

CHAPTER 2

CORNEAL TRANSPLANTATION

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2.0 INTRODUCTION

Corneal transplantation surgery allows restoration of vision in patients with corneal blindness. Corneal transplantation in Malaysia dates back to the 1970's. Today it is performed by ophthalmologists both in the government and private sectors with each centre contributing data towards the National Transplant Registry.

The National Transplant Registry (NTR) was established in December 2003. The corneal transplant section of the NTR is a systematic centralised data collection of all corneal transplantations performed in the country.

A total of 46 centres registered and agreed to provide information on retrospective and prospective corneal transplant activities. A total of 75 contributing surgeons participated in the NTR – Corneal Transplant section. Participation was on a voluntary basis.

Retrospective data (from 1998 to 2003) on corneal transplant activities were collected to identify the trend of corneal transplant surgery in the recent past. **Prospective data** (from the year 2004) on corneal transplant activities involved gathering information on all cornea transplants performed in Malaysia on two forms. The first form is the i) **Corneal Transplant Notification Form (Form N-cds)** which is completed at the time of surgery and gathers information on the recipient, operative procedure and the donor. The second form is the ii) **Corneal Transplant Outcome Form (Form O-cds)** which is completed at the end of 12 months and annually thereafter. Follow-up only ceases upon failure of graft, death or loss to follow-up of the patient.

The Corneal section of the NTR will be discussed under 5 sections.

Section 2.1 and Section 2.2 covers notification data on corneal transplantation over 9 years from 1998 to 2007. Effort was made to ensure that all cases of corneal transplantation were reported. To the best of our knowledge, this report provides information on all corneal transplants performed in the country.

Section 2.3 covers prospective notification data on corneal transplantation performed (from 2004 onwards)

Section 2.4 covers prospective outcome data on corneal transplantation performed (from 2004 onwards).

Section 2.5 covers prospective outcome data on corneal transplantation complications (from 2004 onwards).

2.1 CORNEAL TRANSPLANT ACTIVITIES AND TRENDS (1998 – 2008)

The number of cornea transplants performed between 1998 and 2008 showed an increasing trend from 119 in 1998 to 230 in 2008. The highest number of corneal transplantation performed was in the year 2008 (Table 2.1.1).

Penetrating keratoplasty was the most frequent type of cornea transplant surgery and was performed in 91% of cases (Table 2.1.2).

Table 2.1.1: Number of Corneal Transplantation and Transplant Rate per million population (pmp), 1998-2008

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
No. of new transplants	119	122	126	221	203	165	184	192	177	196	230
New transplant rate, pmp	5	5	5	9	8	7	7	7	7	7	8

Table 2.1.2: Types of Corneal Transplant, 1998-2008

Surgery type	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)		2003 (N=165)		2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=1935)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Penetrating Keratoplasty	114	96	116	95	120	95	207	94	196	97	156	95	165	90	173	90	153	86	175	89	188	82	1763	91
Lamellar Keratoplasty	1	1	5	4	4	3	14	6	5	2	8	5	10	5	13	7	16	9	7	4	21	9	104	5
Patch Graft for Cornea	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	2	5	3	10	5	12	5	32	2
Patch Graft for Sclera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	1	5	0
Cornea Scleral Keratoplasty	0	0	1	1	0	0	0	0	0	0	1	1	7	4	2	1	2	1	3	2	4	2	20	1
Endothelial keratoplasty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	3	0
No data	4	3	0	0	2	2	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	8	0

2.2 RECIPIENTS' CHARACTERISTICS

There was a preponderance of male recipients each year and this ranged from 59% to 69% (Table 2.2.1). Ethnic Chinese (38%) were the predominant race undergoing cornea transplant surgery followed by Malays (33%) and Indians (22%) (Table 2.2.2). The mean age was 45 years (SD 21) with a range from as young as 2 months of age to as old as 102 years (Table 2.2.3).

The commonest primary indication for surgery was keratoconus (16%) followed by cornea scar (14%), pseudophakic bullous keratopathy (14%), other non-pseudophakic bullous keratopathy (11%) and microbial keratitis (10%) (Table 2.2.4). There may be one or more indications for corneal transplant surgery. The most frequent indication was *optical*, followed by *tectonic* and/or *therapeutic* indications (Table 2.2.5).

Table 2.2.1: Gender Distribution, 1998-2008

Year	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)		2003 (N=165)		2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=1935)		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Male	78	66	80	66	81	64	142	64	122	60	114	69	112	61	115	60	118	67	129	66	143	62	1234	64	
Female	41	34	42	34	45	36	79	36	81	40	51	31	72	39	77	40	59	33	67	34	87	38	701	36	
No data	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.2.2: Ethnic Distribution, 1998-2008

Year	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)		2003 (N=165)		2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=1935)		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Ethnic group	28	24	34	28	41	33	70	32	74	36	52	32	66	36	62	32	60	34	64	33	79	34	630	33	
Malay	47	39	46	38	50	40	92	42	83	41	67	41	58	32	73	38	59	33	70	36	83	36	728	38	
Chinese	36	30	35	29	28	22	49	22	35	17	34	21	43	23	41	21	40	23	38	19	41	18	420	22	
Indian	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	3	2	2	2	2	1	9	0	
Bumiputra Sabah	0	0	0	0	0	0	1	0	0	0	0	0	4	2	5	3	4	2	4	2	7	3	25	1	
Bumiputra Sarawak	8	7	7	6	7	6	9	4	11	5	12	7	12	7	10	5	11	6	18	9	18	8	123	6	
Others																									

Table 2.2.3: Age Distribution of Corneal Transplant Recipient Patients, 1998-2008

Year	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)		2003 (N=165)		2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=1935)		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
0-9	4	3	5	4	6	5	8	4	9	4	6	4	6	3	8	4	7	4	4	4	2	5	2	68	4
10-19	13	11	17	14	9	7	29	13	16	8	21	13	15	8	14	7	23	13	13	7	20	9	190	10	
20-39	28	24	34	28	34	27	49	22	53	26	36	21	55	30	59	31	53	30	48	24	68	30	517	27	
40-59	38	32	32	26	40	32	61	28	57	28	51	31	52	28	45	23	41	23	66	34	69	30	552	28	
≥60	36	30	34	28	37	29	74	33	68	34	51	31	56	31	66	35	53	30	65	33	68	30	608	31	
Mean	45		43		44		45		46		45		45		46		44		47		46		46		45
SD	21		22		20		21		21		21		21		21		22		21		21		20		21
Median	45		43		45		50		46		46		44		49		43		49		48		48		46
Minimum	4 months		5		2 months		5 months		1		5 months		2 months		2 months		2 months		2 months		3		1		2 months
Maximum	82		92		86		85		86		84		86		84		96		102		102		87		102

