

The Incidence and Underlying Cause of Keratoplasty

Abdolmejed F^{1*} and Almajri K²

¹Department of Ophthalmology, Tobruk University, Libya

²Department of Ophthalmology, Omer Al Mukhtar University, Libya

***Corresponding author:** Fathy Abdolmejed, Department of Ophthalmology, Tobruk University, Libya, Email: idressattitalla2004@yahoo.com

Received Date: September 09, 2020; **Published Date:** October 07, 2020

Abstract

A retrospective statistical study a collection of all patients which need keratoplasty in the Central Committee for Internal and External Therapy in Tobruk medical Centre between 01.01.2018 to 31.05.2020. Aimed to analyze the indication of keratoplasty and type of keratoplasty in our region. There were 81 patients asking for keratoplasty 61 patients (76%) were keratoconus, 28 were male (46%) and 33 were female (54%), the age average for the keratoconus cases is 32.5 Years, The most cases of keratoconus, 46 patients (75.4%) presented with Grade IV with corneal opacity and poor vision between (HM and CF 3 meter), these cases advised to do penetrating keratoplasty (PKP). DALK (deep anterior lamellar kertoplasty) advised only for (24.6%) of keratoconus cases. The second most common indications for keratoplasty in our study was post traumatic corneal scar, 7 patients (9%), average of age is 33.4 Years, 6 patients (86%) was male, all of the cases presented with sever loss of the vision (HM and PL), and deep scaring involved most of the corneal layers, all of the cases advised for penetrating keratoplasty. The post infectious keratitis recorded as third leading indications were only in 5 patients (6.2%), two was male and 3 female, average of age is 56 Years, all of them with unilateral corneal opacity due to herps keratitis, 60% of them with sever corneal opacity and sever loss of vision and penetrating keratoplasty was indicated. The corneal decompensating post cataract surgery was the fourth indication for keratoplasty, there were 4 Patients, two male and two female, all them presented with sever loss of vision (HM and PL), due to advanced corneal opacity and all of them advised for penetrating keratoplasty. As in the other many prewise studies in different region the post LASIK and congenital corneal opacity are very rare indication for keratoplasty.

Keywords: Keratoplasty; Lamellar or Penetrating; Corneal Opacity; Tobruk

Abbreviations: PKP: Penetrating Keratoplasty; DALK: Deep Anterior Lamellar Kertoplasty; PK: Penetrating Keratoplasty; EK: Endothelial keratoplasty; PLK: Posterior Lamellar Keratoplasty; DALK: Deep Anterior Lamellar Keratoplasty; PMMA: Plastic Polymethyl Methacrylate.

Introduction

The cornea is the anterior clear transparent layers of the eyeball; its helps focus of light on the neurosensory retina and produce vision function. If it gets damaged, the vision is deteriorated and you might need to replace it. A keratoplastyis cornea transplant, can bring a good vision

again heal the corneal ulcer and improve the appearance of your cornea if had advanced scar [1].

Penetrating Keratoplasty (PK); is performed a full-thickness resections of the cornea, followed by placement of a full-thickness donor corneal graft. Penetrating transplantation technique is advised primarily for significant corneal scarring, advanced opacities or significant posterior corneal involvement, sever stag of keratoconus especially if there is history of hydrops, when both stromal and epithelial disease and infectious or non-infectious corneal ulcer or perforations. The first organ transplant with full thickness penetrating keratoplasty in a human was successful

performed in 1905 [2]. Postoperative recovery and improvement of visual acuity take a long time more than one year, most common due to high astigmatism. There is a higher risk of allograft rejection 17%, compared with other newer procedures, lesser rejection rates have been recorded in DMEK (1%) and DSAEK (9%) [3].

The recent time, there are a lot of keratoplasty techniques with only selective tissue replacement, that preserve healthy corneal tissue and avoid high risks of rejection, astigmatism and delay healing result from penetrating corneal transplantation [4].

The lamellar keratoplasty discovered first with anterior lamellar keratoplasty and then evolved into endothelial keratoplasty (EK) in 1956. With time, the posterior lamellar keratoplasty (PLK) performed, in which the posterior cornea was dissected out and replaced with posterior stroma and endothelium from donor corneal tissue [2,5].

