Eye Banking - An Overview

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Cornea Services

ARAVIND EYE CARE SYSTEM

Eye Banking in India

- 1945 First eye bank established at RIO, Madras
- 1960 First successful corneal transplant performed by Dr. R. P. Dhanda and Dr. Kalevar
- 1965 First motivational work in Eye
- Banking was done by Mr G Mazumdar in Dholka, Gujarat.

Eye Banking in India

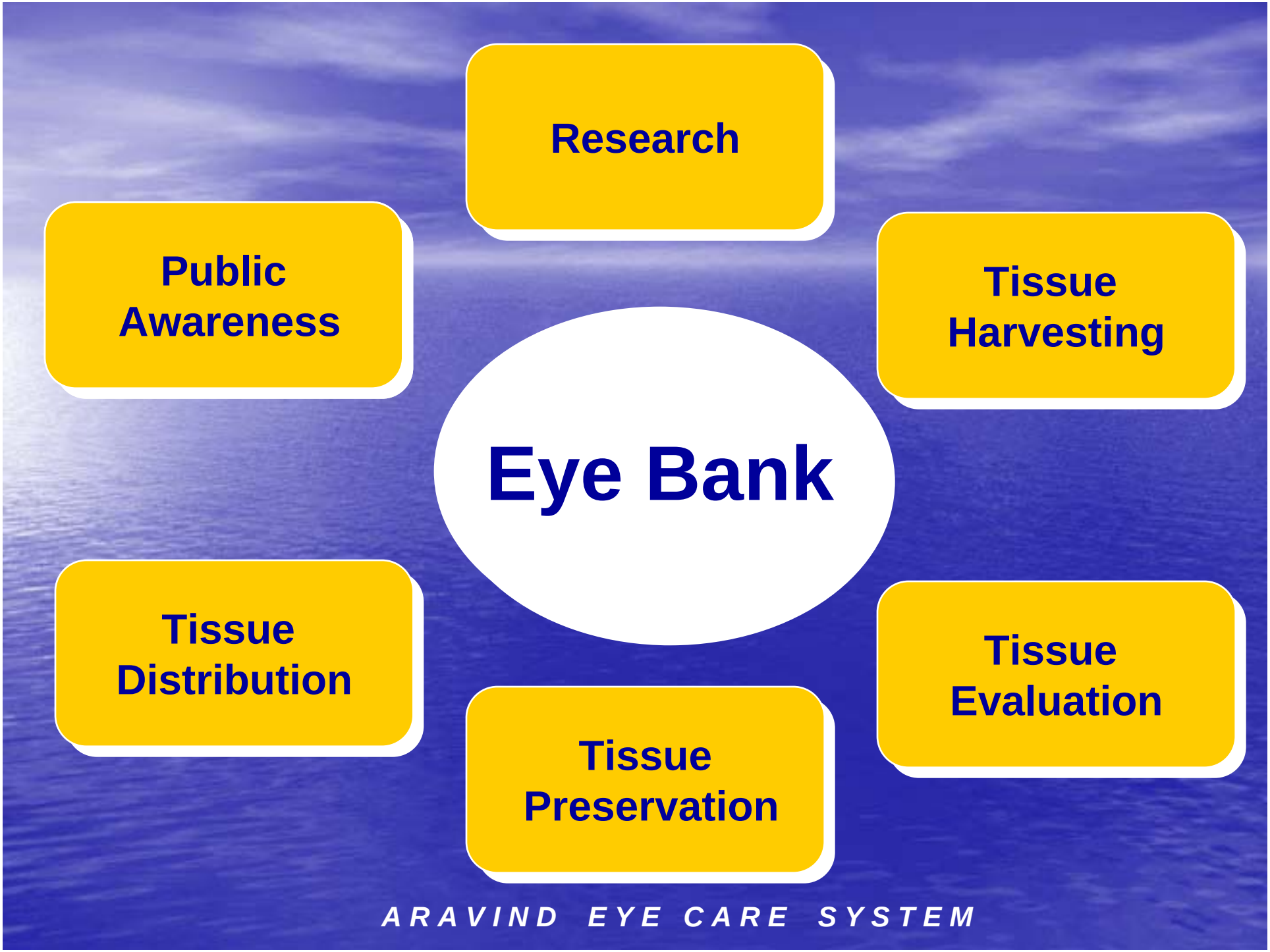
- 1989 Eye Bank Association of India (EBAI) established
- 1999 Medical Standards of Eye Banking in India

Magnitude of The Problem

- 1.3 million corneal blind in India
- Mostly children and young adults
- Current Collection - 22000 corneas
- Current Requirement - 100,000 corneas
- Vast gap between demand and supply.

What Is An Eye Bank?