Table 2.2.4: Primary Diagnosis, 1998-2008

Year	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)		2003 (N=165)		2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=1935)		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Primary Diagnosis	24	20	24	20	15	12	38	17	32	16	18	11	34	18	34	18	33	19	28	14	37	16	317	16	
Keratocoma	33	28	25	20	21	17	34	15	28	14	21	13	26	14	20	10	18	10	25	13	29	13	280	14	
Comeal scar	11	9	11	9	19	15	30	14	31	15	21	13	18	10	13	7	11	6	14	7	18	8	197	10	
Microbial keratitis	1	1	6	5	1	1	6	3	4	2	4	2	17	9	20	10	7	4	10	5	12	5	88	5	
Microbial keratitis+Cornea perforation	6	5	7	6	8	6	12	5	12	6	27	16	13	7	18	9	20	11	21	11	18	8	162	8	
Comeal perforation (non microbial)	10	8	16	13	17	13	23	10	15	7	19	12	19	10	35	18	30	17	36	18	45	20	265	14	
Pseudophakic Bullous keratopathy	14	12	4	3	19	15	37	17	47	23	25	15	16	9	14	7	11	6	8	4	14	6	209	11	
Other (non pseudophakic) bullous keratopathy	14	12	12	10	13	10	17	8	15	7	14	8	12	7	14	7	10	6	23	12	16	7	160	8	
Failed previous graft	5	4	6	5	5	4	12	5	9	4	7	4	8	4	6	3	10	6	12	6	10	4	90	5	
Comeal dystrophy	1	1	1	1	1	1	1	0	0	0	1	1	8	4	4	2	1	1	1	1	5	2	24	1	
Congenital opacity	3	3	8	7	7	6	15	7	14	7	10	6	34	18	34	18	36	20	39	20	48	21	248	13	
Others	0	0	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	8	0	
No data																									

Table 2.2.5: Indications of Corneal Transplant, 2004-2008

Indication of transplant	2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=979)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Optical	120	65	135	70	124	70	139	71	154	67	672	69
Tectonic	26	14	23	12	20	11	17	9	25	11	111	11
Therapeutic	27	15	19	10	17	10	24	12	24	10	111	11
Tectonic+Therapeutic	9	5	9	5	4	2	8	4	6	3	36	4
Optical+Tectonic	1	1	1	1	1	1	0	0	1	0	4	0
Optical+Tectonic+Therapeutic	0	0	1	1	0	0	1	1	1	0	3	0
Optical+Therapeutic	0	0	0	0	5	3	6	3	7	3	18	2
Optical+Others	0	0	0	0	1	1	0	0	1	0	2	0
Therapeutic+Others	0	0	0	0	0	0	0	0	1	0	1	0
Others	1	1	4	2	4	2	1	1	9	4	19	2
No data	0	0	0	0	1	1	0	0	1	0	2	0

2.3 TRANSPLANT DATA, 2004-2008

2.3.1 Recipient Data

Regrafts were performed in 13% of cases (Table 2.3.1.1). Ocular co-morbidity was noted in 52% of the patients and corneal vascularisation was the most frequently encountered (Table 2.3.1.2).

From the data available 59% of the cases were legally blind (vision worse than 3/60) prior to corneal transplantation (Table 2.3.1.3).

Table 2.3.1.1: No of Previous Grafts in Grafted Eye, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0	123	89	171	89	160	90	161	82	201	87	816	87
1	11	8	15	8	15	8	30	15	21	10	92	10
2	3	2	2	1	1	1	4	2	5	2	15	2
3	0	0	1	1	1	1	0	0	0	0	2	0
4	1	1	0	0	0	0	1	1	0	0	2	0
Not available	0	0	0	0	0	0	0	0	1	0	1	0
Missing	0	0	3	2	0	0	0	0	2	1	5	1

Table 2.3.1.2: Ocular Co-morbidity, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Ocular co-morbidity												
Any ocular co-morbidity (a to d below)	88	64	103	54	82	46	89	45	126	55	488	52
a) Superficial corneal vascularisation	44	50	48	47	44	54	53	60	70	56	259	53
b) Deep corneal vascularisation	42	48	39	38	22	27	28	31	31	25	162	33
c) History of glaucoma	29	33	36	35	36	44	39	44	68	54	208	43
d) Current ocular inflammation	41	47	50	49	41	50	39	44	66	52	237	49

*Patient might have multiple ocular co-morbidities

Table 2.3.1.3: Pre-operative Vision, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
6/6	3	2	0	0	1	1	1	1	1	0	6	1
6/9	1	1	1	1	1	1	2	1	6	3	11	1
6/12	0	0	2	1	3	2	0	0	2	1	7	1
6/18	0	0	1	1	0	0	2	1	1	0	4	0
6/24	3	2	5	3	4	2	2	1	3	1	17	2
6/36	4	3	6	3	5	3	3	2	5	2	23	2
6/60	7	5	16	8	17	10	11	6	14	6	65	7
5/60	1	1	0	0	0	0	0	0	0	0	1	0
4/60	3	2	1	1	2	1	2	1	0	0	8	1
3/60	2	1	2	1	1	1	4	2	5	2	14	2
2/60	1	1	2	1	4	2	1	1	2	1	10	1
1/60	4	3	9	5	7	4	2	1	1	0	23	2
CF	47	34	47	24	45	25	43	22	40	17	222	24
HM	47	34	46	24	37	21	48	24	47	20	225	24
PL	13	9	15	8	12	7	17	9	20	9	77	8
NPL	2	1	1	1	0	0	1	1	0	0	4	0
No data	0	0	38	20	38	21	57	29	83	36	216	23

2.3.2 Donor details

Eye Banks in the United States of America (USA) were the most frequent source of the corneal tissues (Table 2.3.2.1). The majority of donors were elderly patients with a median age of 57 years (Table 2.3.2.2). Optisol GS was the commonest corneal tissue storage medium used at 76% (Table 2.3.2.3). The major cause of death of the donors were related to the cardiac or circulatory system (31%) followed by malignancy (15%) (Table 2.3.2.4).

