

SUITABILITY OF CORNEAL TISSUE FOR TRANSPLANTATION PROCURED FROM HANGING CASES

Rekha Gyanchand¹, Vineeta Pa²

¹Consultant and Medical Director, Department of Ophthalmology, Lions International Eye Bank, Bangalore.

²Cornea Fellow, Department of Ophthalmology, Lions International Eye Bank, Bangalore.

ABSTRACT

BACKGROUND

Requirement of donor cornea is essential to target the corneal blind. The best method to procure such corneas is from any major hospitals, which has a mortuary facility. The eye donation with hanging as the cause of death is very common in a mortuary setup. Some factors that are concerning regarding corneas procured from death due to hanging is the prolonged exposure of the cornea at the time of death, the exact time of death is not known, most of the cadavers are refrigerated for investigations as these arrive at the mortuary usually at night. Due to these reasons, the corneal surgeons are hesitant to use corneas procured from death due to hanging for corneal transplantation. Analysing these corneas would contribute to a great extent to the donor cornea pool in providing sight to the corneal blind, especially as majority are young individuals who commit suicide by hanging. In this study, the donor corneas were analysed with regards to corneal epithelial defect, endothelial cell morphology and utilisation of these corneas for transplantation.

The aim of the HCRP study is to analyse the effect of death due to hanging on donor cornea. 1. Corneal epithelial status. 2. Corneal endothelial cell morphology. 3. Utilisation of corneas for transplantation.

MATERIALS AND METHODS

Donor corneas from 22 donors who died due to hanging were procured from hospital mortuary. All the 44 corneas were transplanted. Various parameters like demography, death to enucleation time, cadaver preservation in cold storage, endothelial cell density and utilisation of cornea for transplantation were noted.

Design- Retrospective study.

Statistical Analysis- Descriptive statistics, Pearson and Spearman correlation and Chi-square test were used to test the hypotheses.

RESULTS

Out of the 44 corneas analysed, 75% of the donors were refrigerated as a part of medicolegal investigations protocol. The average DTP time was 12 hours in refrigerated group and 5 hours in non-refrigerated group. Preservation to transplant time was 3.16 days in refrigerated donors and 2.45 days in non-refrigerated donors. Donor epithelial defects were significant in both groups. The number of corneas used for Penetrating Keratoplasty (PKP) was less in refrigerated group (61%) when compared to non-refrigerated group (91%). Graft clarity were comparable in both groups. The postoperative course was uneventful in non-refrigerated group. In the refrigerated group, 6% of cases had primary graft failure and 6% had rejection.

CONCLUSION

It is safe to collect eyes from donors where death has occurred due to hanging. The refrigerated cadaver gives us additional time for motivation of the donor family and also provide us a large pool of younger corneas for transplantation. The mortuary department does provide information regarding the time of death. The corneal epithelial and endothelial cell morphology is fit to be used for corneal transplantation. The transplantation results were also satisfactory.

KEYWORDS

Hanging, DTP = Death to Preservation, Refrigerated Donor Preservation, Endothelial Morphology, PKP = Penetrating Keratoplasty, HCRP = Hospital Cornea Retrieval Program.

HOW TO CITE THIS ARTICLE: Gyanchand R, Pai V. Suitability of corneal tissue for transplantation procured from hanging cases. J. Evid. Based Med. Healthc. 2017; 4(52), 3206-3211. DOI: 10.18410/jebmh/2017/636

Financial or Other, Competing Interest: None.
Submission 18-05-2017, Peer Review 25-05-2017,
Acceptance 07-06-2017, Published 29-06-2017.

Corresponding Author:
Dr. Rekha Gyanchand,
No. 94/c, 9th Cross, RMV Extension,
Bangalore-500080.