*A not -for -profit **community based** organization, managed by a Board of Directors,with the objective of increasing the quantity and quality of eye tissue.*


Research
Public Awareness
Tissue Harvesting
Eye Bank
Tissue Distribution
Tissue Evaluation
Tissue Preservation
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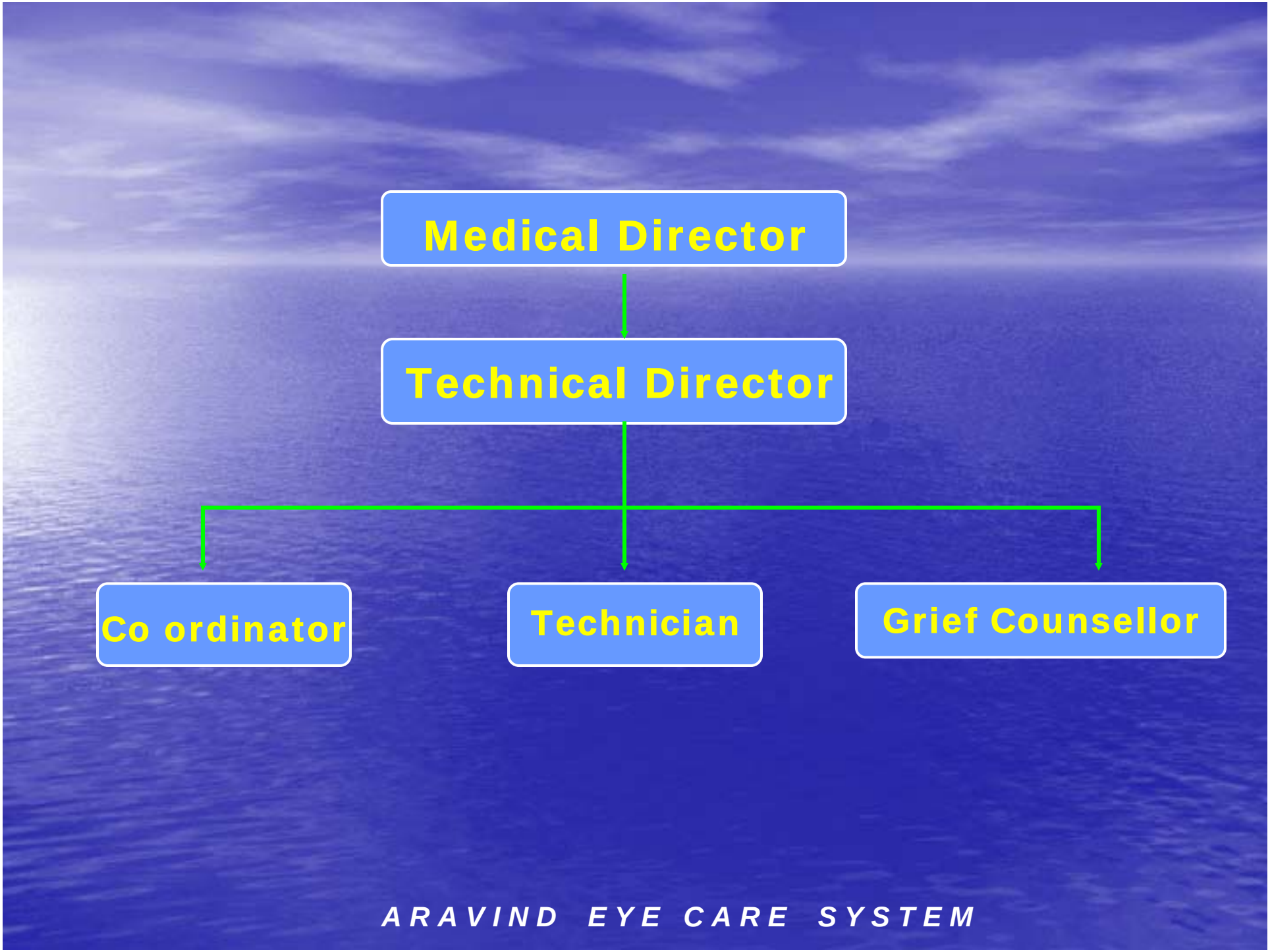
Medical Director
Technical Director
Co ordinator
Technician
Grief Counsellor
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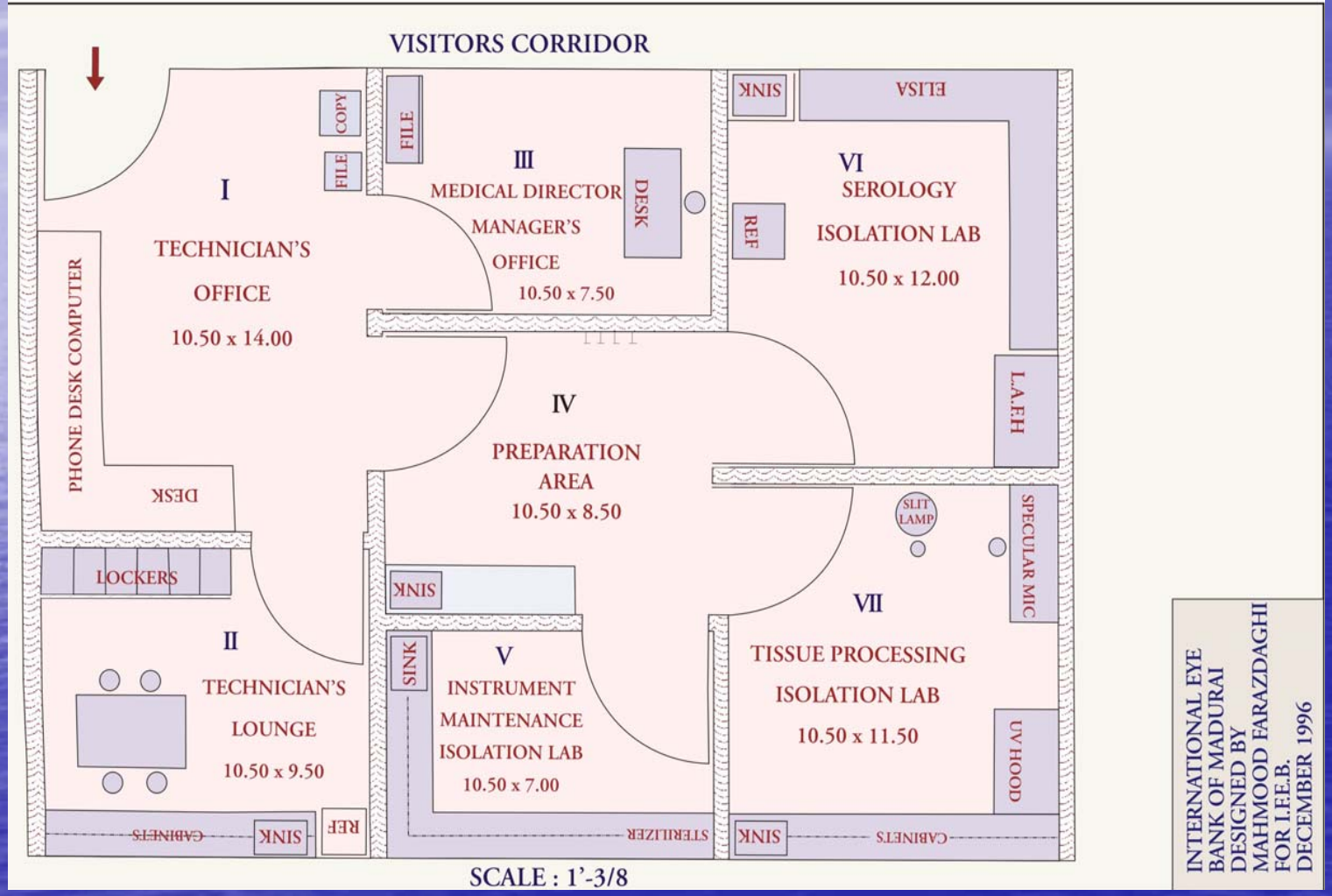
Infrastructure

