

**SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL
SCIENCES AND TECHNOLOGY
THIRUVANANTHAPURAM, KERALA**



**VISUAL FIELD DEFECTS AND THEIR IMPACT ON
QUALITY OF LIFE AFTER ANTERIOR
TEMPORAL LOBECTOMY**

**Dissertation submitted in partial fulfilment of the rules and regulations for
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by

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DECLARATION

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FORWARDED:

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SUMMARY

Purpose: This prospective study aimed to quantify visual field defects (VFDs) along with other defects in ophthalmic functions after anterior temporal lobectomy (ATL) in patients with mesial temporal lobe epilepsy (MTLE), and their impact on quality of life using a VFQ-25 questionnaire.

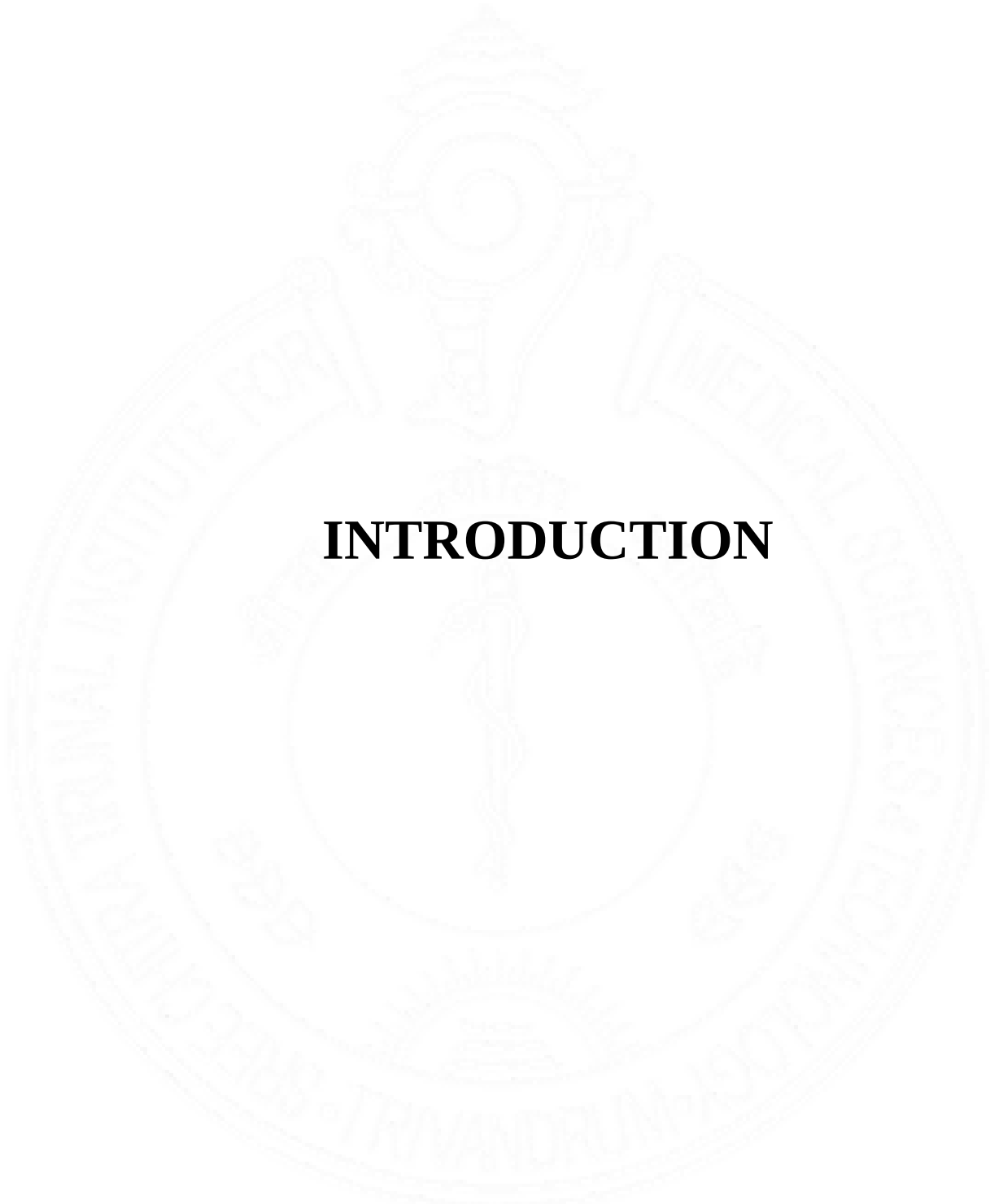
Methods: Ophthalmic evaluation was done during pre-operative evaluation as well as 3 months after surgery. It included Best Corrected Visual Acuity (BCVA), visual field evaluation, color vision examination, fundoscopy, extra ocular movements and diplopia charting. Visual field evaluation was done using Humphrey field analyzer. The foveal threshold (FT), mean deviation (MD) and pattern standard deviation (PSD) were calculated for each patient. Quality of life assessment was done using Visual Functioning Questionnaire-25 (VFQ-25). Two-tailed independent T-tests and Chi-square test was performed for comparison of results.

Results: Thirty-four patients were included in this study (23 men; 11 women). Mean age was 26.6 years (range 9-44 years). Post-operatively, none complained of a visual field disturbance. Thirty-one (91.17%) out of 34 patients had a new quantifiable superior quadrantanopia. FT, MD and PSD of patients ranged between 29db to 40db, -1.23 to -14.28 and 1.75 to 15.34 respectively. There was no detectable abnormality in visual acuity, color vision, fundoscopy, diplopia charting or extraocular movements. VFQ-25 scores ranged from 84 to 100. The difference between VFQ scores of patients with and without quadrantanopia was not significant.

Conclusion: Standard ATL produces asymptomatic VFDs that do not affect quality of life. A combined effort of Neurologist and Ophthalmologist becomes important to counsel the patient before surgery.

Key words- Temporal lobe epilepsy; visual field defects; anterior temporal lobectomy; quality of life