Table 2.3.2.1: Source of Donor Cornea Tissue, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Source of donor												
Local	20	14	19	10	36	20	31	16	41	18	147	16
USA	95	69	133	69	98	56	114	58	150	65	590	64
Sri Lanka	22	16	38	20	41	23	51	26	36	16	188	20
Others	0	0	0	0	2	1	0	0	2	1	4	0
No data	1	1	2	1	0	0	0	0	1	0	4	0
If Local, ethnic group:												
Malay	0	0	4	21	1	3	5	16	0	0	10	7
Chinese	14	70	8	42	12	33	16	52	22	54	72	49
Indian	5	25	7	37	23	64	4	13	9	22	48	33
Others	0	0	0	0	0	0	4	13	6	15	10	7
No data	1	5	0	0	0	0	2	6	4	10	7	5

* In the year 2004 there were a total of 184 corneal transplants performed but complete data set was only received for 138 patients

Figure 2.3.2.1: Source of Donor Corneal Tissue, 2004-2008

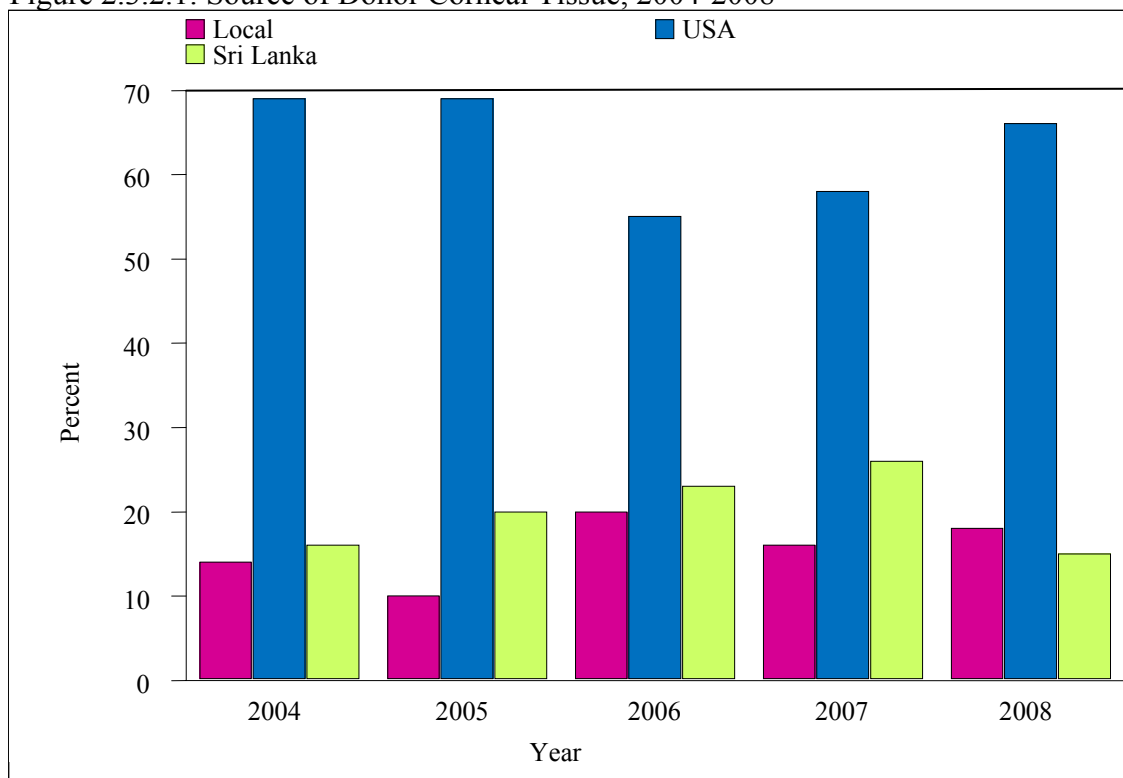


Table 2.3.2.2: Donor Age Distribution, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	2	1	3	2	2	1	2	1	7	3	16	2
10-19	6	4	4	2	9	5	5	3	7	3	31	3
20-39	11	8	7	4	11	6	13	7	19	8	61	7
40-59	52	38	89	46	81	46	83	42	79	34	384	41
≥60	67	49	89	46	74	42	93	47	118	51	441	47
Mean	56		58		56		57		56		57	
SD	15		14		16		14		17		15	
Median	59		58		56		59		60		59	
Minimum	8		3		6		4		1		1	
Maximum	78		79		78		78		76		79	

Table 2.3.2.3: Preservation Media, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Optisol GS	110	80	147	76	129	72	134	68	189	82	709	76
MK Medium	22	16	37	19	40	23	51	26	34	15	184	19
Moist Chamber	4	3	3	2	7	4	8	4	4	2	26	3
Others	0	0	1	1	0	0	3	2	1	0	5	1
No data	2	1	4	2	1	1	0	0	2	1	9	1