- Administrative Area
- Laboratory Area
  - Tissue Processing Laboratory
  - Serology Laboratory
  - Instrument cleaning/Decontamination
- Slit Lamp Biomicroscopy / Specular Microscopy

ROTARY-ARAVIND INTERNATIONAL EYE BANK - LAYOUT



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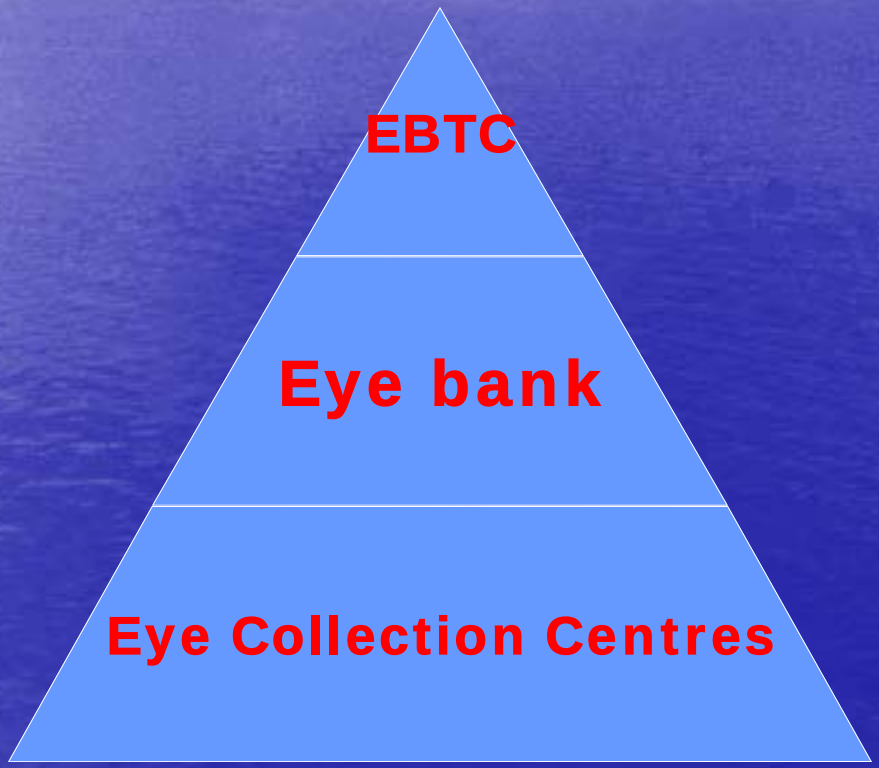
Three Tiered Eye Banking Structure in India



Manpower	EBTC	EB	EDC
Board of Directors	Yes	Yes	No
Medical Director	Yes	Yes	No
Executive Director	Yes	Yes	Yes
Eye Bank Manager	Yes	Yes	No
Eye Bank Technicians	Yes	Yes	No
Eye Donation Counselors	Yes	Yes	No
Administrative Secretary	Yes	Yes	No
Trained Telephone Operator	Yes	Yes	No
Panel of Registered Medical Practitioners to enucleate round the clock	Yes	Yes	No