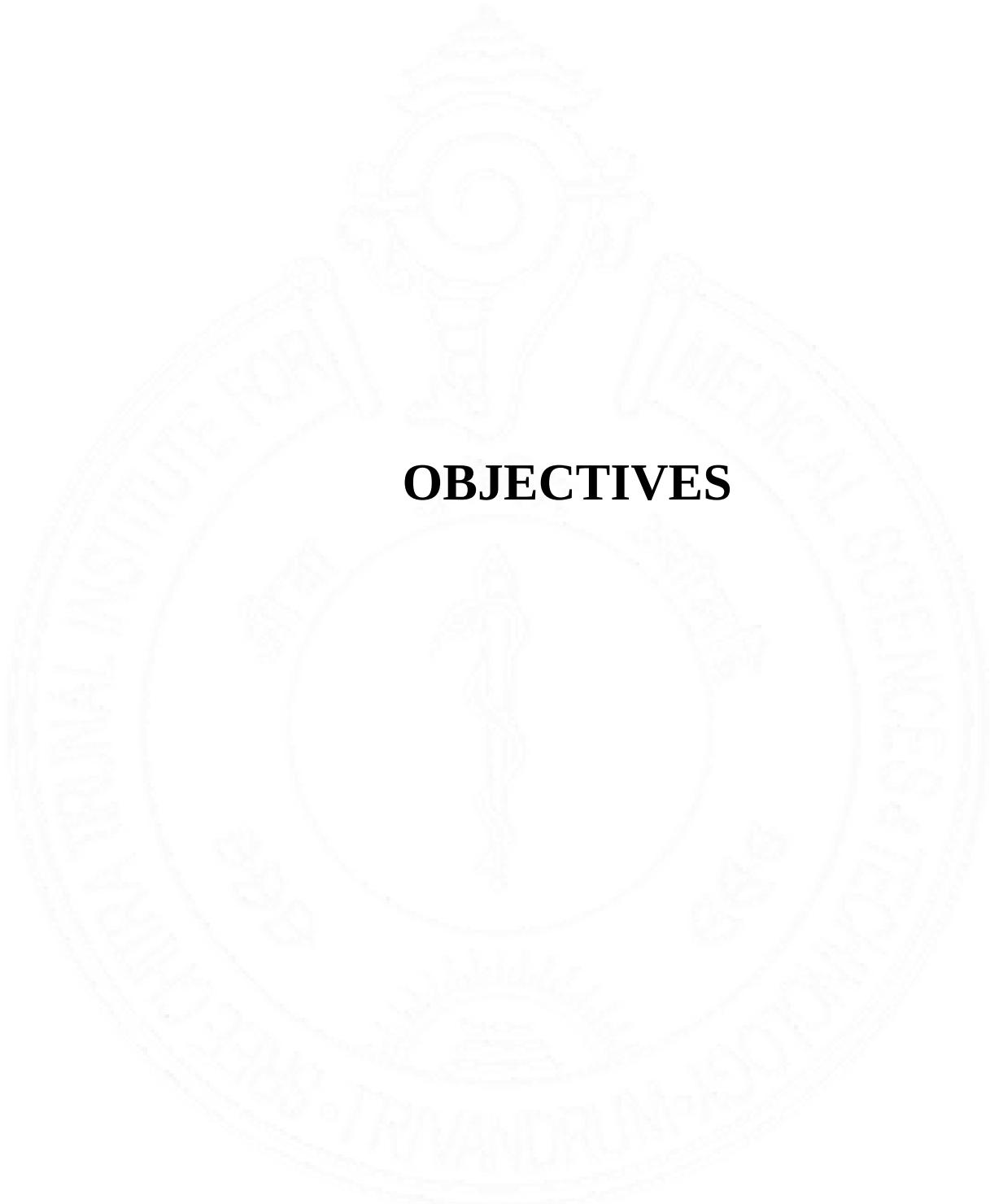


INTRODUCTION

Anterior temporal lobectomy with amygdalohippocampectomy (ATL) is the traditional approach in the surgical treatment of drug resistant temporal lobe epilepsy (TLE). Visual field defects (VFDs) are a common occurrence after ATL with incidence of about 52% to 97% in various studies.¹⁻⁵ VFDs typically occur in the superior homonymous field contralateral to the resection and are due to disruption of Meyer's loop. The extent of VFD reflects the retinotopic organization of fibers; with crossed and uncrossed fibers coursing in three major bundles. Fibers of the anterior bundle closely associated with the temporal horn of the lateral ventricle are at greatest risk during resection. Variability in previous studies can be attributed to factors such as heterogeneity in VFD estimation, differences in the nature and extent of surgery and anatomic variability of Meyer's loop.⁶

VFDs in the post-operative period can jeopardize the functional skills of patient like driving ability and thus their social independence. Another concern is in the context of pre-surgical counseling of patients undergoing ATL where VFDs after surgery needs to be detailed. Hence, a combined effort of Neurologist and Ophthalmologist becomes important to quantify it and counsel the patient before surgery.

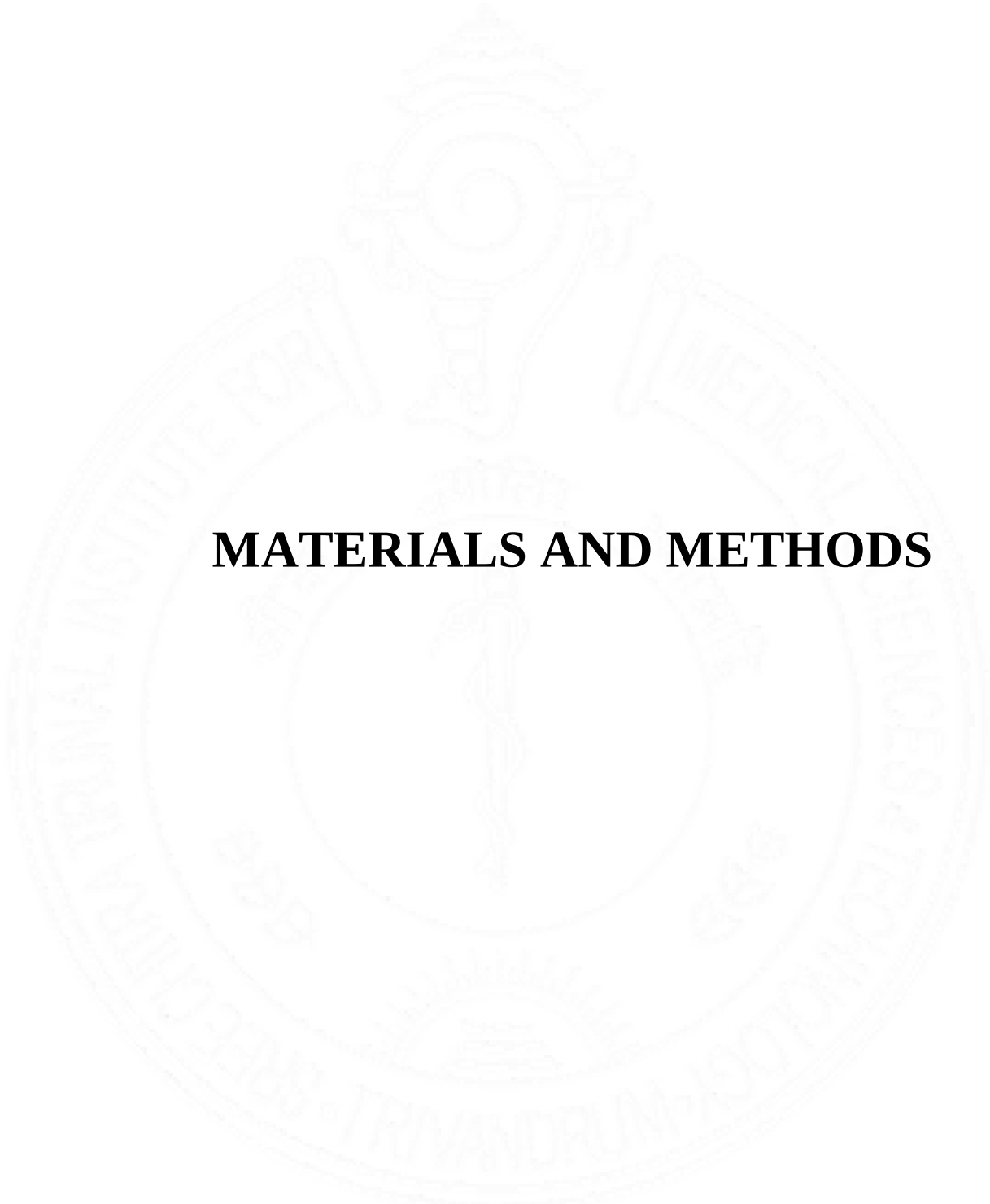
However, recent advances like pre-operative tractography as was demonstrated from our group, intra-operative MRI and neuronavigation has reduced the incidence of VFDs substantially.^{7,8} Still the impact of such deficits and their effect on post-operative quality of life has been a great concern among the caregivers.



OBJECTIVES

The aim of the current study was to estimate the VFDs occurring after standard ATL for intractable TLE (with mesial temporal sclerosis as pathological substrate). The objectives while doing so were:

1. To quantify VFDs occurring after ATL for drug-resistant TLE.
2. To estimate any other defects in ophthalmic functions after ATL (visual acuity, contrast sensitivity, color vision, ocular movements).
3. To compare the side of resection and extent of VFDs.
4. To estimate the quality of life using a VFQ-25 questionnaire



MATERIALS AND METHODS

The study was a post hoc analysis of a prospectively acquired database conducted at the R. Madhavan Nayar Center for Comprehensive Epilepsy Care, Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum, Kerala, South India (a tertiary referral center for advanced epilepsy care and has completed more than 2500 epilepsy surgeries so far since 1995) and Regional Institute of Ophthalmology, Trivandrum (a tertiary academic and referral centre for ophthalmic diseases). The study was conducted after obtaining the institutional ethics committee clearance.

There were 36 patients who were included in the study. Two children were excluded from the study (**Fig.1**). Pre- and post-operative data were obtained from 34 patients who underwent standard ATL for drug-resistant mesial TLE (MTLE) in SCTIMST. The side of resection was determined after obtaining electro-clinico-radiologic concordance from a team comprising of Epileptologists, Neurosurgeons, Imageologists, Psychologist(s), Speech pathologist(s) and Occupational rehabilitation expert(s).