*Others (specify) Eusol-C

Figure 2.3.2.3: Preservation Media, 2004-2008

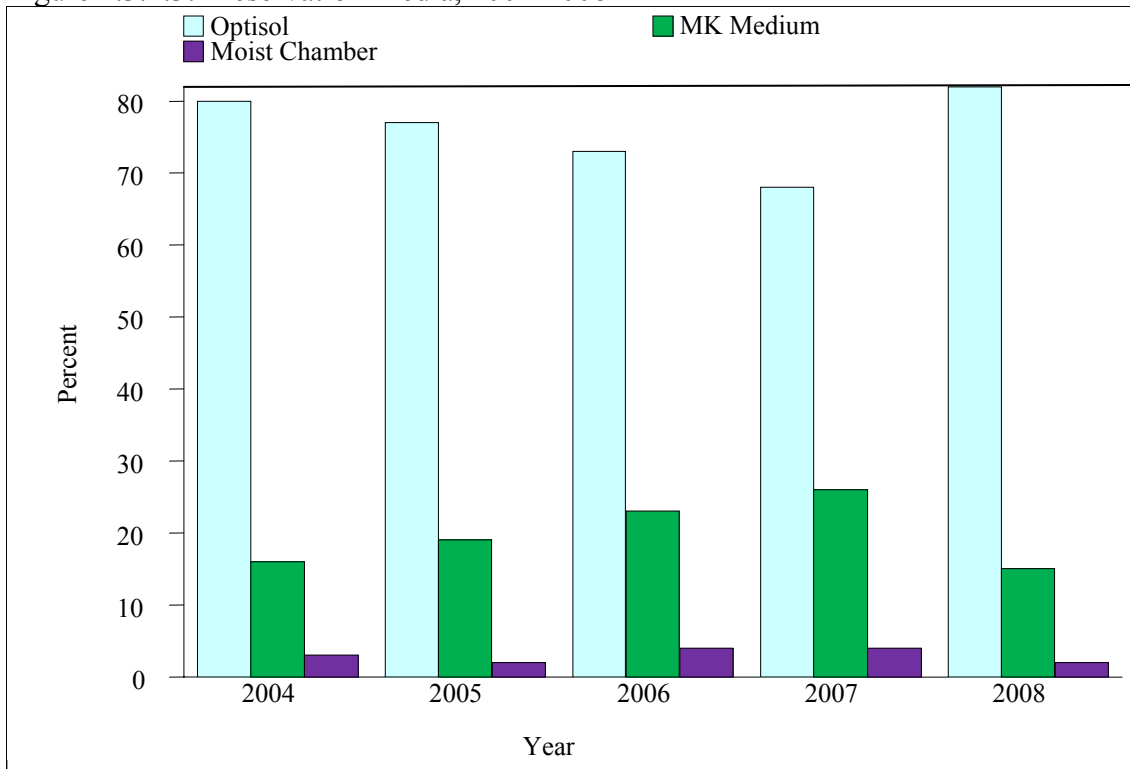


Table 2.3.2.4: Cause of Death in Corneal Donors, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cardiac / Circulatory System	47	34	49	26	59	33	75	38	61	27	291	31
Cerebrovascular System	17	12	25	13	11	6	23	12	35	15	111	12
Malignancy	19	14	31	16	25	14	26	13	41	18	142	15
Trauma / Accident	20	15	13	7	19	11	24	12	21	9	97	10
Respiratory System	15	11	8	4	8	5	13	7	10	4	54	6
Others	17	12	21	11	27	15	32	16	58	25	155	17
No data	3	2	45	23	28	16	3	2	4	2	83	9

2.3.3 Transplant Practices

Penetrating Keratoplasty (PK) was the commonest type of surgery performed (86%) (Table 2.3.3.1). Corneal transplantation was performed in combination with other surgical procedures in 19% of cases. Cataract extraction, with or without intraocular lens implantation (IOL), was the commonest combined procedure (Table 2.3.3.2).

The recipient graft size ranged from 2mm to 10mm, with the median recipient cornea graft size being 7.5mm.(Table 2.3.3.3). The majority of cases had the donor tissue oversized by 0.5mm (Table 2.3.3.4). The commonest suturing technique was interrupted sutures (Table 2.3.3.5).

Table 2.3.3.1: Types of Surgeries, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Penetrating Keratoplasty	120	87	173	90	153	86	175	89	188	82	809	87
Lamellar Keratoplasty	10	7	13	7	16	9	7	4	21	9	67	7
Patch Graft for Corneal	2	1	3	2	5	3	10	5	12	5	32	3
Patch Graft for Scleral	0	0	1	1	1	1	1	1	2	1	5	1
Cornea Scleral Keratoplasty	6	4	2	1	2	1	3	2	4	2	17	2
Endothelial keratoplasty	0	0	0	0	0	0	0	0	3	1	3	0

* In the year 2004 there were a total of 184 corneal transplants performed but complete data set was only received for 138 patients

Table 2.3.3.2: Types of Combined Surgeries, 2004-2008

Combined surgeries	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
No. of patients with corneal transplant surgery combined with another surgical procedure	31	22	27	14	41	23	35	18	46	20	180	19
(a) Glaucoma surgery	2	6	3	11	1	2	0	0	3	7	9	5
(b) Cataract Extraction	16	52	13	48	21	51	13	37	17	37	80	44
(c) IOL	14	45	10	37	24	59	19	54	23	50	90	50
(d) Cataract extraction and IOL	10	32	8	30	15	37	10	29	16	35	59	33
(e) Retinal Surgery ± Internal Tamponade	1	3	1	4	2	5	4	11	10	22	18	10
(f) Anterior vitrectomy	9	29	3	11	4	10	10	29	6	13	32	18
(g) Others	5	16	8	30	8	20	16	46	14	30	51	28

*Patients may have more than one combined surgery

Table 2.3.3.3: Recipient Cornea Trephine Size, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2	1	1	1	1	2	1	1	1	0	0	5	1
3	0	0	1	1	2	1	1	1	1	0	5	1
4	1	1	2	1	1	1	5	3	2	1	11	1
5	0	0	0	0	0	0	1	1	1	0	2	0
5.5	1	1	0	0	0	0	0	0	0	0	1	0
6	3	2	0	0	5	3	4	2	4	2	16	2
6.25	0	0	1	1	0	0	0	0	0	0	1	0
6.5	2	1	5	3	4	2	8	4	7	3	26	3
6.7	0	0	0	0	0	0	0	0	0	0	0	0
6.75	1	1	3	2	2	1	1	1	1	0	8	1
7	25	18	36	19	25	14	29	15	37	16	152	16
7.2	0	0	0	0	0	0	0	0	0	0	0	0
7.25	10	7	10	5	14	8	5	3	5	2	44	5
7.5	36	26	18	9	26	15	37	19	50	22	167	18
7.75	10	7	11	6	6	3	12	6	14	6	53	6
8	19	14	7	4	13	7	19	10	26	11	84	9
8.15	0	0	0	0	0	0	0	0	0	0	0	0
8.25	4	3	4	2	5	3	4	2	4	2	21	2
8.5	6	4	6	3	2	1	11	6	10	4	35	4
8.75	0	0	1	1	0	0	0	0	0	0	1	0
8.8	0	0	0	0	0	0	0	0	0	0	0	0
9	8	6	3	2	1	1	4	2	3	1	19	2
9.5	0	0	2	1	0	0	0	0	1	0	3	0
10	1	1	0	0	0	0	0	0	2	1	3	0
11	0	0	0	0	0	0	0	0	1	0	1	0
12	0	0	0	0	0	0	0	0	1	0	1	0
No data	10	7	81	42	69	39	54	28	57	25	271	29
Mean	7.5		7.3		7.2		7.3		7.5		7.4	
SD	0.9		1		1.1		1.1		0.9		1	
Median	7.5		7.3		7.3		7.5		7.5		7.5	
Minimum	2		2		2		2		3		2	
Maximum	10		9.5		9		9		12		12	

Table 2.3.3.4: Difference in Trephined Sizes of Recipient and Donor Corneas, 2004-2008