E-mail: rekha221@gmail.com
DOI: 10.18410/jebmh/2017/636



BACKGROUND

India needs about 2 lakh eye donations per year to restore sight to the corneal blind. The incidence of corneal blindness is increasing and the contraindications are increasing year by year, which has led the drop in availability of donor cornea further causing decrease in corneal transplantation. The technology in eye banking has advanced with respect to retrieval and preservation. The cadaver preservation has improved in the mortuary too. As per the standards of the Eye Bank Association of America,¹ the eligibility criteria

protocol for the donor corneas in relation to preservation is as follows- If the donor body is refrigerated within 6 hours of death, the eye donation can be done with up to 12 hours, and if not refrigerated, it is within 8 hours of death.² But, in India, we follow 6 hours for not preserved donors and this is due to the hot and humid climate conditions. The cadaver preservation gives time to the eye donation counsellors to motivate the family to donate eyes and also get medicolegal clearance from the police. The Hospital Cornea Retrieval Program (HCRP) has changed the cornea transplantation rate from 20,000-40,000/year. The association of the eye banks with a multispecialty general hospital has become essential in eye banking in the present day scenario.³

Bangalore is a fast growing urban city with a very high stress level. The city is also known as the suicide capital of India.⁴ Hanging is one of the common method of committing suicide. The incidence of hanging in a single large multispecialty government hospital in Bangalore is 30-35 cases per month. A report published by a tertiary care hospital in Kolkata mortuary states that the incidence of hanging was 48.8%.⁵ An average of 20-25% eye donations per month is received from death due to hanging if eye retrieval is from the mortuary. A number of eye banks do refuse to collect these corneas received from death due to hanging as the exact time of death is uncertain in these cases. The time family members see the body is documented as the time death. Hanging also causes hypoxic damage to the endothelium?.

Aim and Objective

The objective of this study was to evaluate the donor cornea where the cause of death was hanging, the donor corneal epithelial status and corneal endothelial cell morphology and to analyse utilisation of corneas for transplantation.

MATERIALS AND METHODS

This study was conducted at Lions International Eye bank, Bangalore, Karnataka.

This is a retrospective study of 44 eye donations received with hanging as the cause of death. The corneas were analysed for corneal epithelial status, corneal endothelial cell morphology and utilisation of the corneas for transplantation. All the 44 corneas were transplanted.

The donor eyes were received from a mortuary of a large multispecialty government hospital in the city. The mortuary had the facility for cadaver preservation in cold storage,

which maintained a temperature of 4 to 8 degrees Celsius. The Eye Donation Counsellors (EDC) from Lions International Eye Bank were stationed in this mortuary as a part of Hospital Cornea Retrieval Program (HCRP). Standard eye bank protocol was followed with respect to contraindications and consenting and police clearance. The eye donation counsellors were all adequately trained. The time of death was recorded as per the relatives, but confirmed as per the postmortem report. Enucleation was the procedure of choice for retrieval of donor cornea. The cadaver was refrigerated in cases where the medicolegal investigations were delayed or if the cadaver arrived at night. This gave time to the eye donation counsellors to motivate the family.

This Study had 2 Types of Eye Donors- The donors which were refrigerated (for legal issues) within 6 hours of death and eye donation done within 12 hours were put as Group 1. The donors who were not refrigerated and eye donations done within 6 hours of death were put under Group 2.

The donated eyeballs were processed at the eye bank. At the eye bank, the standard serology tests as per NPCB was conducted for HIV, HCV, VDRL and HBsAg. Lab excision of the corneal button was done and preserved in McCarey-Kaufmann Medium (MK). Tissue evaluation was done with the slit-lamp biomicroscopy and eye bank specular microscopy.

Inclusion Criteria

Death due to hanging, which came to the mortuary were only considered. If donor preservation was done within 6 hours of death, then cornea retrieval was done within 12 hrs. If donor not preserved, then collection was done within 6 hours of death.

Exclusion Criteria

Homicide cases, penlight examination if the cornea was hazy, opaque or collapsed due to exposure.