In 1999 new modifications to PLK technique called deep lamellar endothelial keratoplasty (DLEK). The Descemet stripping endothelial keratoplasty (DSEK) performed in 2004 by Melles as a modification technique to DLEK by stripping and removing the patient's Descemet membrane and endothelium with Descemetorhexis technique [6].

Descemet Stripping Automated Endothelial Keratoplasty (DSAEK); is a partial thickness cornea transplant procedure that involves selective removal of the patient's Descemet membrane and endothelium, followed by transplantation of donor corneal endothelium in addition to donor corneal stroma [2]. This procedure performed for cases of corneal edema for e.g. endothelial dystrophies (such as Fuchs corneal dystrophy), pseudophakic bullous keratopathy, iridocorneal endothelial (ICE) syndrome [4].

Descemet Membrane Endothelial Keratoplasty (DMEK); is a partial-thickness cornea transplant procedure that involves selective removal of the patient's Descemet membrane and endothelium, followed by transplantation of donor corneal endothelium and Descemet membrane without additional stromal tissue from the donor. DMEK technique performed in cases of endothelial dysfunction [7,8].

Additionally, anterior lamellar keratoplasty (ALK) techniques have been evolved over the last five decades. The deep anterior lamellar keratoplasty (DALK) performing to a partial-thickness cornea transplant procedure that involves selective transplantation of the corneal stroma, leaving the native Descemet membrane and endothelium [5], but in some cases, intraoperative conversion to a full-thickness perforating keratectomy (PK) is still required. The technique is used for patients with keratoconus or scarring that does

not involve Descemet membrane or endothelium [9].

The indications for keratoplasty have been broadened to include keratoconus, bullous keratopathy and Fuchs' endothelial dystrophy, Cornea scarring because of an injury or an infection, and others such as interstitial keratitis and other situations with corneal vascularization, chemical burns, and many others [10].

Keratoprosthesis; implantation is a procedure that involves full-thickness removal of the cornea and replacement by an artificial cornea. It consists of a clear plastic polymethyl methacrylate (PMMA). Keratoprosthesis performed for patients who have a history of multiple failed PKs or chemical injury, severe keratitis or ocular surface disease due to limbal stem cell failure, such as Stevens-Johnson syndrome ocular cicatrice pemphigoid [11].

Materials and Methods

A retrospective study done through collection of the data from patients asking for keratoplasty in Central Committee for Internal and External Therapy in Tobruk medical center-Tobruk, in time between 2018-2020. The recorded data included patient age, gender, clinical indications for keratoplasty, visual acuity and type of keratoplasty advised. Statistical analysis was performed using Microsoft Office Excel program. Nominal and statistical significant variables were analysed using t- test for two samples. P value ≤ 0.05 or level (95%) was considered statistically significant.

Results

In our study we have collect all keratoplasty indication cases that were introducing themselves in tobruk medical center in time between 2018-2020.

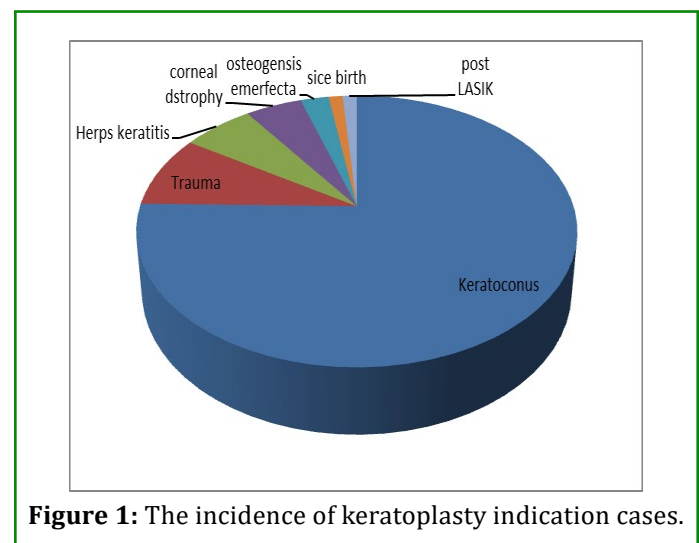


Figure 1: The incidence of keratoplasty indication cases.