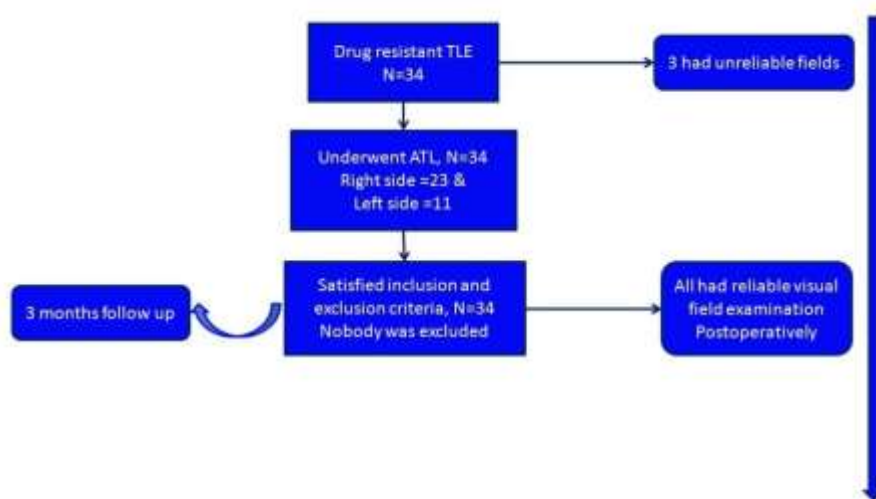


Fig.1. Flow chart showing the study protocol and the cohort selected

Neurosurgeon(s) experienced in epilepsy surgery resected a maximum of 6.0 to 6.5 cm of the anterior lateral non-dominant temporal lobe or 4.0 to 4.5 cm of the dominant temporal lobe. The mesial resection included the amygdala and, at a minimum, the anterior 1.0 to 3.0 cm of the hippocampus (most commonly, 4.0 cm).

Best Corrected Visual Acuity (BCVA), color vision examination, fundus examination, extra ocular movements, diplopia charting and visual field evaluation were obtained. The various outcome variables measured were degree of field defect, mean deviation (MD), pattern standard deviation (PSD), foveal threshold (FT), and changes in any other visual functions like BCVA, color vision, fundus changes, extra ocular movements, and Visual Functioning Questionnaire 25 (VFQ-25) score. Patients unable to do field testing due to other neurologic problems, children, patients with preexisting VFDs or other causes for VFD like ocular causes like glaucoma and patients who gave unreliable fields on repeated testing at least 3 times consecutively were excluded from the study. The reliability criteria used were fixation losses less than 20%, false positive and false negative errors less than 33%.⁹ Best Corrected Visual Acuity (BCVA) was assessed using Snellen chart examined at 6 meters. BCVA of < 6/6 was considered abnormal. Color vision examination was done with Ishihara chart. Fundus was examined by slit lamp biomicroscopy using 90D lens. Extra ocular movements were checked in all 9 cardinal positions. Diplopia charting was done after dissociating both eyes with red and green goggles.

Visual field evaluation

Visual field testing was obtained with automated perimetry which is the gold standard. Testing was done with the 30-2 program on the Humphrey field analyzer (Humphrey Instruments model 630/640), with a white-on-white Goldman Size III target with threshold strategy which tested 76 points in the central 60 degrees of vision. The threshold for light detection was determined for each point using staircase method. The reliability criteria used were fixation losses less than 20%, false positive and false negative errors less than 33%.⁹

Quadrantanopia was diagnosed if any of the following was present: a) depression of thresholds by 5 db or more, in 3 or more contiguous points adjacent to the vertical meridian in the involved quadrant as compared to their mirror image points across the vertical meridian; b) pattern deviation plot showed 3 or more points adjacent to the vertical meridian in the involved quadrant depressed to the 1 % probability level with normal mirror image points across the vertical meridian. Fixation losses, false positive errors, and false negative

errors were recorded. As part of the Humphrey program, foveal threshold, mean deviation (MD) and pattern standard deviation (PSD) were calculated for each patient. The MD represents the overall extent of depression of the field and is measured in decibels; zero is normal for age. The PSD quantifies the SD of the points in the pattern deviation determination (plot) relative to the neighboring points and is an indication of how much each point differs from its neighbors. A higher PSD indicates higher variability among neighboring points. MD and PSD values with $p \leq 0.05$ were considered significant in the study for analysis. Data was obtained pre-operatively and 3 months post-operatively. Adjoining edema and blood or CSF collection in the operated site may cause errors in the immediate post-operative period and hence warranted a 3 months post-surgical evaluation.

VISUAL FUNCTIONING QUESTIONNAIRE (VFQ-25)

Quality of life assessment was done using the Malayalam (local language) and English versions of Visual Functioning Questionnaire 25 (VFQ-25), version 2000 of National Eye Institute (*PB/SA National Eye Institute Visual Functioning Questionnaire-25 (VFQ-25) version 2000 (self-administered format)*).¹⁰ Part-1 consists of questions related to general health and vision, Part-2 consists of questions related to difficulty with activities and Part-3 consists of questions related to responses to vision problems. The various subscales under which questions are grouped are General Vision, Near Activities, Distance Activities, Vision Specific activities (Social Functioning, Mental Health, Role Difficulties, Dependency), Driving, Color Vision and Peripheral Vision. Scoring was done based on NEI VFQ-25 Scoring Algorithm, August 2000. Thus, a subscale score and a composite score was obtained. Comparisons were made between groups based on these scores.

Inclusion and Exclusion criteria

Inclusion criteria:

Consecutive patients with drug-resistant MTLE-HS awaiting surgery.

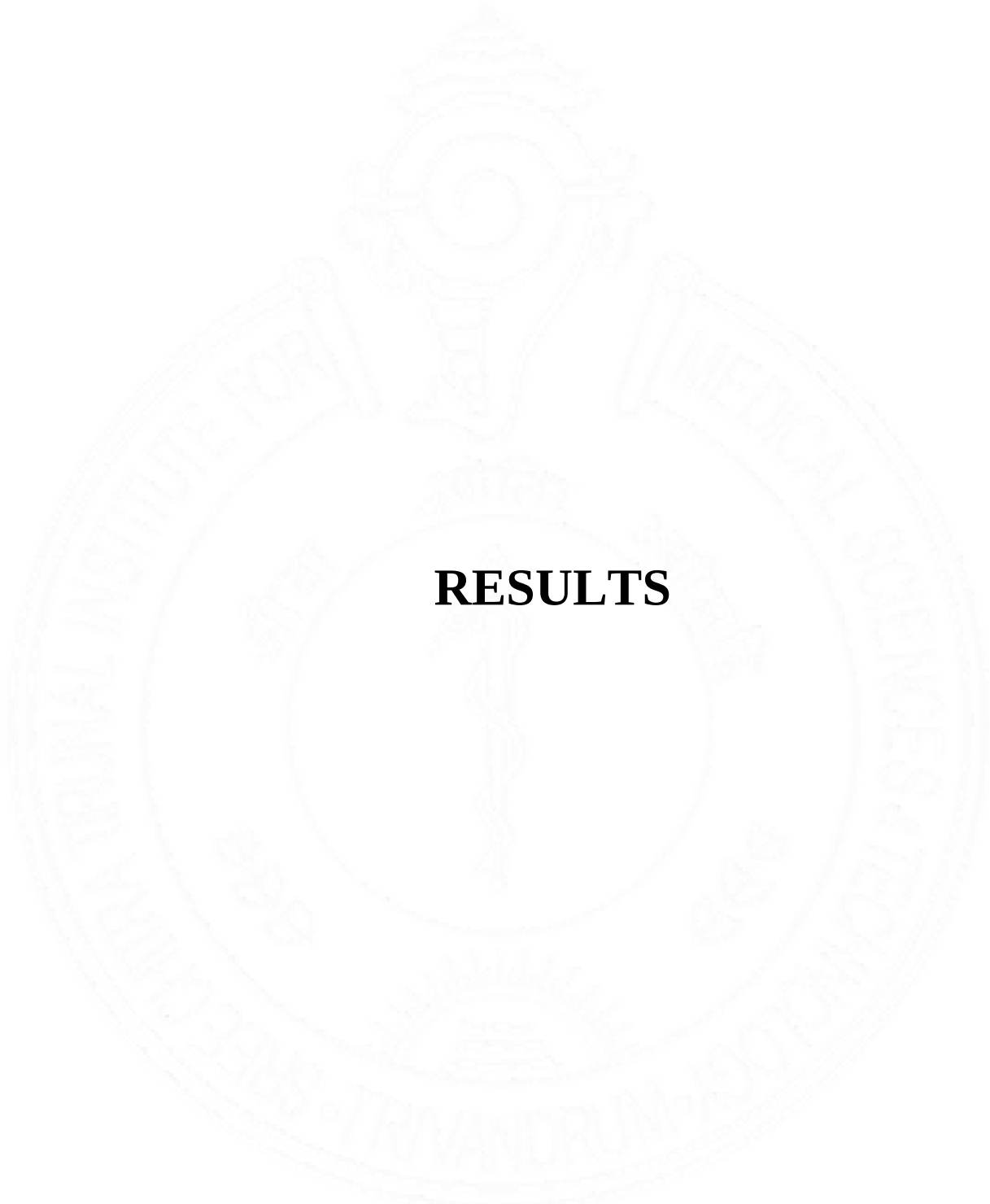
Exclusion criteria:

1. Patient who is unable to do fields due to neurologic problems.

2. Children who could not co-operate with testing.
3. Patients with preexisting visual field defects due to other neurologic (multiple sclerosis, intracranial space occupying lesions like pituitary tumors, CNS vasculitis etc.) or ocular causes.
4. Patients who gave unreliable fields on repeated testing, at least, 3 times consecutively.

Statistical analysis

The Statistical package SPSS Version 17 (SPSS, Chicago, Illinois, USA) was used for statistical analysis. Two-tailed independent t-test and Chi-square test was performed for the comparison of results and a 'p' value less than 0.05 was considered as statistically significant.



RESULTS

Of the 34 patients (after excluding 2 children preoperatively), 23 (67.64%) were males and 11 (32.36%) were females. Their age ranged from 9 to 44 years (median age-26.5 years). Automated perimetry pre-operatively was unreliable in 3 patients. Out of 34 patients screened, this unreliable fields during pre-operative examination in 3 patients were attributed to their inability to cooperate with examination as part of their disease. They were not excluded as their post-operative fields were reliable on all occasions. None of the patients had a significant field defect in the quadrant at risk pre-operatively. Of the 34 patients, 23 (67.64%) underwent a right ATL and 11 (32.36%) a left ATL (**Table 1**).

Table 1 Demographic characteristics of the study population (N=34).

Sex		Age distribution in years n (%)				Side of resection n (%)	
Males	Females					Right	Left
n (%)	n (%)	<10	10-20	21-30	>30	Right	Left
23(67.64)	11(32.36)	1(2.94)	9(26.48)	12(35.29)	12(35.29)	23(67.64)	11(32.36)

N – number; % - percentage.

Post-operatively, none of the patients complained of any visual field disturbance. The follow-up was done 3 months after the surgery. Seven (20.5%) patients had vague visual complaints regarding vision and visual concentration. Thirty-one (91.17%) had new quantifiable VFD. Qualitatively the visual field defects were superior quadrantanopias that met our definition (**Fig 2**). Out of 34 patients, 3 (8.82%) did not have any quadrantanopia bilaterally, 2 had ipsilateral quadrantanopia only sparing their contralateral eye and one patient had quadrantanopia in the contralateral eye only. On inspection, only 3 (9.67%) had

defects which appeared congruous. Twenty eight (90.32%) patients had incongruous quadrantanopias.

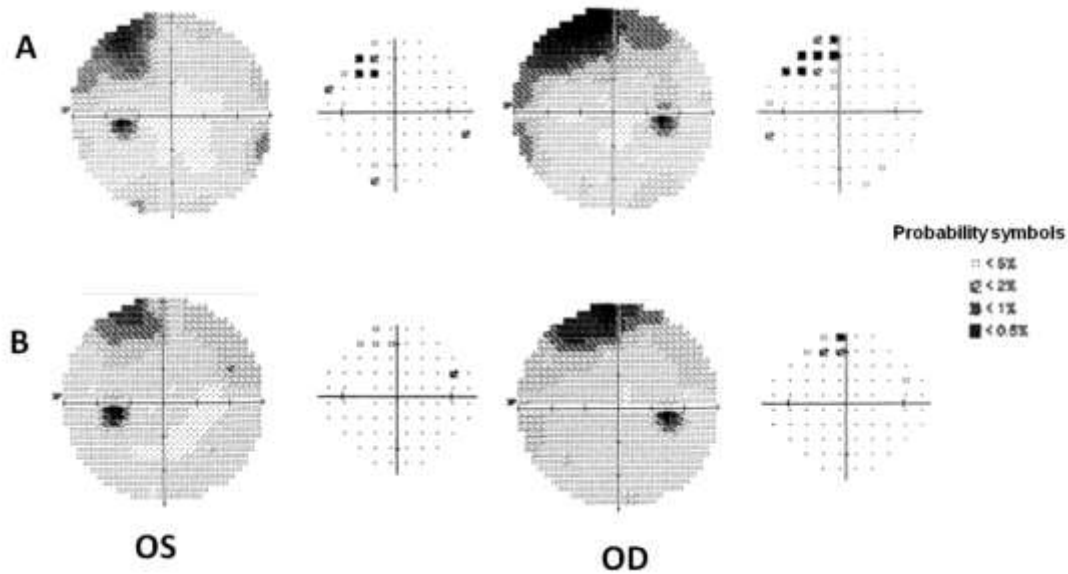


Fig.2. Gray scale and pattern deviation plots from the Humphrey visual field analyzer in two patients after right ATL, contralateral eye has smaller defects and points near the vertical midline are spared. (A) An example of a typical visual field defect with superior quadrantanopia called “pie in the sky” appearance (B) An example of a minimal VFD. OS left eye; OD right eye.

The mean population measures of quantitative visual field analysis are summarized in **Table 2**. Foveal thresholds (FT) of patients in the study group were in the range between 29db to 40db. Mean FT was 33.59 ± 2.95 db for ipsilateral fields and 33.68 ± 2.52 db for contralateral fields and the difference was not statistically significant. Mean Deviation (MD) ranged from -1.23 to -14.28. Pattern standard deviation (PSD) ranged from 1.75 to 15.34. The incidence of significant VFD was 96.7%. There was significant difference in the mean

values of MD and PSD between ipsilateral and contralateral eyes ($p < 0.05$). Of the 34 patients examined, 29 (85.29%) had an ipsilateral VFD greater than contralateral visual field defect.

Table 2 Data depicting the outcome variables in the study population.

Variable	VFD			Quadrantanopia			Side of resection		VFQ score	
	Mean(SD)		p value	n (%)		p value	Mean PSD(SD)		(Median quartiles)	
	IL	CL		IL	CL		Right	Left	With quadrantanopia=31	Without quadrantanopia n=3
FT	33.59 (2.95)	33.68 (2.52)	0.865							
MD	-8.02 (3.25)	-6.82 (3.13)	0.002	27 (87.1)	23 (74.19)	0.33				
PSD	9.97 (4.24)	8.75 (3.83)	0.001	30 (96.8)	29 (93.5)	0.99	10.23 (4.17)	10.69 (3.94)		
							P=0.7			
VFQ Score									100 (91,100)	90(84,98)
									p value=0.124	

VFD -visual field defect; FT - foveal threshold; MD - mean deviation; PSD - pattern standard deviation; VFQ - visual functioning questionnaire; n – number; IL – ipsilateral; CL- contralateral; SD - standard deviation. p by Chi square test

On comparing the quadrantanopias in 31 patients, it appeared to be significant with PSD in 30 (96.7%) patients in their ipsilateral eye and 29 (93.54%) patients in their contralateral eye, but this difference between the two sides was not statistically significant ($p=0.2$) (**Table 2**). Difference between quadrantanopias which occurred after the right and left sided resections were also not significant statistically ($p = 0.7$). (**Table 2**). Other visual functions like BCVA, color vision, fundus examination, diplopia charting and extra ocular movements detected no anomalies. VFQ-25 scores ranged from 84 to 100. The difference in VFQ scores of patients with and without quadrantanopia was not significant statistically ($p = 0.12$).