	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Difference in Graft size, mm												
Same Size	9	7	8	4	8	5	12	6	19	8	56	6
0.2	0	0	0	0	0	0	0	0	2	1	2	0
0.25	29	21	19	10	30	17	27	14	27	12	132	14
0.5	87	63	84	44	67	38	95	48	116	50	449	48
0.55	0	0	0	0	0	0	0	0	1	0	1	0
0.6	0	0	0	0	0	0	0	0	1	0	1	0
0.75	1	1	0	0	1	1	1	1	2	1	5	1
1	1	1	0	0	1	1	4	2	2	1	8	1
1.5	0	0	0	0	0	0	0	0	1	0	1	0
2	1	1	0	0	0	0	0	0	0	0	1	0
Not Available	10	7	81	42	70	40	57	29	59	26	277	30

Table 2.3.3.5: Suture Technique, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Suture Technique												
Interrupted only	132	96	139	72	124	70	138	70	170	74	703	75
Continuous only	0	0	0	0	5	3	1	1	6	3	12	1
Combined	6	4	18	10	18	10	12	6	10	4	64	7
No data	0	0	35	18	30	17	45	23	44	19	154	17

2.4 CORNEAL TRANSPLANT OUTCOME 2004-2008

Table 2.4.1: Stock and Flow - Graft Status (Whole Database)

		Optical		Non optical		Total	
		No.	%	No.	%	No.	%
Number registered		699	71	280	29	979	100
Number followed	Total	312		159		471	
	1 year	197	63	126	79	323	69
	2 year	67	22	23	14	90	19
	3 year	41	13	6	4	47	10
	4 year	7	2	4	3	11	2
Graft status	Total	312		159		471	
	-Surviving graft	249	80	87	55	336	71
	-Failed graft	63	20	72	45	135	29
Recipient status	Total	699		280		979	
	-Recipient with complete follow up	143	20.46	103	36.78	246	25.13
	-Recipient deaths	3	0.43	1	0.36	4	0.41
	-Recipient loss - followed	156	22.32	54	19.29	210	21.45
	-Recipient loss - not followed	234	33.47	58	20.71	292	29.82
	-Graft not yet followed (Transplant duration less than 1 year)	163	23.32	64	22.86	227	23.19

2.4.2 Outcome – Graft Survival 2004-2008

Graft survival for both optical and non-optical indications at 12 months was 77.3% but this declined to 63.2% at 36 months (Table 2.4.2.1). The cases were grouped into two groups based on the indication for surgery – i) Optical and ii) Non-Optical. Graft survival was 87% at 12 months in the optical group and 58% in the non-optical group. This declined to 71% at 36 months in the optical group and 48% in the non-optical group (Table 2.4.2.2). Gender did not influence graft survival (Table 2.4.2.3). Poorer graft survival was observed in children less than 10 years of age (Table 2.4.2.4). Primary graft failure was the commonest cause of graft failure. Graft failure as a result of infection was present in 26 patients (19%), the indication for surgery was non optical in 20 patients with 12 of these patients having infective keratitis with or without perforation as the diagnosis at the time of notification (Table 2.4.2.5).

Table 2.4.2.1: Graft Survival, 2004-2008

Interval (months)	No.	% success	SE
0	471	100	-
12	366	77.3	2
24	148	69.9	2
36	58	63.2	3
48	11	50.7	7

Figure 2.4.2.1: Graft Survival, 2004-2008

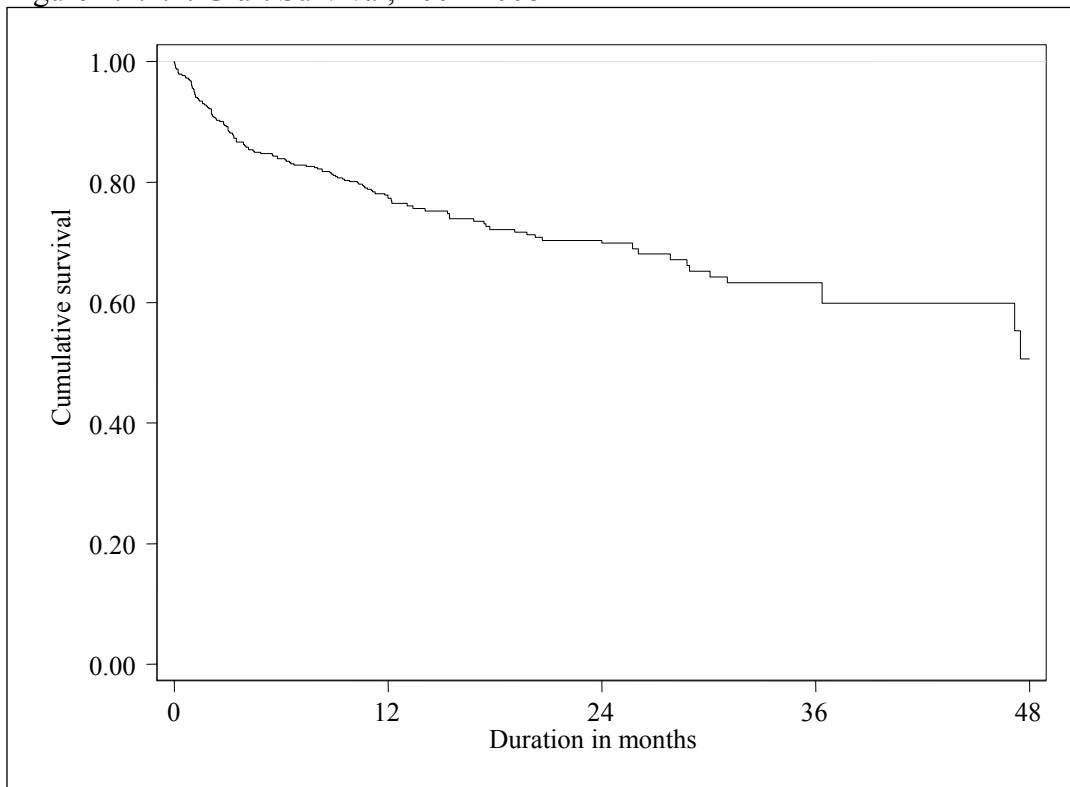


Table 2.4.2.2: Graft Survival by Optical and Non-optical Indication, 2004-2008

Interval (months)	Optical			Non-Optical		
	No.	% success	SE	No.	% success	SE
0	312	100	-	159	100	-
12	271	86.8	2	95	58.5	4
24	115	79.1	3	33	51.9	4
36	48	71.2	4	10	47.8	6
48	7	51.4	10	4	47.8	6