Infrastructure

INFRASTRUCTURE	EBTC	EB	EDC
Equipment			
Slit Lamp	Yes	Yes	Yes*
Refrigerator	Yes	Yes	No
Serology Equipment	Yes	Yes	No
Specular Microscope	Yes	Yes	No
Six sets of instruments for corneal excision and Enucleation	Yes	Yes	Yes
Autoclave	Yes	Yes	Yes*
Transportation	Yes	Yes	Yes*
Furniture	Yes	Yes	Yes*
Computer with email facility	Yes	Yes	Yes*

Supportive:(Administrative)			
Two exclusive line (one with 1919 and another for outgoing calls)	Yes	Yes	Yes
Standard Public info material	Yes	Yes	Yes
Forms for tissue retrieval, evaluation, and distribution On going:	Yes	Yes	Yes
Hospital Cornea Retrieval Program	Yes	Yes	Yes
Financial sustainability	Yes	Yes	Yes

* *Should have access*

Eye Donation Centre

- Affiliated to a registered eye bank
- Conducts public awareness programs
- Coordinates between donor families & hospitals
- Retrieves corneal tissue and blood for serology

Eye Bank

- 24/7 Service
- Public Education
- Link between donor family & hospital
- Retrieval, Evaluation, Processing of corneal tissue
- Distribution
- Safe transport
- Documentation

Eye Bank Training Centre

- All activities of an eye bank
- Training of eye bank personnel

Eye Bank-support Systems

- Ministry of Health, Government of India
- State government
- Rotary/Lions organizations
- EBAI
- IFETB
- NGO’s - Orbis
- Others

Eye bank - legal implications

- Consent is mandatory.
- Transplantation of Human Organs Act (1994)
- Required Request Law
- Presumed Consent Law

Eye Bank - Sources of Tissue

- Voluntary
- Police mortuaries-Medico Legal Cases.
- Hospital Cornea Retrieval Program(HCRP).
- Other Eye Banks.

HCRP

- Proactive
- Good Quality Tissue
- Role of Grief Counselors
- Public Awareness
- Legal tie-up between the hospital and eye bank
- Part of an organ donation program.

Donor Screening

Tissue from donors with the following is potentially hazardous to eye bank personnel and should be strictly avoided:

- **Active viral Hepatitis**
- **Acquired immunodeficiency syndrome (AIDS) or HIV**
- **Active viral encephalitis or encephalitis of unknown origin**
- **Creutzfeldt-Jakob disease**
- **Rabies**

Contraindications

Tissue from donors with the following are potentially health threatening and also affect the success of the surgery and shall not be offered for surgical purposes.

- **Do not use for Keratoplasty**
  - **Septicemia**
  - **Extensive burns**
  - **Death from an unknown cause**
  - **Death with CNS disease of unestablished diagnosis**
  - **Subacute sclerosing panencephalitis**
  - **Progressive multifocal leukoencephalopathy**

Contraindications

- Leukemias
- Reye's Syndrome
- Rabies
- Active Tuberculosis

Contraindications

- Instrinsic eye disease
  - Retinoblastoma
  - Malignant tumors of the anterior ocular segment
  - Active inflammation at the time of death
  - Congenital or acquired disorders of the eye that would preclude a successful outcome

Contraindications

- Laser photo ablation surgery .
- Corneas from patients with anterior segment surgery may be used if screened by specular microscopy and meet the Eye Bank's endothelial standards.
- Laser surgical procedures such as argon laser trabeculoplasty, retinal and panretinal photocoagulaton do not necessarily preclude use for penetrating keratoplasty but should be cleared by the medical director.

Donor to Host Transmission

Viral infections are the greatest hazard

- **Viruses with proven transmission - Rabies, C - J Disease, Hepatitis B**
- **Possible Transmission - HIV, HSV, CMV, Adenovirus, Epstein - Barr, Rubella virus**
- **Transmission unlikely - V - Z virus**

Other Factors

- Donor Age
- Death – Enucleation time

Donor Tissue Evaluation

- Gross examination
- Slit Lamp Examination
- Serological testing
- Specular Microscopy

Laminar Air Flow Hood

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Corneo Scleral Button Dissection