Criteria for determining corneal tissue for suitability, which was followed at the eye bank.⁶

Criteria for Cornea Suitability-

	PKP	EK	IEK	IEALK/ALK	K-Pro	KLALK	Patch Graft/Tectonic	Glaucoma Shunt Patch
Age	2-75	10-75	2-75	2-75	2-75	2-75	2-75	2-75
Cell density	>2000 mm ²	>2700 mm ²	>2700 mm ²	Any	Any	Any	Any	Any
Pterygium central clear cornea=8.50 mm	1 mm on cornea	No deep scar	1 mm	Nil	1 mm	Nil	Any	Any
Band keratopathy central clear cornea=8.50 mm	8.50 mm	Any	Nil	Nil	8.0 mm	Nil	Any	Any
IOLS	Ok	No	No	Ok	Ok	Ok	Ok	Ok
Anterior scars/sub-epi hazes	8.50 mm central clear cornea	Ok	8.50 mm	No	No	No	No	No
LASIK/PRK/RK scars	No send for HPE	Ok	No	No	No	No	No	No
Foreign bodies (not infectious)	No	Ok	8.0 mm	No	Ok	Ok	Ok	Ok
Cloudy dystrophy or central crocodile Shagreen	No	Ok	No	No	No	No	Ok	Ok
Stress lines	No stress lines	No stress lines	No stress lines	Any	Any	No stress lines	Any	Any
Cell dropout	Mild-moderate	Mild	Mild	Any	Any	Mild-moderate	Any	Any
Endo peel/detachments	Clear >8.5 mm	>9.5 mm	>8.0 mm	Ok	Ok	>8.0 mm	Ok	Ok
Rim width	Any	>1.0	>1.0	Any	Any	>2.0	Any	Any

RESULTS

The total number of corneas received from the HCRP program due to hanging were analysed.

The study period was done in the year 2014. The number of corneas analysed were 44.

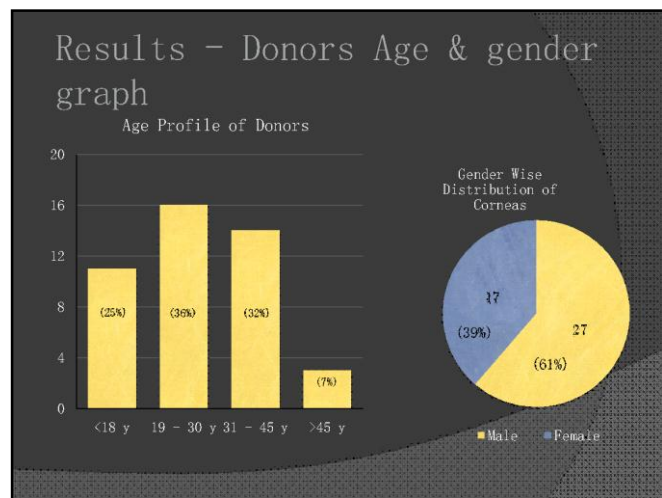


Figure 1. Donors Age and Gender

The peak age of suicide due to hanging was 68% in the age group of 19 yrs. to 45 yrs. The incidence of death due to hanging was common in males (61%) than in females (39%).

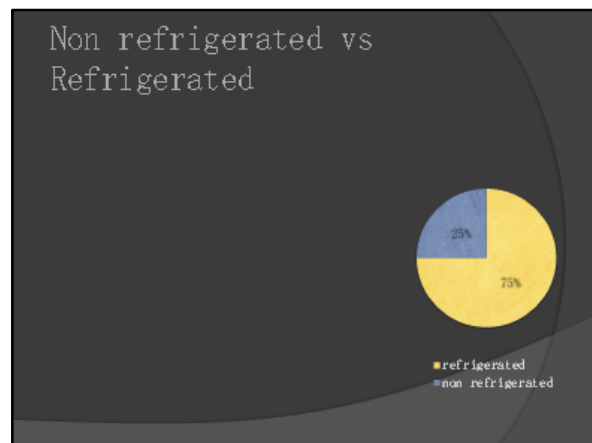


Figure 2. Non-Refrigerated Vs. Refrigerated Donor

The cadaver arriving at night to the mortuary and till police clearance was obtained the cadaver were refrigerated and if investigations was not required from the police, then the body would be released for eye donation. In our study, we had 75% of donors were refrigerated and 25% of the donors were not preserved or not refrigerated.