Out of the 81 recorded patients of keratoplasty indicated cases, there were 43 male and 38 female, the age average is 34 Years, there were 61 patients with Keratoconus, seven cases post traumatic corneal scar, five cases post herpetic keratitis, four cases had corneal decomposition post cataract surgery, two cases of bilateral corneal dystrophy of Osteogenesis imperfecta, one case of corneal dystrophy since birth and one case of corneal scar post LASIK (Figure 1).

In our study the most common indication for keratoplasty was Keratoconus about (76%), 28 were male (46%) and

33 were female (54%), the age average for the keratoconus cases is 32.5 Years, 42 patients (69%) need bilateral Keratoplasty (penetrating or lamellar keratoplasty), 8 patients had penetrating keratoplasty on the other eye and 11 Patients (18%) need keratoplasty only for one eye. The most cases of keratoconus, 46 patients (75.4%) presented with Grade IV with corneal opacity and poor vision between (HM and CF 3 meter), and these cases advised to do penetrating keratoplasty (pKP). DALK (deep anterior lamellar kertoplasty) advised only for (24.6%) of keratoconus cases (Tables 1&2).

| Diagnosis | Penetrating keratoplasty | Lammellar keratoplasty |
|-----------------------------|--------------------------|------------------------|
| keratoconus | 46 patients (75%) | 15 (25%) |
| Post traumatic corneal scar | 7 patients (100%) | no |
| Post Herpis kerratitis | 3 patients (60%) | 2 |
| Corneal decompensation | 3 patients (75%) | 1 |
| Osteogenesis imperfecta | One case (50%) | One case (50%) |
| Post LASIK | One cas (100%) | 0 |
| Since birth (congenital) | One case (100%) | 0 |

Table 1: Type of keratoplasty which advised.

| Diagnosis | Effected Side Need Keratoplasty | Gender |
|-----------|---------------------------------|------------|
| KC | 42 bilateral | 28 male |
| | 19 unilateral | 33 female |
| PT | All the cases | 6 male |
| | unilateral | 1 female |
| HK | All the cases | 2 male |
| | unilateral | 3 female |
| CD | All the cases | 2 male |
| | unilateral | 2 female |
| OE | All the cases | One male |
| | bilateral | One female |
| PL | bilateral | One female |
| CO | unilateral | One male |

KC= Keratoconus, PT=post traumatic

HK= Herps keratitis CD= corneal decomposition

OE= Oseteogenesis imerfecta, PL= post LASIK

CO= congenital dystrophy

Table 2: Figure show the effected side of cases need keratoplasty and Gender of patients.

The second most common indications for keratoplasty in our study was post traumatic corneal scar, 7 patients (9%), average of age is 33.4 Years (between 16 – 60 Years), all of them had plant trauma with stone during fighting, 6 patients

(86%) was male, all of the cases presented with sever loss of the vision and all of the cases advised for penetrating keratoplasty, because of deep scaring involved most of the corneal layers. The cases of post infectious keratitis

which need keratoplasty ranked as the third indication for keratoplasty in our region, all of them Post herpetic corneal scars, comprising 5 patients (6.2%), average of age is 56 Years, and two cases was male and 3 female. Three cases (60%) presented with deep corneal opacity and advised for penetrating keratoplasty.

Our study showed that corneal decomposition was the fourth indication for keratoplasty, there were 4 patients, two male and two female, all of them post cataract surgery, average of age is 65 Years, all of them presented with sever loss of vision due to advanced corneal opacity, penetrating keratoplasty advised for all of them. There were 2 patients of same family, the cases diagnosed as Osteogenesis imperfect, the first is male, 14 Years old with bilateral corneal opacity and he had sever poor vision (HM) in one eye, and other eye with moderate loss of vision <0.05 cc, his sister 15 Years old with bilateral corneal opacity and she had mild loss of vision (right eye 0,2cc and left eye 0.3cc). One case presented as a case of keratoectasia with corneal opacity post LASIK and one case with corneal opacity since birth. keratoconus is the leading indication for keratoplasty in our region, followed by traumatic corneal scarring. Despite the technique of keratoconus had evolved in last decade but perforating keratectomy (PK) is still required.