Of the 34 patients, 11 patients drove vehicles and among these, 9 patients had VFDs and they did not experience any difficulty during driving. Significant VFDs were not associated with any difficulties in driving as indicated by a subscale and composite score of VFQ.



DISCUSSION

The incidence of significant VFD was 96.7% in our study. The previous studies showed a VFD in 52% to 97% of patients after ATL.^{1-5,11-13} The higher incidence here than most of the previous studies could be due to the higher sensitivity and quantifiability of automated perimetry which is the current gold standard. Studies which used Bjerrum campimetry showed lower incidence, 52% whereas those using automated perimetry on 32 patients who underwent ATL reported an incidence of 97%, comparable to ours.^{2,11,14}

Despite a 96% incidence of VFD, none of our patients complained of visual field disturbances. This was in concordance with study by Egan et al., and Katz et al., while in discordance with the one by Tecoma et al., where 8% of patients noticed symptomatic deficits.^{15,16}

As expected, the superior quadrant was preferentially affected (**Fig 3A**). There were variations in the extent of field involvement between patients. MD ranged from -1.23 to -14.28. PSD ranged from 1.75 to 15.34. The range of severity in the field defects with excisions of any given magnitude is probably largely accounted for by the variations in the extent of the anterior sweep of the radiation from one person to another, as well as by variations in the size of the temporal lobe with reference to the rest of the brain.¹⁷

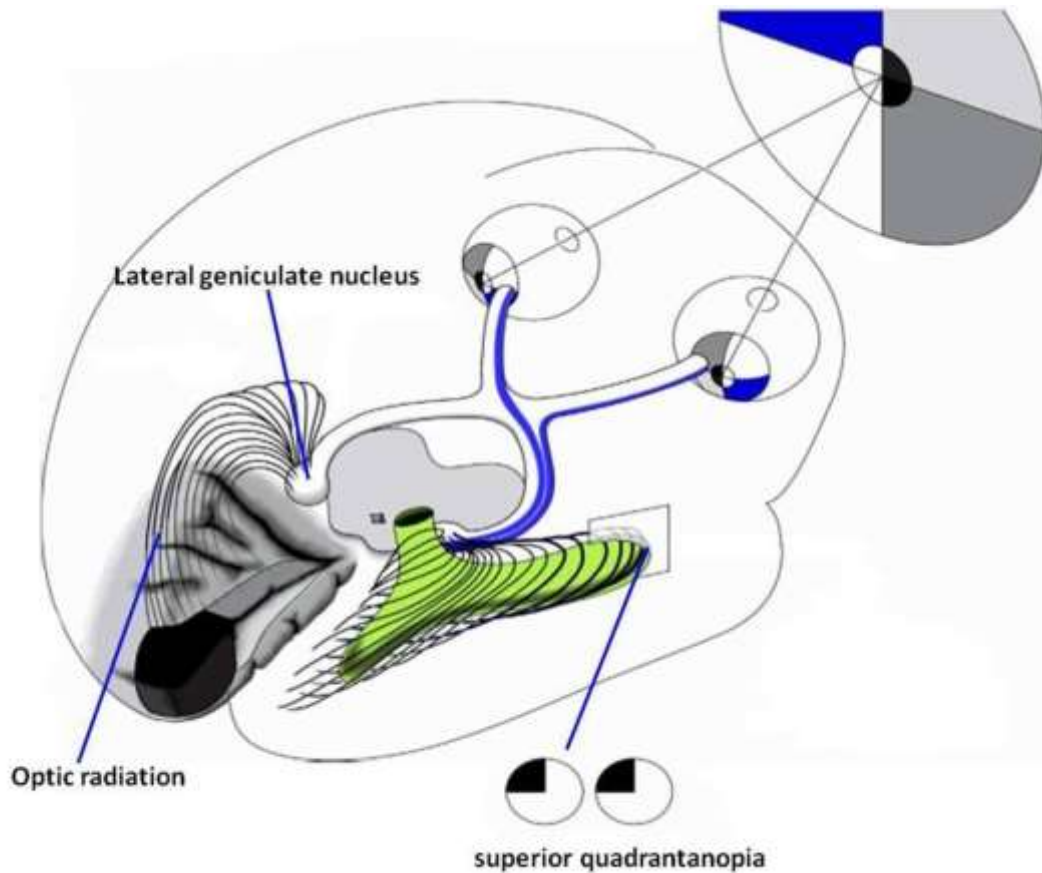


Fig. 3.A. Visual pathways: A temporal lobe lesion results in damage to Meyer's loop and cause a VFD in the contralateral superior quadrant.

The field defects in the ipsilateral eye were found to be more than the contralateral eye on comparing the mean values of MD and PSD and this difference was found to be statistically significant. A previous study by Hughes et al., also had established that the superior quadrant was affected to a greater degree in the ipsilateral eye than in the contralateral one.¹⁴ This supports the anatomic model suggested by others, in which the fibers of Meyer's loop from the ipsilateral eye course anteriorly and laterally to those from the contralateral eye (**Fig. 3.B.**) and therefore are at greater risk during ATL.¹⁸

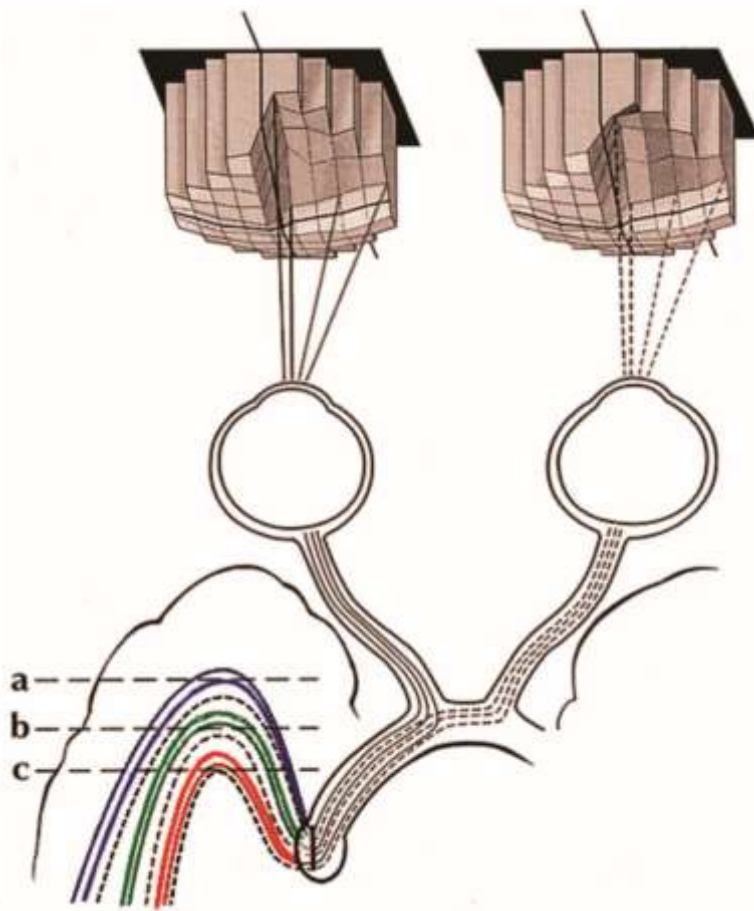


Fig.3. B. Organization of Meyer's loop, each visual field is represented graphically in three dimensions, with the affected superior quadrant facing upward and to the right. The bold lines over each field represent the horizontal and vertical meridians. The fibres from the medial sector (blue lines) are the anterior-most, the fibers carrying central vision are posteriorly located (red lines). The fibers from the lateral sector are intermediate in location (green lines). The fibers from the contralateral eye (dashed lines) are relatively posterior to those from the ipsilateral eye (solid lines), with maximum separation in anterior fibres followed by lateral sector and central vision. A resection at **level a** predominantly affects the medial sector of the ipsilateral eye. A resection at **level b** will affect both medial sectors, and the lateral sector of the ipsilateral eye to a greater degree than the contralateral eye. Central vision is still relatively spared. A resection at **level c** will affect both eyes almost equally in the medial and lateral sectors, as well as the most medial inferior test point.