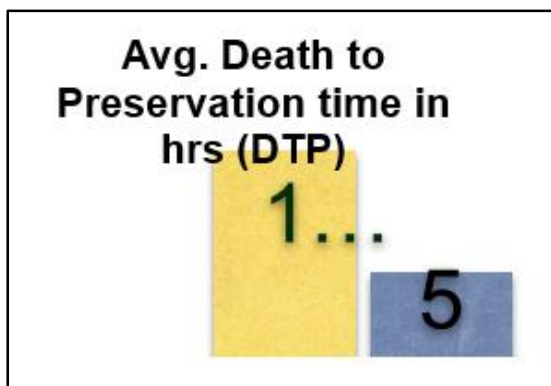


Figure 3. Death to Preservation Time (DTP) or Death to Enucleation Time (DTE)

This indicates the time of death to preservation in moist chamber or time of enucleation. In the non-refrigerated group, the enucleation was done within 5 hours of death. In the refrigerated group, the cadaver are refrigerated and the enucleation was done within 12 hours (DTP).

Note- In the refrigerated group, the cadaver preservation in cold storage was done within 6 hours of death. They are eligible for eye donation upto 12 hours from death.

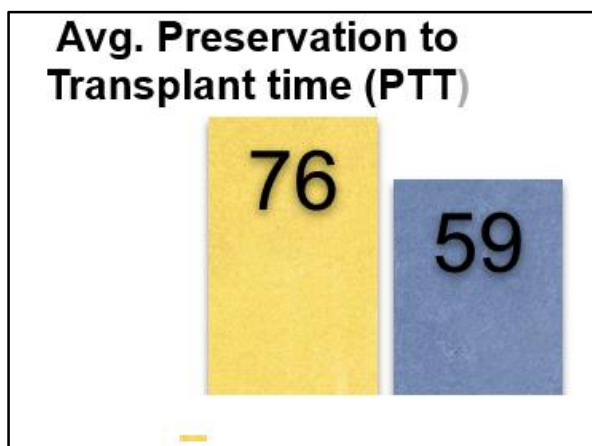


Figure 4. Preservation to Transplantation

The time from preservation to cornea transplantation in the refrigerated group was 76 hours (3.1 day), and non-refrigerated group, it was 59 hours (2.45 days). All the corneal buttons was preserved in MK medium.

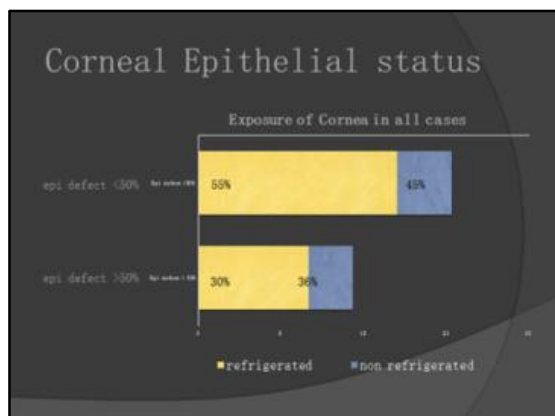


Figure 5. Donor Corneal Epithelium

The corneal epithelial defect of varying degree was seen in all the corneas irrespective of the group. More than 50% of the corneal epithelial defect was seen in 55% of the refrigerated group when compared to 45% of the non-refrigerated group (Figure 5).