Discussion

Keratoplasty is the main method for improvement of corneal disease that affect cornea transparency and visual function, this procedure consider as a main visual rehabilitation technique. The keratoplasty or corneal transplantation is especially for treatment of corneal diseases that mainly affects tromaand endothelium [12].

This study focus on indications for penetrating keratoplasty and lamellar keratoplasty from 2018 to 2020 in Tobruk medical center. Because of inherited and environmental factors like hot weather and longtime excessive ultra-violet exposure, we found in our stud the most common indication for keratoplasty in our region is keratoconus, there were 61 case (76%) had different degree of keratoconus. In many other studies, the most common indication for keatoplasty is keratoconus (53%), the result was reported in Sudia Arabia Al Arfai, et. al. [13] reported in China as a second indication for keratoplasty with 17.9% [14] but in European countries (UK) reported as the fourth indication for keratoplasty, account only (15.5%) from all cases which need Keratoplasty [7]. In all these studies, we find the keratoconus is younger age disease, the average age is (34 Years) in this study. The gender was making no statistical significant risk factor for the keratoconus (P value = 0.25). The most of cases had bilateral keratoconus with different degree, there were 69% need keratoplasty on both eyes, 8 cases (13%) had keratoplasty

on the other eye, and 11 cases (18%) need keratoplasty only on one eye, other eye with mild- moderate keratoconus and didn't need keratoplasty. Despite the management of keratoconus in last decade had directed to the lamellar keratoplasty, because less Risk of rejection and best vision improvement outcome was reported with lamellar keratoplasty [6,8]. On the other hand, many studies reported that the PKP is the most common keratoplasty technique in sever keratoconus cases especially which presented with corneal opacity [5,12]. In our study we find, the most of cases of keratoconus, 46 patients (75.4%) presented with Grade IV with corneal opacity and poor vision between (HM and CF 4 meter), and thy need penetrating keratoplasty (pKP). DALK (deep anterior lamellar kertoplasty) advised only for (24.6%) of keratoconus cases. The high tendency towards pKP in the current study is due to the fact that keratoplasty in our region is very low in last decade because the cornea bank closed since long time and keratoplasty abroad is expensive, these two reasons my explain way the patients came later with advanced keratoplasty.

The second most common indications for keratoplasty in our study was post traumatic corneal scar, were making (9%), there were 86% was male and all of them having plant trauma with Stone during fighting, all of them presented with sever loss of vision HM or less and all of them advised penetrating keratoplasty for improve the vision. According to our knowledge, the high tendency towards trauma in the current study is due to the fact that trauma and accident in our country is very high, in other prewise studies as in British, China not recorded the post traumatic corneal scar as indication for Keratoplasty [7]. In other study in china had reported the post traumatic corneal scar as a fifth indication of keratoplasty with 4.8% [15].

Although in many countries the post infectious keratitis recorded as commonest leading cause for Keratoplasty [3,15,16]. We find the third leading indications were infectious keratitis only in 5 patients (6.2%). Two was male and 3 female, all of them with unilateral corneal opacity due to herps keratitis, 60% of them with sever corneal opacity and sever loss of vision and penetrating keratoplasty was indicated. As a fourth leading indication for keratoplasty was corneal dystrophy post cataract surgery, in united state of America the pseudophakic bullous keratopathy was the most common leading indication for PKP [17].

The less common indication for keratoplasty in our geographical region are congenital corneal opacity and post LASIK ectasia, similar study result in Colombia [3].

Conclusion

In conclusion, in this study, keratoconus is the leading

indication for keratoplasty in our region, followed by traumatic corneal scarring, post infectious corneal scarring and then with post cataract surgery corneal dystrophy. Despite the technique of keratoconus had evolved in last decade into advanced procedure like lamellar keratoplasty which had better rehabilitation of visual function outcome and less risk of rejection and astigmatism but perforating keratectomy (PK) is still required. There are a lot of corneal disorders requiring keratoplasty in our region and the need for further work for detection, early prevention and early intervention.

