous eye surgeries: 80% underwent phacoemulsification with intraocular lens implantation.

Conclusion: Lamellar corneal transplant techniques have stood out due to their enhanced effectiveness and safety, providing a quicker and more efficient visual rehabilitation, reducing induced astigmatism, and minimizing changes in the refractive power of the transplanted cornea. Additionally, they significantly reduce the risk of graft rejection and failure.

INTRODUCTION

Corneal transplant, also known as keratoplasty, is a widely performed successful surgery worldwide. Since its earliest mentions in 1813, it has evolved to replace only layers of the cornea[1]. Initially, lamellar keratoplasty faced challenges, but with advances, it overcame issues of full-thickness penetrating transplantation. This evolution has promoted better visual outcomes and overall success in the procedure [1].

Lamellar corneal transplant involves the removal and selective replacement of specific layers of the cornea affected by a healthy donor cornea. Unlike full- thickness penetrating transplant, lamellar transplant aims to preserve the healthy and exchange the diseased layers of the cornea [2-5].

There are several lamellar transplant techniques, each of new devices and techniques, promoting advancements in Ophthalmology [2].

Despite the distinct advantages of the surgery, penetrating keratoplasty still remains the commonly used technique, because lamellar surgery is technically more demanding [4]. Lamellar transplants showed a significant advance around the 1960s when the first microkeratomes were invented, allowing more precise mechanical dissections and better quality cutting of corneal lamellae [2].

In anterior lamellar transplants, specific layers of the corneal stroma are selectively replaced, preserving the Descemet membrane and recipient endothelial cells. These techniques are employed to address various corneal conditions, including advanced keratoconus, superficial corneal scars, and other stromal diseases that do not affect the corneal endothelium [1,5-9].

Anterior Lamellar Keratoplasty (SALK) is indicated for treating corneal opacities affecting 30 to 40% of the anterior cornea. The Deep Anterior Lamellar Keratoplasty (DALK) involves the selective replacement of the diseased corneal stroma with a healthy one, preserving the Descemet membrane and endothelial cells of the recipient [9].

The Automated Lamellar Therapeutic Transplant (ALTK) uses a microkeratome for precise dissections in both host affected cornea and healthy donor tissues. Another approach, Femtosecond Laser-Assisted Anterior Lamellar Keratoplasty without sutures (FALK) uses the Femtosecond Laser for separation. These techniques represent advancements in correcting anterior corneal conditions [1,9].

The objective of posterior lamellar transplants is to selectively replace the inner layers of the cornea, the endothelium and/or posterior stroma, in conditions where these layers are affected, preserving the remaining healthy recipient cornea. The main types are: DLEK (Deep Lamellar Endothelial Keratoplasty), DSEK (Descemet Membrane Endothelial Keratoplasty) and DSAEK (Descemet Stripping Automated Endothelial Keratoplasty), which involve the replacement of the endothelial layer, Descemet, and posterior stroma with a donor graft. DSAEK is performed with the assistance of an automated microkeratome for donor tissue dissection, making the procedure more precise [1,9,10].

DMEK (Descemet Membrane Endothelial Keratoplasty) replaces only the Descemet membrane and the diseased endothelium with healthy ones. These techniques offer advantages over traditional penetrating keratoplasty, with faster visual recovery, fewer suture-related complications, and better outcomes [7,10].

OBJECTIVES

The main objective of this study is to analyze ten cases of lamellar transplants performed at a tertiary hospital in Campinas, São Paulo. Patient data, including gender, age, and the laterality of the transplanted eye, were investigated. Additionally, indications for lamellar corneal transplant, associated ocular pathologies, and prior ocular surgeries will be examined too. An evaluation of pre and post-operative visual acuity was conducted following the transplant, and intra and post-operative complications, graft rejection presence, and progression to failure were monitored throughout patient follow-up.

As a secondary objective, these findings will contribute to a better understanding of the outcomes and challenges of lamellar transplants in this specific service and context.

MATERIALS AND METHODS

The study was conducted in a descriptive and retrospective manner, utilizing secondary data sourced from the ophthalmological medical records of patients who underwent lamellar corneal transplants at PUC-Campinas Hospital.