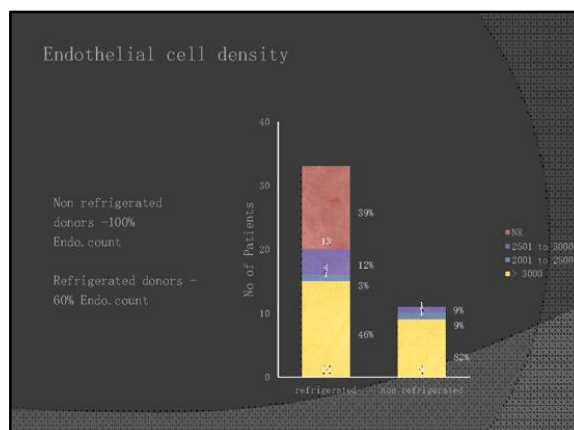


Figure 6. Corneal Endothelial Cell Density (ECD)

In the Refrigerated Group, the EDC was as follows- 46% had 3000 cells/mm², 12% had 2001-2501 cells/mm², 3% had 2501-3000 cells/mm², 39% of corneas endothelial cells were not recordable.

In the non-refrigerated group, the EDC was as follows- 82% had 3000 cells/mm², 9% had 2001-2501 cells/mm² and 9% had 2501-3000 cells/mm².

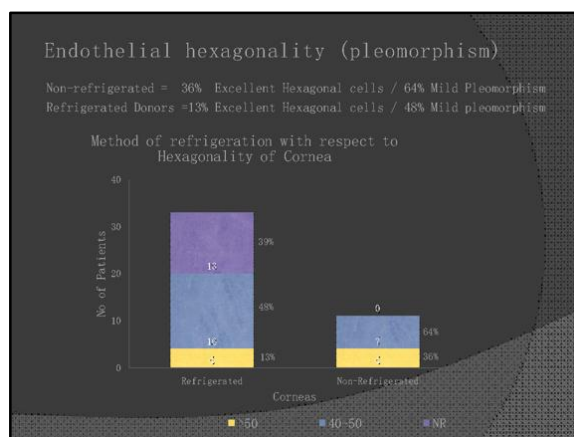


Figure 7. Endothelial Hexagonality or Pleomorphism (6A)

Non-refrigerated = 36% excellent hexagonal cells/64% mild pleomorphism.

Refrigerated donors = 13% excellent hexagonal cells/48% mild pleomorphism, 39% of corneas endothelial cells were not recordable.

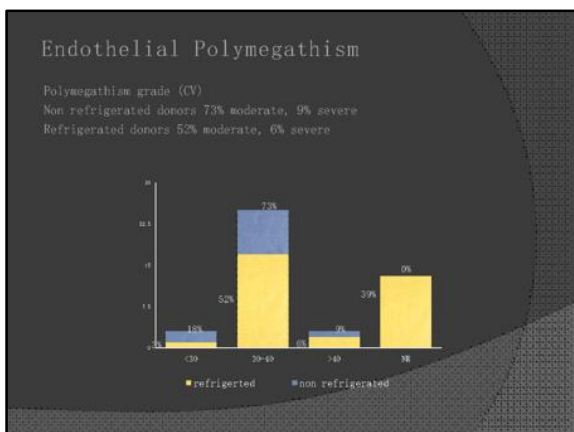


Figure 8. Polymegathism (CV)

In the non-refrigerated group, moderate polymegathism was seen in 73% and severe polymegathism was seen in 9%.

In the refrigerated donors, 52% of corneas had moderate polymegathism and 6% had severe polymegathism.