Acknowledgement

We would like to thank the Staff of Ophthalmology Word of Tobruk Medical Center.

References

- Rémont L, Duchesne B, La C, Rakic JM, Hick S (2014) Updates in corneal transplantation. *Rev Med Liege* 69(9): 490-496.
- Donaghy CL, Vislisel JM, Greiner MA (2015) An Introduction to Corneal Transplantation.
- Galvis V, Tello A, Gomez AJ, Rangel CM, Prada AM, et al. (2013) Corneal transplantation at an ophthalmological referral center in Colombia: indications and techniques (2004-2011) *Open Ophthalmol J* 7: 30-33.
- Sharma VK, Kumar S, Patyal S, Trehan HS, Yadav AK, et al. (2020) Endothelial corneal transplants: indications, clinical profile and surgical outcomes in a tertiary care hospital. *Med J Armed Forces India* 76(2): 166-171.
- Cassidy D, Beltz J, Jhanji V, Loughnan MS (2013) Recent advances in corneal transplantation for keratoconus. *Clin Exp Optom* 96(2): 165-172.
- Stuart AJ, Romano V, Virgili G, Shortt JK (2018) Descemet's membrane endothelial keratoplasty (DMEK) versus Descemet's stripping automated endothelial keratoplasty (DSAEK) for corneal endothelial failure. *Cochrane Database Syst Rev* 256(6): CD012097.
- Tan JCH, Holland SP, Dubord PJ, Moloney G, McCarthy M, et al. (2014) Evolving indications for and trends in keratoplasty in British Columbia, Canada, from 2002 to 2011: a 10-year review. *Cornea* 33(3): 252-256.
- Singh A, Zarei Ghanavati M, Avadhanam V, Liu C (2017) Systematic Review and Meta-Analysis of Clinical Outcomes of Descemet Membrane Endothelial Keratoplasty Versus Descemet Stripping Endothelial Keratoplasty/Descemet Stripping Automated Endothelial Keratoplasty. *Cornea* 36(11): 1437-1443.
- Kanavi MR, Javadi MA, Motevasseli T, Chamani T, Kanavi MR, et al. (2016) Trends in Indications and Techniques of Corneal Transplantation in Iran from 2006 to 2013; an 8-year Review-*J Ophthalmic Vis Res* 11(2): 146-152.
- Ghosheh R, Cremona FA, Rapuano CJ, Cohen EJ, Ayres BD, et al. (2008) Trends in penetrating keratoplasty in the United States 1980-2005. *Int Ophthalmol* 28(3): 147-53.
- Tan TH, Dart JK, Holland EJ, Kinoshita S (2012) Corneal transplantation. *Lancet* 79(9827): 1749-1761.
- Javadi MA, Kanavi MR, Safi S (2020) A 27-Year Report from the Central Eye Bank of Iran. *J Ophthalmic Vis Res* 15(2): 149-159.
- Al Arfai KM, Yassin SA, Al Beshri AS, Al Jindan MY, Al Tamimi ER (2015) Indications and techniques employed for keratoplasty in the Eastern province of Saudi Arabia: 6 years of experience. *Ann Saudi Med* 35(5): 387-393.
- Sun XT, Zhai HL, Cheng J, Kong QQ, Cong L, et al. (2019) Indications for penetrating keratoplasty and anterior lamellar keratoplasty during 2010-2017. *Int J Ophthalmol* 12(12): 1878-1884.
- Wang Yi, Xie L X, Song XS, Zhao J (2011) Trends in the indications for penetrating keratoplasty in Shandong, 2005-2010. *Int J Ophthalmol* 4(5): 492-497.
- Jamali H, Gholampour AR (2019) Indications and Surgical Techniques for Corneal Transplantation at a Tertiary Referral Center. *J Ophthalmic Vis Res* 14(2): 125-130.
- Dobbins KR, Price FW, Whitson WE (2000) Trends in the indications for penetrating keratoplasty in the midwestern United States. *Comparative Study* 19(6): 813-816.