Initiating the process involved collecting medical record numbers from all patients who had undergone corneal lamellar transplants and completed a minimum of 1 year of follow-up at the Cornea Department by January 2023. The first transplant took place on April 26, 2018, and the last transplant included in the study, according to inclusion criteria, was performed on January 25, 2022

After the initial patient selection, data from Cornea Department visits were gathered for all selected participants through the examination of physical records.

The analyzed data include:

- Patient details: gender and age
- Eye laterality
- Preoperative diagnosis
- Type of lamellar transplant
- Previous ocular surgeries
- Visual acuity pre and post-transplant
- Intra and post-operative complications
- Presence of rejection
- Progression to graft failure

RESULTS

The data from 10 lamellar transplants performed at the University Hospital were analyzed

Analyzed Data

Gender: 60% were male (M) patients, 40% female (F) patients; age: the youngest patient was 20 years old, and the oldest was 83, with an average age of 71 years; laterality: 30% left eyes (OS) and 70% right eyes (OD); diagnosis: 70% of the patients were diagnosed preoperatively with pseudophakic bullous keratopathy (PBK), 20% with Fuchs' endothelial dystrophy, 10% with macular dystrophy; previous eye surgeries: 80% of the patients had undergone previous phacoemulsification with intraocular lens implantation (PHACO+IOL).

Regarding the indications for types of endothelial transplants: 8 DMEKs, 1 combined PHACO+DMEK surgery, and 1 DALK; intra and post-operative complications: 2 patients experienced graft detachment, 2 had infectious keratitis, 4 developed rejection and 2 experienced graft failure (Table 1).

DISCUSSION

Lamellar transplants are a promising option in the field of ophthalmology, offering various benefits such as faster visual recovery and a lower risk of rejection. However, it is important to highlight that this procedure still requires significant financial resources. At PUC-Campinas Hospital, the performance of

Table 1: Quantitative data for 10 Patients

Patients	Gender	Age	Eye	Diagnosis	Surgeries	Transplant	Pre-VA	Post-VA	Complic.	Rejection	Graft failure
1	M	83	OS	PBK	PHACO	DMEK	HM	20/40			
2	F	80	OS	Fuchs' dystr.	PHACO	DMEK	CF AF	20/50	Button detachment		
3	F	82	OD	PBK	PHACO	DMEK	CF 1m	20/40			
4	M	68	OD	PBK	PHACO	DMEK	HM	20/60	Infectious keratitis	Yes	
5	F	20	OD	Macular dystr.		DALK	20/80	20/30			
6	M	82	OS	PBK	PHACO	DMEK	HM	20/100		Yes	Yes
7	M	76	OD	PBK	PHACO	DMEK	CF AF	20/200	Button detachment Herpetic Keratitis	Yes	Yes
8	M	76	OD	PBK	PHACO	DMEK	20/200	20/40			
9	F	68	OD	PBK	PHACO	DMEK	HM	20/50	Infectious keratitis	Yes	
10	F	80	OD	Fuchs' dystr.	PHACO	PHACO+ DMEK	HM	20/40			

lamellar transplants is limited due to a quota established by the municipality, allowing only one transplant per month funded by the Public Health System. Additionally, the capacity to perform these procedures is restricted as the hospital has only one specialized and trained ophthalmologist to conduct such surgeries.

Since the first lamellar transplant in 2018, only ten procedures have been performed. The COVID pandemic significantly impacted the scenario, resulting in a reduction in the number of procedures conducted during this period of public health crisis. Although lamellar transplants have been a preferred option for specific indications, penetrating transplants were still performed for other conditions where this type of procedure was considered more appropriate, contributing to the low number of lamellar transplants.

Another significant reason contributing to the reduction in corneal transplant indications, including lamellar transplants, is the availability of a diverse range of rigid contact lenses in the hospital's ophthalmology department. These lenses have proven effective in treating various eye conditions, offering a non-invasive and personalized therapeutic approach for patients.