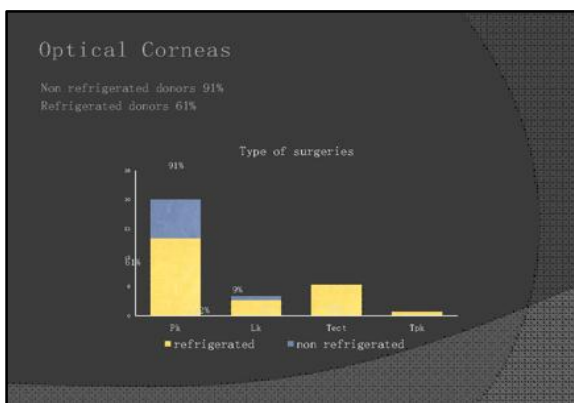


Figure 9. Utilisation of Donor Cornea for Transplantation

In the refrigerated group, 61% of the corneas were used for Penetrating Keratoplasty (PKP), 3% for (LK) lamellar keratoplasty and 24% for (TPK) therapeutic keratoplasty. In the non-refrigerated group, 91% of the corneas were used for PKP and 9% for LK.

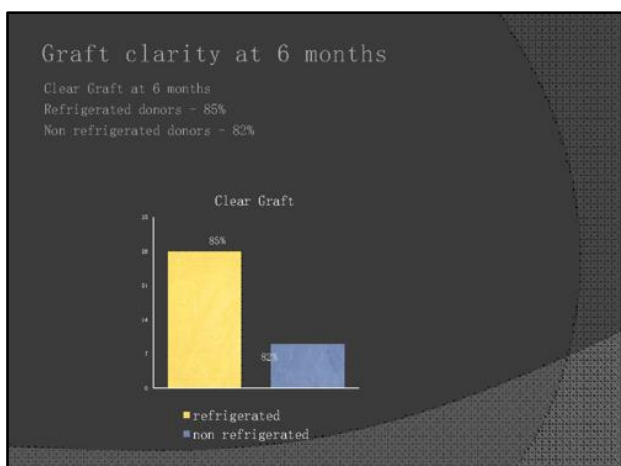


Figure 10. Penetrating Keratoplasty Results

At 6 months, 85% of the grafts were clear in the refrigerated group, and in non-refrigerated group, 82% of the grafts were clear (Figure 10).

Postoperative Complications

The incidence of complications were noted only in the refrigerated group, the complications were primary graft failure in 6% of cases was seen at 3 weeks after transplantation in PKP cases, corneal endothelial graft rejection was seen in 6% of cases, and graft infection in 3% was seen in TPK cases, the recurrence of the primary fungal infection occurred. No complications were noted in the non-refrigerated group.

Lost for Postoperative Follow-up

In 3% of cases in the refrigerated group and 9% in non-refrigerated group, patients did not come for follow up after 6 months.

DISCUSSION

In this study, we have analysed 22 donor corneas retrieved from the mortuary of a multispecialty government general hospital with hanging as a cause of death. In our study, 68% of the donors were in the age group of 19 yrs. to 45 yrs. The incidence of hanging above the age of 45 yrs., we had very few donors (7%). A study published by Rathin Kumar Duari et al⁷ showed the incidence of hanging was seen in the age group of 15-25 yrs. and more of females was seen. Amandeep et al⁸ also found highest incidence (59.24%) amongst the population of 15-25 years. Whereas, Azmak D et al⁹ described highest victims (20.8%) between 30 to 39 years.

In our study, the males (61%) outnumbered the females (39%). The study by Amandeep et al and Azmak D et al also clearly showed males outnumbered females.

In our study, the time of death was noted as per the postmortem report.^{9,10}

In our study, 75% cadavers were refrigerated to complete the police investigations. 25% of the donors were non-refrigerated. The DTP time (death to preservation or enucleation) was average 12 hours in refrigerated, 5 hours in non-refrigerated donors. The PTT (preservation to transplant) was 3.16 days in refrigerated donors and 2.45 days in non-refrigerated donors. No similar study was found in the literature. All corneas were preserved in MK Media and Serology report negative in all cases.