Figure 2.4.2.2: Graft Survival by Optical and Non-optical Indication, 2004-2008

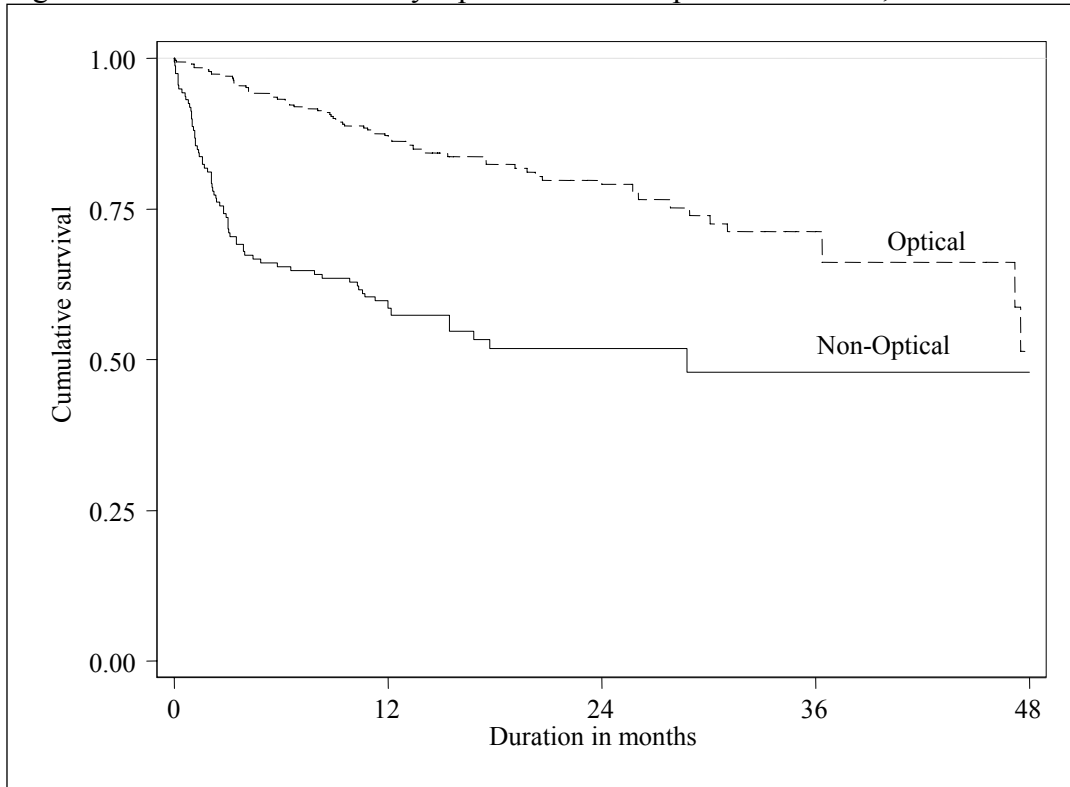


Table 2.4.2.3: Graft Survival by Gender, 2004-2008

Interval (months)	Male			Female		
	No.	% success	SE	No.	% success	SE
0	298	100	-	173	100	-
12	228	76.2	2	138	79.1	3
24	85	69.0	3	63	71.4	4
36	36	61.5	4	22	66.3	5
48	9	56.8	6	2	33.2	17

Figure 2.4.2.3: Graft Survival by Gender, 2004-2008

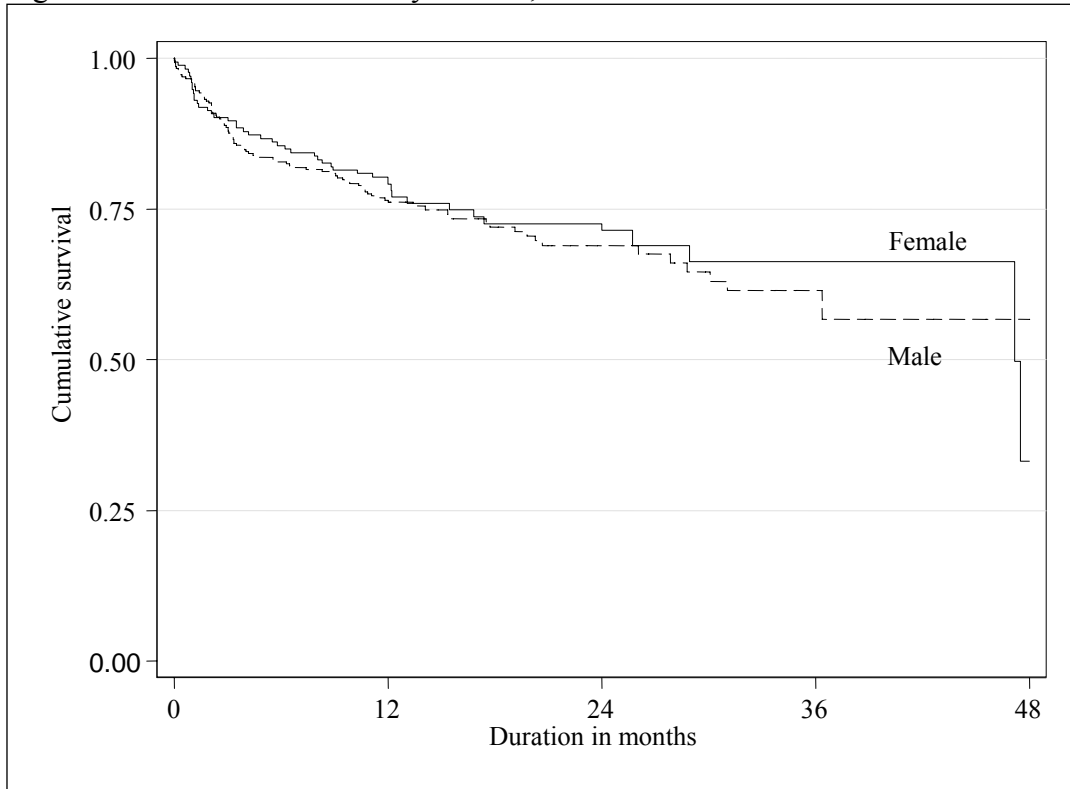


Table 2.4.2.4 Graft Survival by Age, 2004-2008

Interval (months)	0-9			10-19		
	No.	% success	SE	No.	% success	SE
0	9	100	-	21	100	-
12	8	88.9	10	18	85.7	8
24	3	44.4	23	14	85.7	8
36	3	44.4	23	10	85.7	8
48	1	44.4	23	1	.	.
Interval (months)	20-39			≥40		
	No.	% success	SE	No.	% success	SE
0	28	100	-	413	100	-
12	22	78.6	8	318	76.5	2
24	5	78.6	8	126	69.0	3
36	3	78.6	8	44	60.9	4
48	2	78.6	8	9	46.5	8