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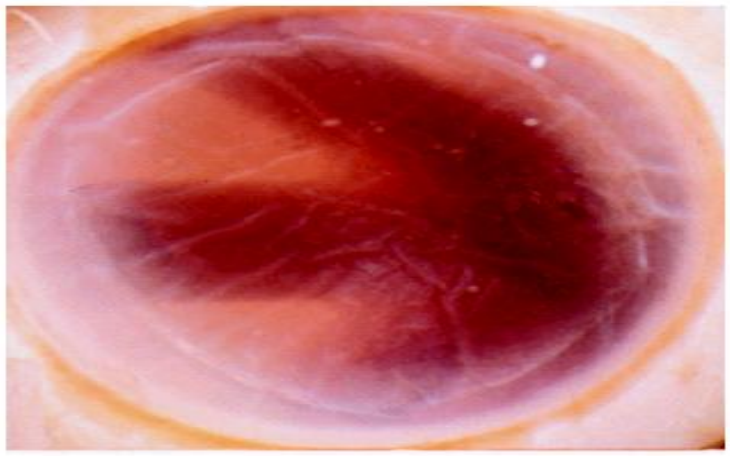
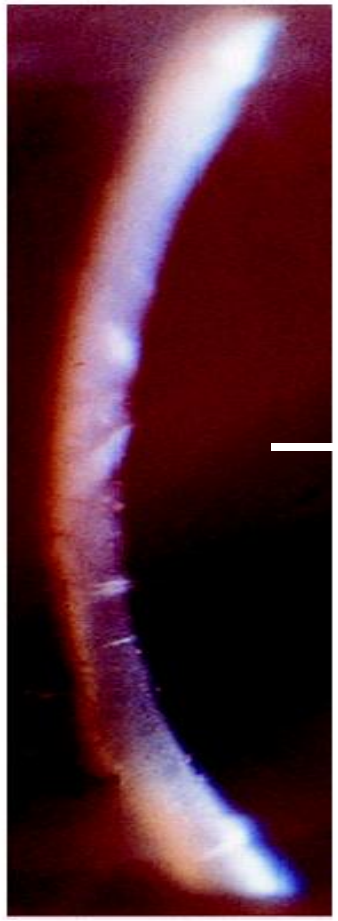
Slit lamp evaluation

- **Epithelium** - intact/defects / exposure / infection
- **Stroma** - clarity/cloudiness/arcus/opacities
- **Descemet's membrane** - folds/degree and location
- **Endothelium** - excellent/very good / good / fair / Nsfs
- Overall rating

Corneo Scleral Button





DMF

Eye Bank - Preservation Media

- Short Term (48hrs) - Moist Chamber
- Intermediate Term (4 days) -

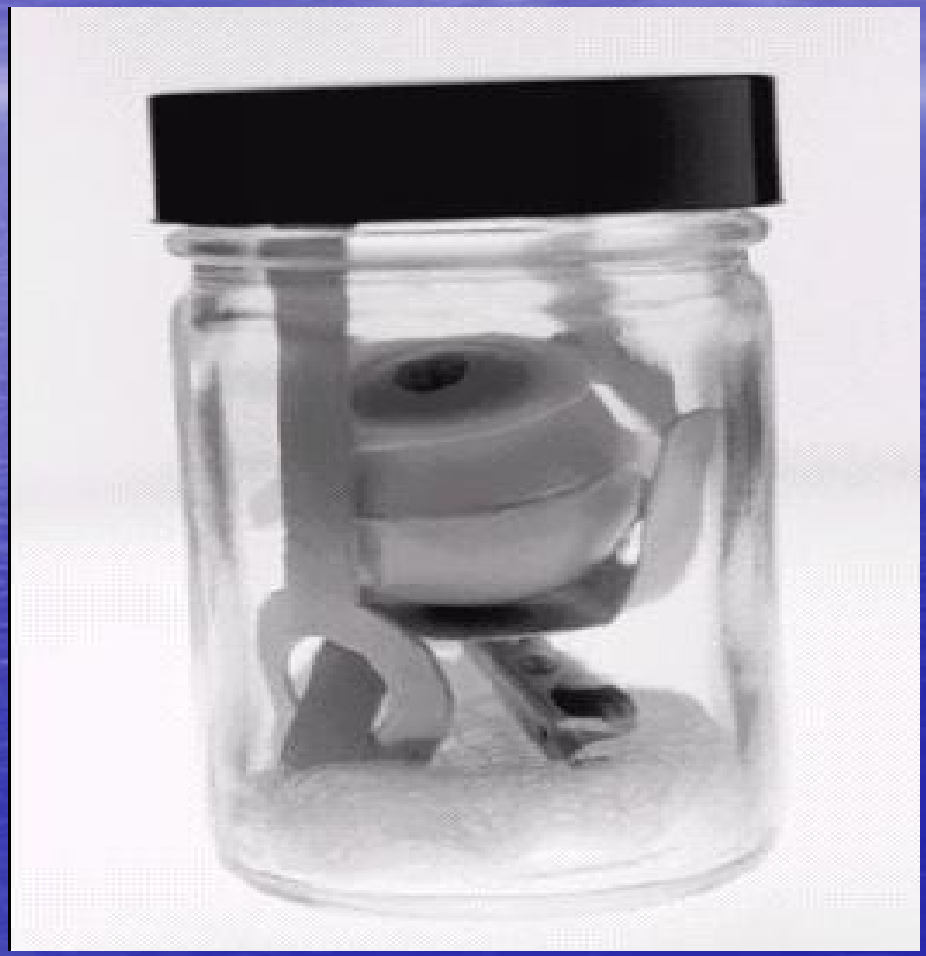
  McCarey - Kaufman medium

  K - Sol medium

  Dexsol medium
- 7 days - Optisol medium
- Long term storage - Organ Culture

  - Cryopreservation

Moist Chamber



Optisol Medium

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Tissue Preservation

- Corneal Preservation
- Preservation of Sclera - Glycerine
- Amniotic membrane - Dulbecco's medium