Among the 31 patients with superior quadrantanopia, greater number of patients (96.77%) had significant PSD in their ipsilateral eye as compared to their contralateral eye (93.54%), although not statistically significant. This shows that though ipsilateral field defects appear to be larger than the contralateral ones, both are significant enough with MD and PSD showing significant affection. Therefore, significant quadrantanopia can occur in both eyes to almost equal degrees following ATL. Also, on comparing the quadrantanopia that occurred in right sided versus left sided resections, the mean PSD values were 10.69 and 10.23 respectively, with no statistical significance though. Therefore, though resections were typically larger in the right hemisphere, there was no effect of the side of resection on VFD as noted by several others.¹³ However, a higher frequency of extensive deficits after left-sided resections in the later studies can be explained by anatomic variability of Meyer's loop and variability in size of temporal lobe.¹⁹ Anterior extension of left Meyer's loop than the right side was supported by studies including ours employing diffusion tensor imaging tractography (DTIT) and might be probably due to language lateralisation of left side and needs further studies for elucidating the reason.^{7,20-22}

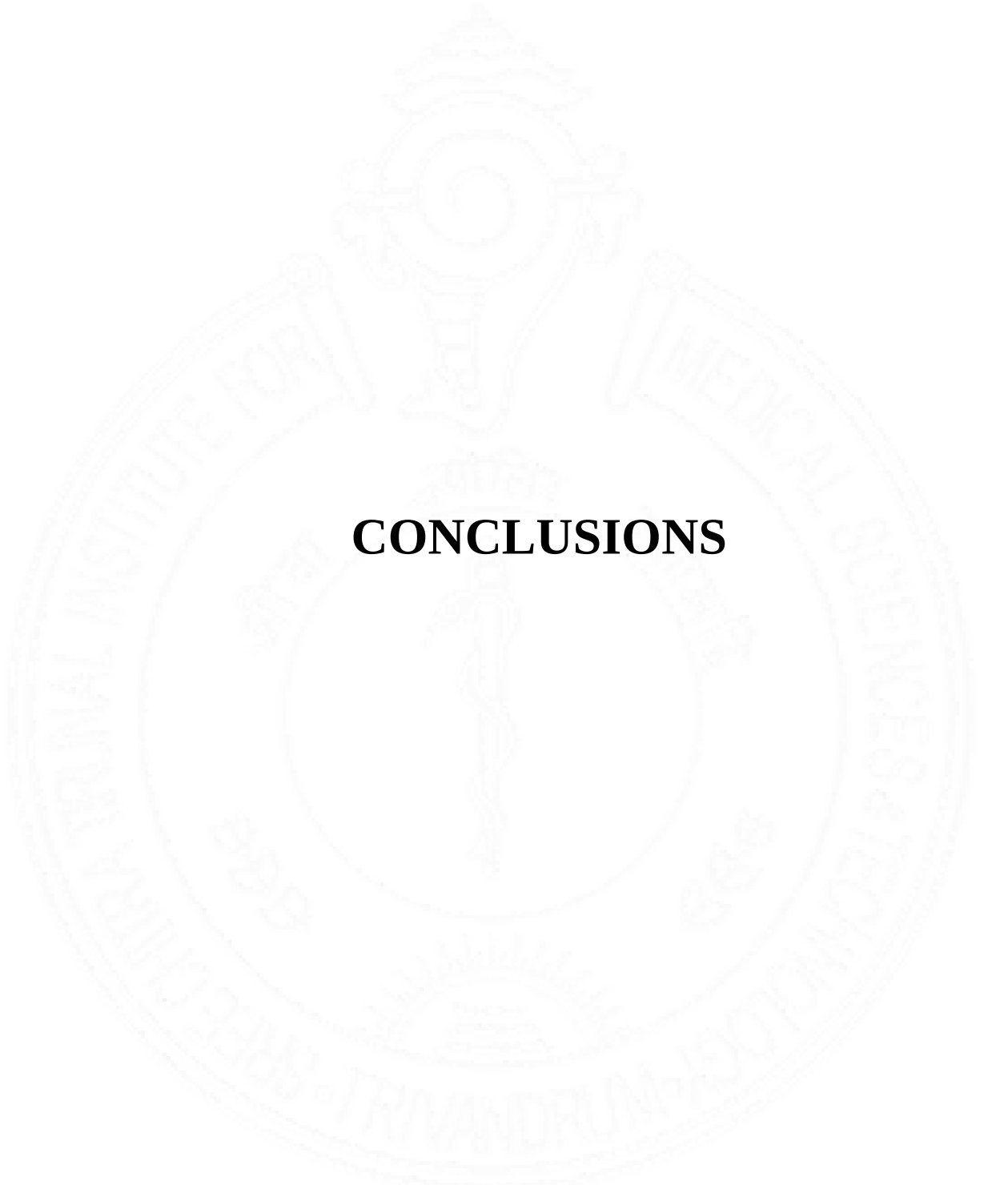
We found that the central 3 degrees were spared in a large number of patients, ipsilaterally in 23 (67.64%) and contralaterally in 19 (55.88%) patients. This is because the fibers carrying information from this area are represented more posteriorly in Meyer's loop (**Fig.3.B.**) and were much less likely to be damaged surgically. Alternatively, fibres subserving central vision may have a greater level of redundancy and may be less prone to damage.

Quality of life assessment done with the VFQ-25 for these patients showed that the difference in the composite scores between patients who developed a quadrantanopia and those who did not was comparable. This showed that the field defect did not have any significant effect on the quality of life and may not cause any disability in these patients, a finding not previously reported. Of the 34 patients, 11 patients drove vehicles and among these, 9 had VFDs, but they did not experience any difficulty during driving. But whether these VFDs would disqualify them for driving license was not addressed in the present study, since each country has their own varied guidelines.

Minimally invasive surgical techniques like gamma knife radiosurgery and stereotactic laser thermo-ablation are now increasingly being studied for their effect on seizure outcome although the ROSE trial showed ATL is better for seizure outcome, although less invasive ones can probably prevent quadrantanopia from occurring.²³ In a study by Quigg et al., the incidence of VFDs after gamma knife radiosurgery was 91% and VFDs did not have any impact on driving status at a 3-year follow-up.²⁴ But the assessment of driving status was only through a self-report by patients for which no validated tools like VFQ 25 were used. Grewal et al., also reported VFDs were not uncommon after laser ablation for mesial temporal epilepsy.²⁵ So resorting to standard ATL would be better to attain greater seizure freedom since it is clear that the visual deficit is not going to affect their day to day living.

One important strength of our study is the post-operative VFD assessment which was done using the current gold standard i.e., automated perimetry. A uniform surgical technique (none underwent selective AH) was used for all subjects. Pre-and post-operative automated perimetry was done homogeneously in patients to accurately assess VFD unlike in most other studies. The most unique strength of our study is the assessment of quality of life with the use of a vision-specific quality of life assessment.