Figure 2.4.2.4 Graft Survival by Age, 2004-2008

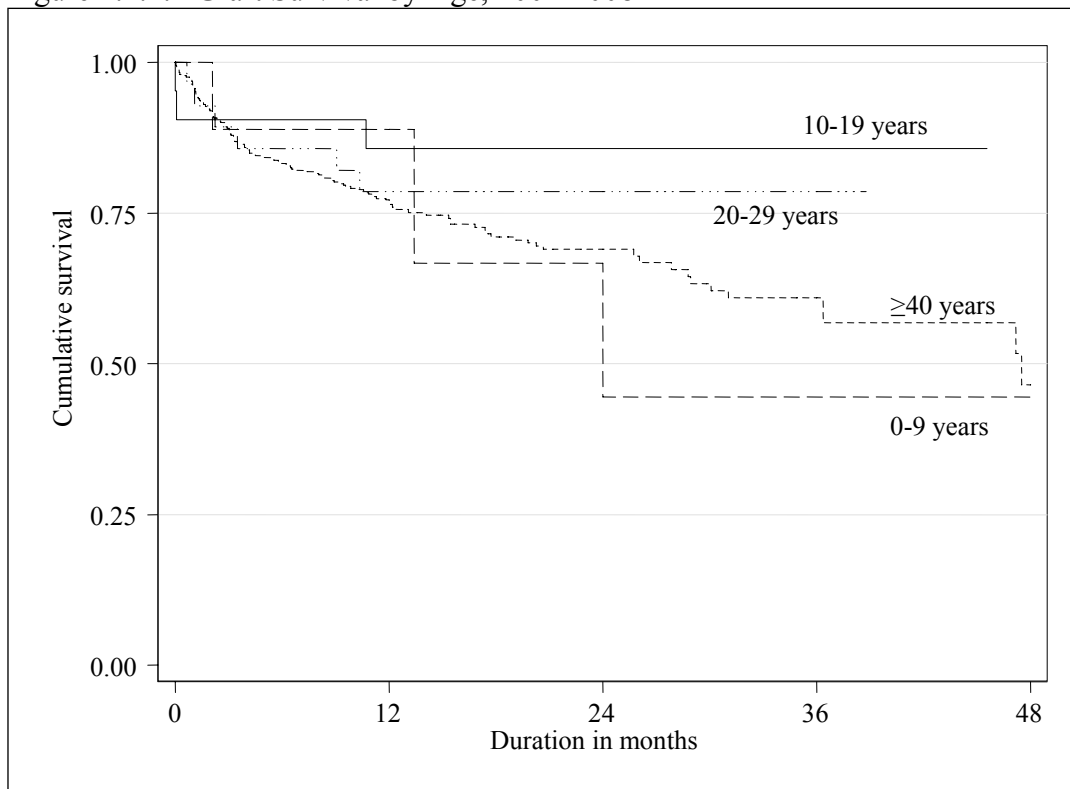


Table 2.4.2.5: Causes of Graft Failure

		Total (N=135)	
		No.	%
Graft Failure		135	29
Cause of Failure	Primary graft failure or Primary Endothelial decompensation	34	25
	Recurrence of primary disease	12	9
	Late Endothelial decompensation	23	17
	Glaucoma	28	21
	Infection	26	19
	Graft rejection	28	21
	Others	31	23
	No data	7	5

*Each patient may have more than one cause of graft failure

77 patients had 1 cause

34 patients had 2 causes

3 patients had 3 causes

1 patient had 4 causes

2.4.3 Visual Outcome

Visual outcome of corneal transplants was analysed in cases where post corneal transplant unaided vision was available. Data on post corneal transplant best corrected vision was only available in a limited number of the cases (Table 2.4.3.1). Forty nine percent of optical and 44% of non-optical cases had improved unaided vision after surgery (Table 2.4.3.2). Majority of surviving optical grafts had an unaided vision of 6/24-6/60, whereas the majority in the non optical group had an unaided vision of less than 6/60 (Table2.4.3.3) (Figure 2.4.3.3).

Table 2.4.3.1: Availability of Data on Post Corneal Transplant Unaided Vision

	Unaided Vision (N =979)	
	No.	%
Data available	414	42
Lost to follow up	524	54
No data	41	4

Table 2.4.3.2: Unaided Visual Outcome After Cornea Transplant Surgery

Reason for graft	Optical (n=283)		Non-optical (n=131)	
	No.	%	No.	%
Vision better	140	49	57	44
Vision same	52	18	37	28
Vision worse	36	13	26	20
Not known*	55	20	11	8