Donor Corneal Epithelial and Endothelial Cell Morphology

The corneal epithelial defect of varying degree was seen in all the corneas irrespective of the group. More than 50% of the corneal epithelial defect was seen in 55% of the refrigerated group when compared to 45% of the non-refrigerated group. The study by Woodford et al also indicated the death to preservation time if prolonged for more than 6 hours would cause more epithelial defects.¹¹ The corneal endothelial cell morphology was recorded by specular microscopy. The endothelial cells were recordable

in 60% of refrigerated donor corneas when compared to 100% in non-refrigerated donors. Hexagonal cells (pleomorphism) were excellent in 13% of refrigerated donors only when compared to 36% in non-refrigerated donors. Endothelial cell density excellent in 82% of non-refrigerated donors compared to 46% in refrigerated donors. Moderate polymegathism was seen in 73% of non-refrigerated donors compared to 52% of refrigerated donors. Among the refrigerated donors, 61% of the cornea was of optical grade and 91% in non-refrigerated donors. The corneal graft results at 6 months, we had 82% had clear graft in non-refrigerated compared to 85% in refrigerated donors. The postoperative complications noted were in the refrigerated group 6% had endothelial graft rejection, 3% had primary failure (end of 2 months) noted in the refrigerated donor cornea, 3% graft infection was seen in the therapeutic keratoplasty cases and the primary diagnosis was active fungal keratitis with hypopyon, no similar study. No complications noted in non-refrigerated group 3% and 9% cases were lost to follow up in the refrigerated and non-refrigerated groups, respectively.

CONCLUSION

Donor cornea obtained from cadavers with hanging as a cause of death does increase our donor pool for procuring more corneas for the eye bank. The cadaver preservation donors can donate eyes and cornea retrieval needs to be done within 12 hours. The donor cornea is within acceptable parameters regarding the corneal morphology with hanging as a cause of death irrespective of donor refrigeration or not. Primary graft failure and rejection was noted in the refrigerated group.

ACKNOWLEDGMENTS

The authors thankful to the staff of Lions International Eye Bank and the Eye Donation Counsellors for assistance with the data collection.

REFERENCES

- [1] Mohamed A, Chaurasia S, Garg P. Outcome of transplanted donor corneas with more than 6 h of death-to-preservation time. *Indian J Ophthalmol* 2016;64(9):635-638.
- [2] Sugar J, Montoya M, Dontchev M, et al. Donor risk factors for graft failure in the cornea donor study. *Cornea* 2009;28(9):981-985.
- [3] Oliva MS, Schottman T, Gulati M. Turning the tide of corneal blindness. *Indian J Ophthalmol* 2012;60(5):423-427.
- [4] Shrivastava P, Som D, Nandy S, et al. Profile of postmortem cases conducted at a morgue of a tertiary care hospital in Kolkata. *J Indian Med Assoc* 2010;108(11):730-733.
- [5] Rediff Bangalore news 2008 <http://www.rediff.com/news/2008/jun/26rate.html>
- [6] Sight life/EBAI –SOP, 2016 <http://ebai.org/cds.php>
- [7] Duari RK, Ray AK. Socio-demographic study of hanging victims in coastal districts of Odisha. *J Evolution Med Dent Sci* 2016;5(73):5364-5366.
- [8] Azmak D. Asphyxial deaths: a retrospective study and review of the literature. *Am J Forensic Med Pathol* 2006;27(2):134-44.
- [9] Gargi J, Gorea RK, Chanana A, et al. Violent asphyxial deaths- a six years study. *Journal of Indian Academy of Forensic Med* 1992;171-176.
- [10] Kawashima W, Hatake K, Kudo R, et al. Estimating the time after death on the basis of corneal opacity. *J Forensic Res* 2015;6:1.
- [11] Meter WSV, Katz DG, White HBS, et al. Effect of death-to-preservation time on donor corneal epithelium. *Trans Am Ophthalmol Soc* 2005;103:209-224.