Lamellar transplants are not free from issues, complications associated with Deep Anterior Lamellar Keratoplasty (DALK) can arise, including perforation of the Descemet membrane during corneal stromal dissection, which may lead to additional complications. The occurrence of irregularities in the interface between the graft and host tissue is a concern, impacting postoperative visual quality. Additionally, the formation of a double chamber between the graft and the host cornea is a potential complication that requires attention, as it can influence transplant stability and result in challenges in patient adaptation to the procedure [9].

The primary complications of posterior lamellar corneal transplants include button detachment, increased intraocular pressure, the possibility of graft rejection, and the occurrence of primary failure [6,12]. Button detachment is mainly observed in the first week postoperatively, potentially requiring surgical re-intervention. Increased intraocular pressure can result from post-surgical inflammation or pupillary block due to the air bubble left in the anterior chamber [9,13]. Graft rejection represents the recipient's immune reaction against donor tissue, and primary failure occurs when the transplanted button does not become transparent as expected, compromising the final visual outcome. Proper monitoring and management of these complications are essential for the success of lamellar transplants [3,12].

CONCLUSION

Lamellar corneal transplant techniques have stood out due to their enhanced efficacy and safety. They provide a faster and more effective visual rehabilitation, minimizing changes in the refractive power of the transplanted cornea, reducing induced astigmatism, and significantly decreasing the risk of rejection and graft failure.

Another notable benefit is the possibility of performing a subsequent penetrating transplant even in cases of lamellar transplant failure. This approach offers a lower rejection rate compared to the need for re-transplantation when the initial procedure was penetrating. This is because the initial lamellar transplant minimizes contact with immune system cells, especially due to the absence of exchange or manipulation of the limbal area. This factor further contributes to the longevity and quality of the treatment of corneal pathologies.

REFERENCES

1. Singh R, Gupta N, Vanathi M, Tandon R. Corneal transplantation in the modern era. Ind J Med Res. 2019; 150: 7.

2. Arenas E, Esquenazi, S, Anwar M, Terry M. Lamellar corneal transplantation. Sur Ophthalmol. 2012; 57: 510-529.

3. Liu S, Wong YL, Walkden A. Current perspectives on corneal transplantation. Clin Ophthalmol. 2022; 16: 631-646.

4. Tan DTH, Mehta JS. Future directions in lamellar corneal transplantation. Cornea. 2007; 26: S21-S28.

5. Alves MR. Conselho Brasileiro de Oftalmologia série Oftalmologia Brasileira: Doenças externas oculares e córnea. 4ed. Rio de Janeiro: Cutura Médica, 2016.

6. Quilendrino R, de Mora MR, Baydoun L, Ham L, Dapena K, Oellerich S, et al. Prevention and management of Descemet membrane endothelial keratoplasty complications. Cornea. 2017; 36: 1089-1095.

7. Zeschau A. Indicações de ceratoplastia: estudo retrospectivo em um Hospital Universitário. Revista Brasileira de Oftalmologia. 2013; 72: 316-320.

8. Melles GR, Remeijer L, Geerards AJ, Beekhuis WH. The future of lamellar keratoplasty. Curr Opin Ophthalmol. 1999; 10: 253-259.

9. Espandar L, Carlson AN. Lamellar keratoplasty: A literature review. J Ophthalmol. 2013.

10. Liu Y, Deng YQ, Yuan J. Combine deep lamellar endothelial keratoplasty and anterior lamellar keratoplasty with limbal allograft for severe corneal injury: a case report. Int J Ophthalmol. 2020; 13: 837.

11. Deniz H, Matthaei M, Bock F, Maruyama K, Notara M, Clahsen T, et al. Immune reactions after modern lamellar (DALK, DSAEK, DMEK) versus conventional penetrating corneal transplantation. Prog Retin Eye Res. 2019; 73: 100768.

12. Romano D, Aiello F, Parekh M, Levis HJ, Gadhvi KA, Moramarco A, et al. Incidence and management of early postoperative complications in lamellar corneal transplantation. Graefe's Arch Clin Experimental Ophthalmol. 2023; 1-15.

13. Borderie VM, Loriaut P, Bouheraoua N, Nordmann JP. Incidence of intraocular pressure elevation and glaucoma after lamellar versus full-thickness penetrating keratoplasty. Ophthalmology. 2016; 123: 1428-1434.