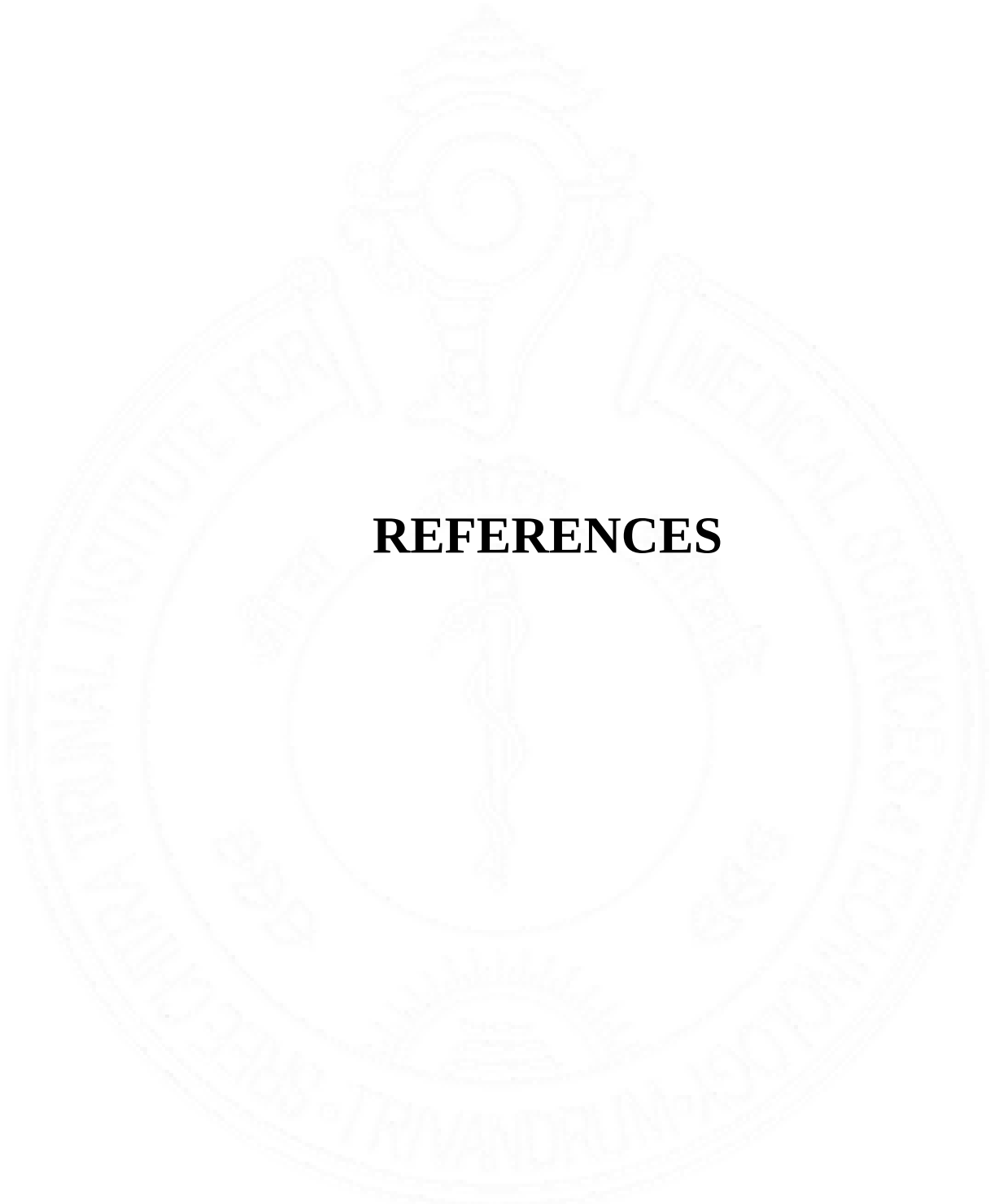
We accept the following shortcomings also. As the study population underwent standard ATL, the incidence of VFD after inferior temporal gyrus approach and selective AH could not be ascertained.^{15,26} Although VFD did not affect quality of life, whether they would disqualify patients from obtaining driver's license was also not addressed.²⁷



CONCLUSIONS

Standard ATL done for drug-resistant temporal lobe epilepsy produce asymptomatic field defects only. VFDs are quantifiable, but are variable due to the anatomic variability between individuals. VFDs do not affect the quality of life of these patients as assessed by VFQ-25 questionnaire. This information is important in pre-surgical counseling of patients.





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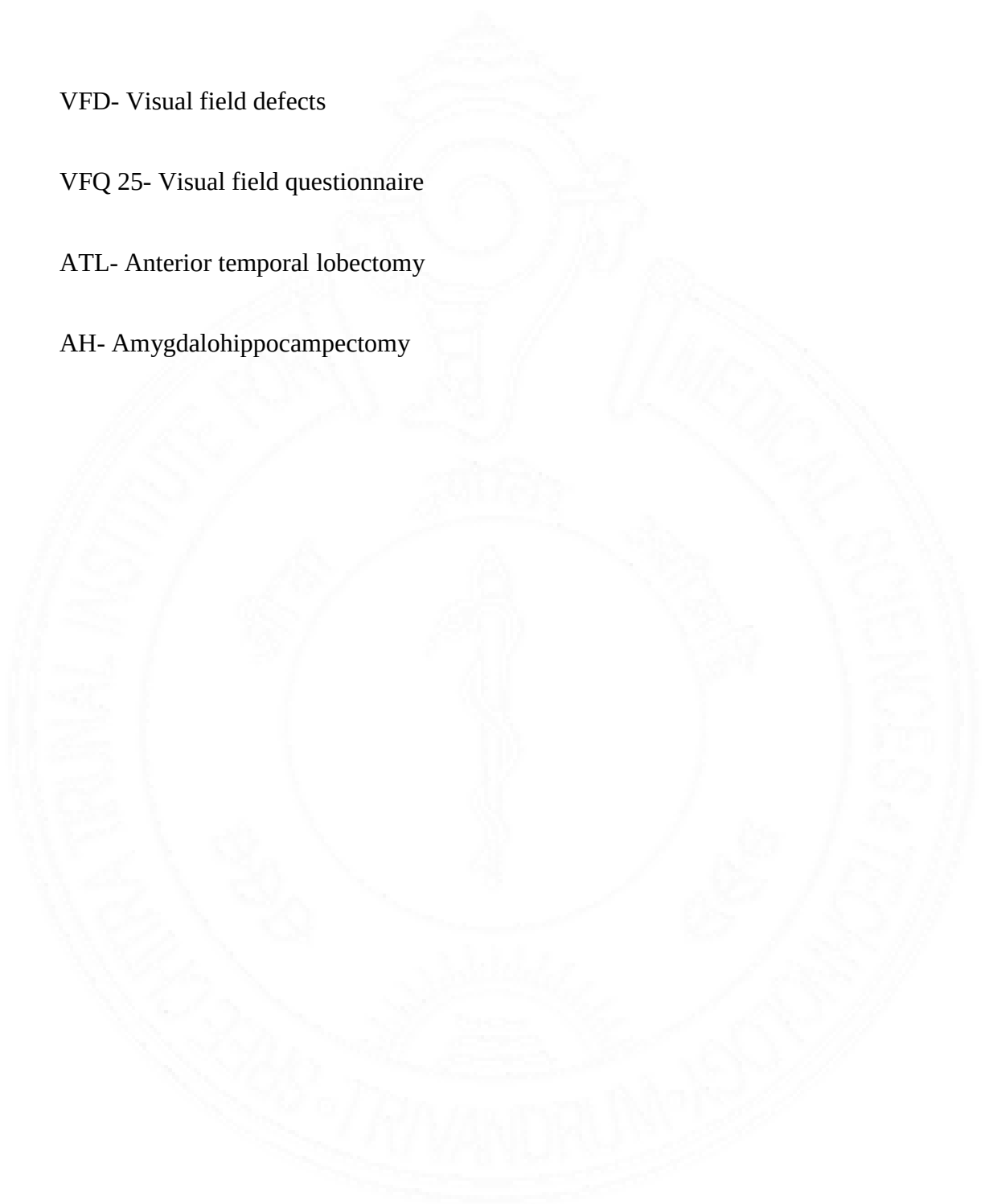
ABBREVIATIONS:

VFD- Visual field defects

VFQ 25- Visual field questionnaire

ATL- Anterior temporal lobectomy

AH- Amygdalohippocampectomy



PROFORMA

1. Patient Details

- a) **Unique identification number**
- b) **Age**
- c) **Sex**
- d) **Phone number**
- e) **Occupation**

2. Primary diagnosis

3. Age of onset

4. Indication for temporal lobectomy:

5. Procedure performed: standard temporal lobectomy/others.....

6. Side of surgery: *Right/Left*

Dominant/non dominant

7. Date of procedure:

8. Neurological deficits:

Preoperative

Higher mental functions:

- 1. Cranial nerves**
- 2. Motor system**
- 3. Sensory system**
- 4. Cerebellum**

9. Current treatment:

10. Ophthalmologic assessment:

	Preoperative	Postoperative
Visual complaints		
Visual acuity		
Colour vision		
Fundus		
EOM		
Diplopia charting		
Perimetry Indices		
Reliability		
Foveal threshold		
Mean deviation		
PSD		
Central Quadrantanopia		

National Eye Institute
Visual Functioning Questionnaire - 25
(VFQ-25)

version 2000

(SELF-ADMINISTERED FORMAT)

January 2000

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7/29/96

The following is a survey with statements about problems which involve your vision or feelings that you have about your vision condition. After each question please choose the response that best describes your situation.

Please answer all the questions as if you were wearing your glasses or contact lenses (if any).