*Either pre op vision and/or post op vision is not available

Figure 2.4.3.2: Unaided Visual Outcome After Corneal Transplant Surgery

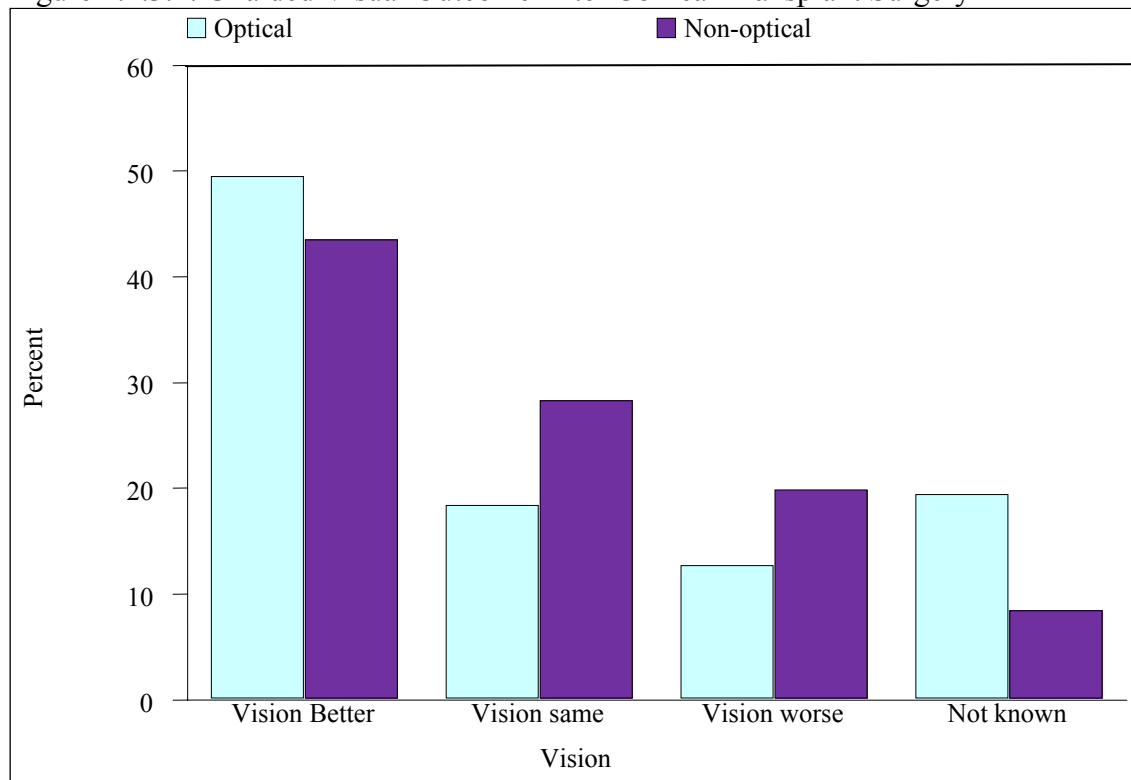
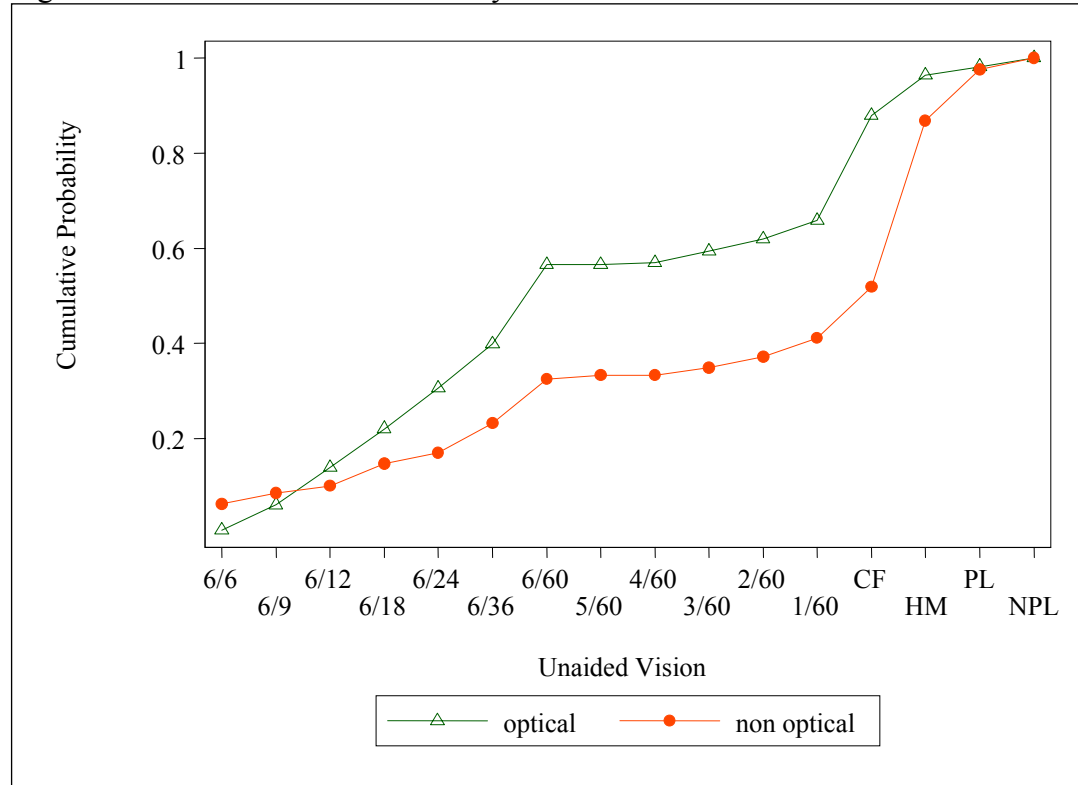


Table 2.4.3.3: Unaided Vision for Optical and Non Optical Cases

Vision	Optical				Non Optical			
	Graft Survival (227)		Graft Failure (56)		Graft Survival (70)		Graft Failure (61)	
	No.	%	No.	%	No.	%	No.	%
6/18 or better	62	27	0	0	17	24	2	3
6/24 – 6/60	94	41	3	5	20	29	3	5
Less than 6/60	69	30	53	95	31	44	56	92
Data not available	2	1	0	0	2	3	0	0

Figure 2.4.3.3: Cumulative Probability for Unaided Vision in Grafts



2.5 POST CORNEAL TRANSPLANT COMPLICATIONS

The common complications observed at one year were post-keratoplasty glaucoma, graft vascularisation, epithelial problems and graft rejection. Rejection was seen in 11% who were on follow-up (Table 2.5.1). Endothelial rejection is the commonest graft rejection (Table 2.5.2).

Table 2.5.1: Post Transplant Complications

		One year outcome (N=225)		2 nd year outcome (N=82)		3 rd year outcome (N=46)		4 th year outcome (N=13)		Total (N=366)	
		No.	%	No.	%	No.	%	No.	%	No.	%
Any complications		147	70	40	19	20	9	4	2	211	62
Complication	Epithelial Problem	37	17	7	9	3	7	2	18	49	14
	Wound Dehiscence	2	1	0	0	0	0	0	0	2	1
	Suture infiltration / abscess	22	10	4	5	2	5	0	0	28	8
	Endophthalmitis	1	0	1	1	0	0	0	0	2	1
	Microbial keratitis	25	12	5	7	2	5	0	0	32	9
	Vascularisation	44	21	8	11	5	12	2	18	59	17
	Post-keratoplasty glaucoma	59	28	21	28	13	30	2	18	95	28
	Graft Rejection	33	15	6	8	0	0	0	0	39	11
No data	67	31	34	46	23	53	7	64	131	38	

* Each patient may have more than one complication

Table 2.5.2: Post Transplant Graft Rejection Types

		One year outcome (N=225)		2 nd year outcome (N=82)		3 rd year outcome (N=46)		4 th year outcome (N=13)		Total (N = 366)	
		No.	%	No.	%	No.	%	No.	%	No.	%
Graft Rejection		33		6		0		0		39	
Types	Epithelial	11	33	2	33	0	0	0	0	13	33
	Stromal	11	33	0	0	0	0	0	0	11	28
	Endothelial	12	36	3	50	0	0	0	0	15	38
	No data	5	15	1	17	0	0	0	0	6	15

* Each patient may have more than one type of rejection