Specular Microscopy

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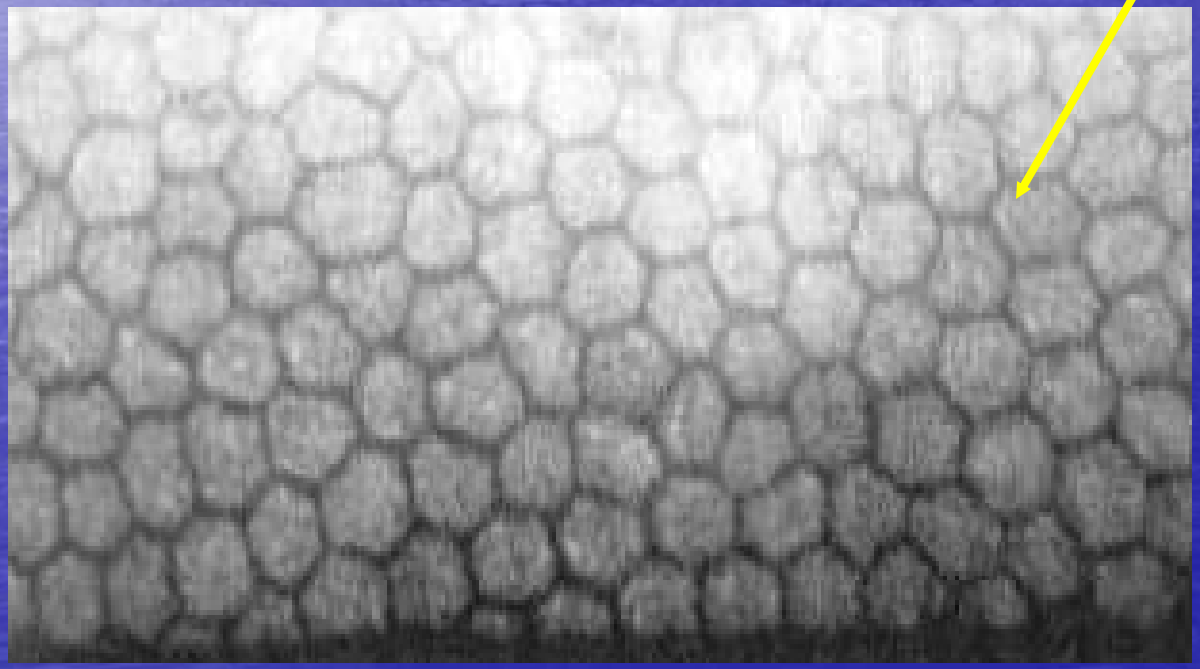
Konan Eye Bank Specular Microscope

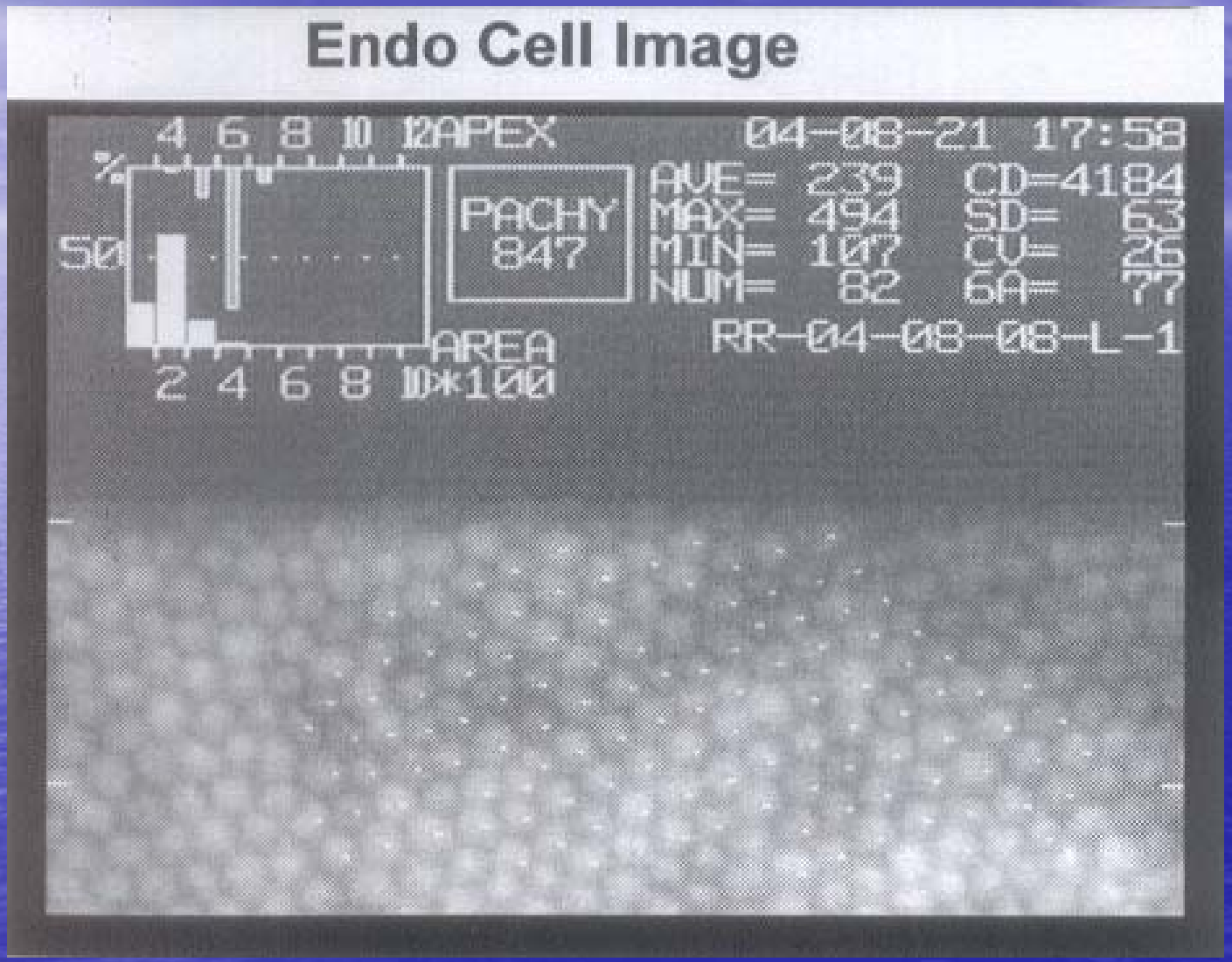
- Built - in high resolution CCD camera – high quality images
- Built - in cell analysis system
- XYZ / rocking platform mechanism – early tracking of endothelial cells
- Built in pachymeter!corneas that have undergone refractive surgery
- Observe endothelium from a vial or corneal chamber