Please take as much time as you need to answer each question. All your answers are confidential. In order for this survey to improve our knowledge about vision problems and how they affect your quality of life, your answers must be as accurate as possible. Remember, if you wear glasses or contact lenses, please answer all of the following questions as though you were wearing them.

INSTRUCTIONS:

1. In general we would like to have people try to complete these forms on their own. If you find that you need assistance, please feel free to ask the project staff and they will assist you.
2. Please answer every question (unless you are asked to skip questions because they don't apply to you).
3. Answer the questions by circling the appropriate number.
4. If you are unsure of how to answer a question, please give the best answer you can and make a comment in the left margin.
5. Please complete the questionnaire before leaving the center and give it to a member of the project staff. Do not take it home.
6. If you have any questions, please feel free to ask a member of the project staff, and they will be glad to help you.

STATEMENT OF CONFIDENTIALITY:

All information that would permit identification of any person who completed this questionnaire will be regarded as strictly confidential. Such information will be used only for the purposes of this study and will not be disclosed or released for any other purposes without prior consent, except as required by law.

Visual Functioning Questionnaire - 25

PART 1 - GENERAL HEALTH AND VISION

1. In general, would you say your overall health is:

(Circle One)

Excellent 1
Very Good 2
Good..... 3
Fair..... 4
Poor 5

2. At the present time, would you say your eyesight using both eyes (with glasses or contact lenses, if you wear them) is excellent, good, fair, poor, or very poor or are you completely blind?

(Circle One)

Excellent 1
Good..... 2
Fair..... 3
Poor 4
Very Poor 5
Completely Blind..... 6

3. How much of the time do you worry about your eyesight?

(Circle One)

None of the time..... 1
A little of the time..... 2
Some of the time 3
Most of the time 4
All of the time? 5

4. How much pain or discomfort have you had in and around your eyes (for example, burning, itching, or aching)? Would you say it is:

(Circle One)

None 1
Mild 2
Moderate 3
Severe, or 4
Very severe? 5

PART 2 - DIFFICULTY WITH ACTIVITIES

The next questions are about how much difficulty, if any, you have doing certain activities wearing your glasses or contact lenses if you use them for that activity.

5. How much difficulty do you have reading ordinary print in newspapers? Would you say you have:

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

6. How much difficulty do you have doing work or hobbies that require you to see well up close, such as cooking, sewing, fixing things around the house, or using hand tools? Would you say:

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

7. Because of your eyesight, how much difficulty do you have finding something on a crowded shelf?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

8. How much difficulty do you have reading street signs or the names of stores?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

9. Because of your eyesight, how much difficulty do you have going down steps, stairs, or curbs in dim light or at night?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

10. Because of your eyesight, how much difficulty do you have noticing objects off to the side while you are walking along?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

11. Because of your eyesight, how much difficulty do you have seeing how people react to things you say?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

12. Because of your eyesight, how much difficulty do you have picking out and matching your own clothes?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

13. Because of your eyesight, how much difficulty do you have visiting with people in their homes, at parties, or in restaurants ?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

14. Because of your eyesight, how much difficulty do you have going out to see movies, plays, or sports events?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

15. Are you currently driving, at least once in a while?

(Circle One)

Yes 1 Skip To Q 15c

No 2

15a. IF NO: Have you never driven a car or have you given up driving?

(Circle One)

Never drove 1 Skip To Part 3, Q 17

Gave up..... 2

15b. IF YOU GAVE UP DRIVING: Was that mainly because of your eyesight, mainly for some other reason, or because of both your eyesight and other reasons?

(Circle One)

Mainly eyesight 1 Skip To Part 3, Q 17

Mainly other reasons 2 Skip To Part 3, Q 17

Both eyesight and other reasons ... 3 Skip To Part 3, Q 17

15c. IF CURRENTLY DRIVING: How much difficulty do you have driving during the daytime in familiar places? Would you say you have:

(Circle One)

No difficulty at all 1

A little difficulty 2

Moderate difficulty 3

Extreme difficulty 4

16. How much difficulty do you have driving at night? Would you say you have:

(Circle One)

- No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Have you stopped doing this because
of your eyesight..... 5
Have you stopped doing this for other
reasons or are you not interested in
doing this 6

- 16A. How much difficulty do you have driving in difficult conditions, such as in bad weather, during rush hour, on the freeway, or in city traffic? Would you say you have:

(Circle One)

- No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Have you stopped doing this because
of your eyesight..... 5
Have you stopped doing this for other
reasons or are you not interested in
doing this 6

PART 3: RESPONSES TO VISION PROBLEMS

The next questions are about how things you do may be affected by your vision. For each one, please circle the number to indicate whether for you the statement is true for you all, most, some, a little, or none of the time.

READ CATEGORIES:	(Circle One On Each Line)				
	All of the time	Most of the time	Some of the time	A little of the time	None of the time
17. <u>Do you accomplish less</u> than you would like because of your vision?	1	2	3	4	5
18. <u>Are you limited</u> in how long you can work or do other activities because of your vision?	1	2	3	4	5
19. How much does pain or discomfort <u>in or around</u> <u>your eyes</u> , for example, burning, itching, or aching, keep you from doing what you'd like to be doing? Would you say:	1	2	3	4	5

For each of the following statements, please circle the number to indicate whether for you the statement is definitely true, mostly true, mostly false, or definitely false for you or you are not sure.

(Circle One On Each Line)

	Definitely True	Mostly True	Not Sure	Mostly False	Definitely False
20. I <u>stay home most of the time</u> because of my eyesight.....	1	2	3	4	5
21. I feel <u>frustrated</u> a lot of the time because of my eyesight.....	1	2	3	4	5
22. I have <u>much less control</u> over what I do, because of my eyesight.	1	2	3	4	5
23. Because of my eyesight, I have to <u>rely too much on</u> <u>what other people tell me.</u> ..	1	2	3	4	5
24. I <u>need a lot of help</u> from others because of my eyesight.....	1	2	3	4	5
25. I worry about <u>doing things</u> <u>that will embarrass myself</u> <u>or others</u> , because of my eyesight.....	1	2	3	4	5

SUBSCALE: GENERAL HEALTH

- (Circle One)

SUBSCALE: GENERAL VISION

- (Circle One)

SUBSCALE: NEAR VISION

- (Circle One)

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- A4. Because of your eyesight, how much difficulty do you have figuring out whether bills you receive are accurate?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

- A5. Because of your eyesight, how much difficulty do you have doing things like shaving, styling your hair, or putting on makeup?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

SUBSCALE: DISTANCE VISION

- A6. Because of your eyesight, how much difficulty do you have recognizing people you know from across a room?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

- A7. Because of your eyesight, how much difficulty do you have taking part in active sports or other outdoor activities that you enjoy (like golf, bowling, jogging, or walking)?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

- A8. Because of your eyesight, how much difficulty do you have seeing and enjoying programs on TV?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not
interested in doing this 6

SUBSCALE: SOCIAL FUNCTION

- A9. Because of your eyesight, how much difficulty do you have entertaining friends and family in your home?

(Circle One)

No difficulty at all..... 1
A little difficulty..... 2
Moderate difficulty..... 3
Extreme difficulty..... 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not

interested in doing this 6

SUBSCALE: DRIVING

A10. [This item, “driving in difficult conditions”, has been included as part of the base set of 25 items as item 16a.]

SUBSCALE: ROLE LIMITATIONS

A11. The next questions are about things you may do because of your vision. For each item, please circle the number to indicate whether for you this is true for you all, most, some, a little, or none of the time.

(Circle One On Each Line)

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. <u>Do you have more help</u> from others because of your vision?	1	2	3	4	5
b. <u>Are you limited</u> in the kinds of things you can do because of your vision?	1	2	3	4	5

SUBSCALES: WELL-BEING/DISTRESS (#A12) and DEPENDENCY (#A13)

The next questions are about how you deal with your vision. For each statement, please circle the number to indicate whether for you it is definitely true, mostly true, mostly false, or definitely false for you or you don't know.

(Circle One On Each Line)

	Definitely True	Mostly True	Not Sure	Mostly False	Definitely False
A12. I am often <u>irritable</u> because of my eyesight.	1	2	3	4	5
A13. I <u>don't go out of my home alone</u> , because of my eyesight.	1	2	3	4	5