Morphology

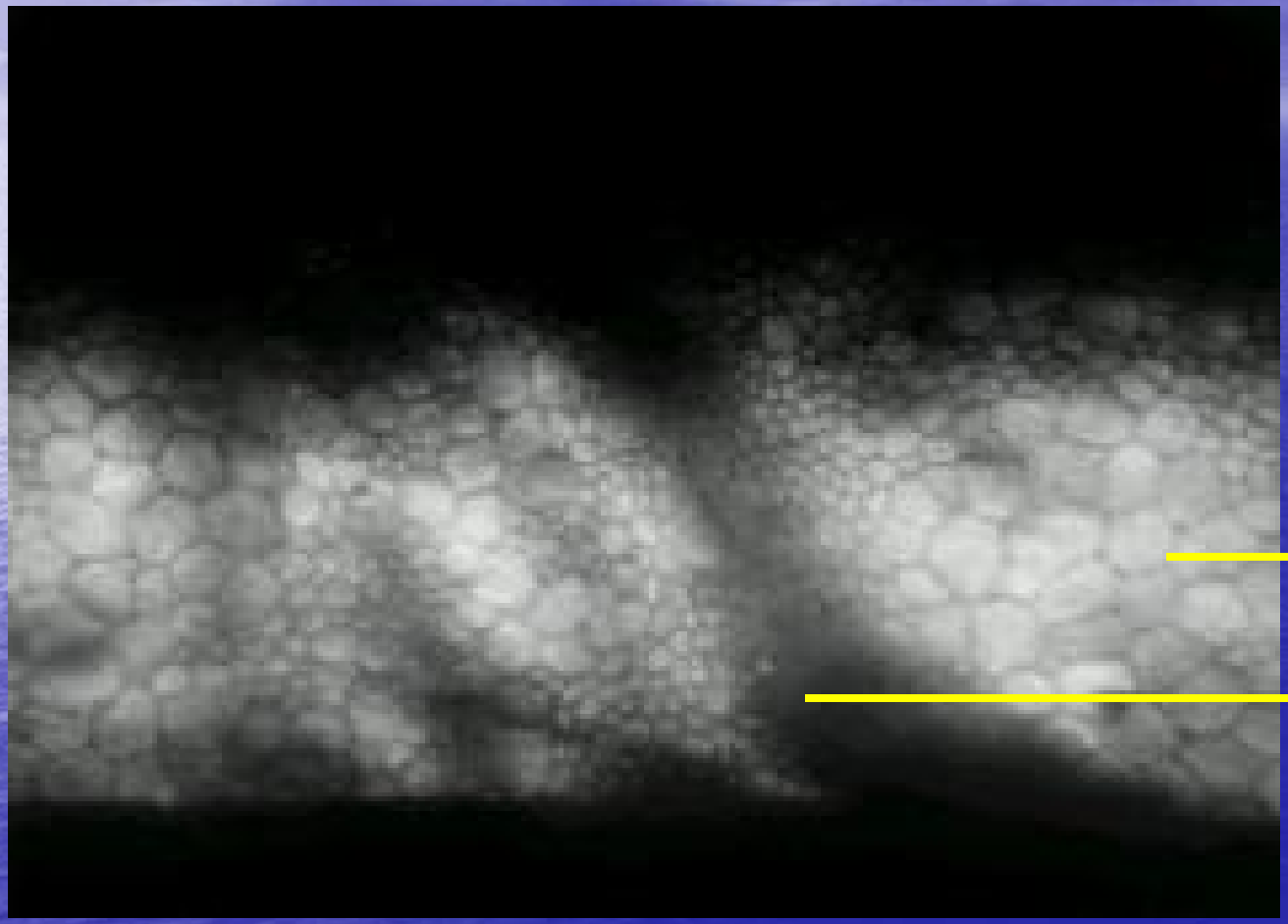
Morphologically, endothelium is a single layer of hexagonal cells of uniform size.



Endo Cell Image



Donor Cornea Specular Microscopy



Parameters obtained by the cell analysis

- Cell density (CD)
- Coefficient of variation of cell area (CV)
- Percentage of hexagonal cells (6A)

Cell Density (CD)

- Inversion of cell area i.e. 1,000,000 divided by average cell area (1mm2 =1,000,000um2)
- Eg. Average cell area = 346 um2 then
- CD = 1,000,000/346 = 2890 cells /mm2

Cell Densities

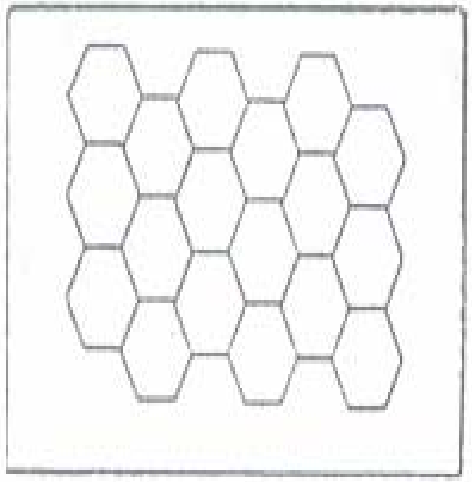
- **Excellent** : cell density of >3000 cells/mm2
- **Very good** : cell density of 2500 - 3000 cells / mm2
- **Good** : cell density of 2000-2500 cells/mm2
- **Fair** : cell density of 1500-2000 cells/mm2
- **Poor** : cell density of 1200-1500 cells/mm2
- **NSFS**

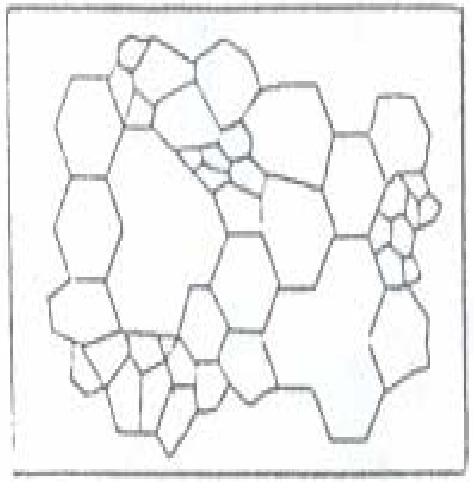
Coefficient of variation of cell area (CV)

- Normal range : 0.20 – 0.30.
- Higher the CV (wide variety in cell sizes) higher polymegathism
- Lower the CV more stable the cornea

Percentage of Hexagonal Cells (6A)

- Represents the shape factor of cells (Pleomorphism)
- Irregular cell shapes in traumatized endothelium elongation/triangle/octagon /square
- 6A is calculated as number of hexagonal cells/number of cells entered
- Higher the 6A – more stable the cornea
- >50% hexagonality is desirable





CD = 2500 cells/mm^2

CV = 0.20

6A = 100%

CD = 2500 cells/mm^2

CV = 0.79

6A = 25%

Donor Tissue

- Keratoplasty - Penetrating/Lamellar
- Optical/Therapeutic/Tectonic
- Research
- Surgical training

Eye Banking - A Model for India

One Eye Bank per 20 million population

5 Training Centers

50 Eye Banks

4000 corneas per eye bank per year

40 Eye Collection Centers per eye bank(2000)

10 HCRP's per eye bank.(500)

1000 trained Cornea Specialists

ARAVIND EYE CARE SYSTEM

Aravind Rotary International Eye Bank

Established in 1998

Member of the IFETB and EBAI

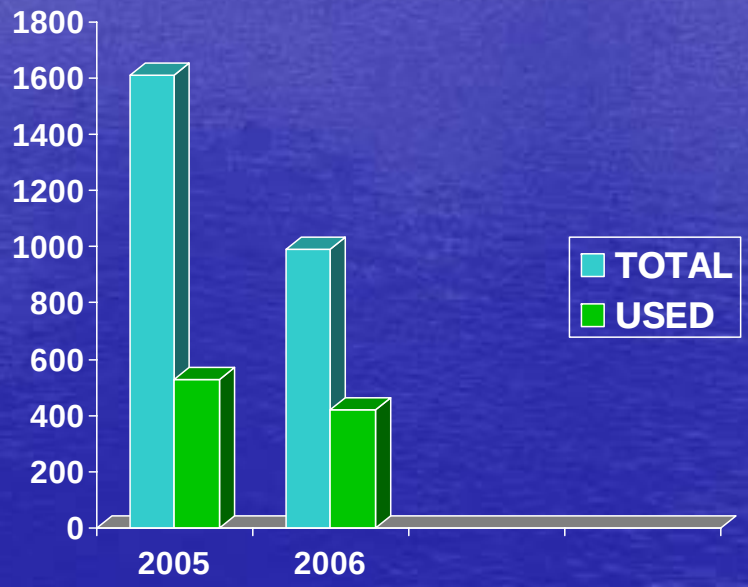
31 Collection Centres

2005 Tissues Collected – 1610

Tissues utilised for Keratoplasty – 530

2006 Tissues collected – 990

2006 Tissues utilised - 422



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Thank You
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