PERIMETRY *for the*
NEW MILLENNIUM
HALIFAX 2000

14th Visual Field Symposium *of the* International Perimetric Society (IPS)

Halifax, Canada
September 6–9, 2000

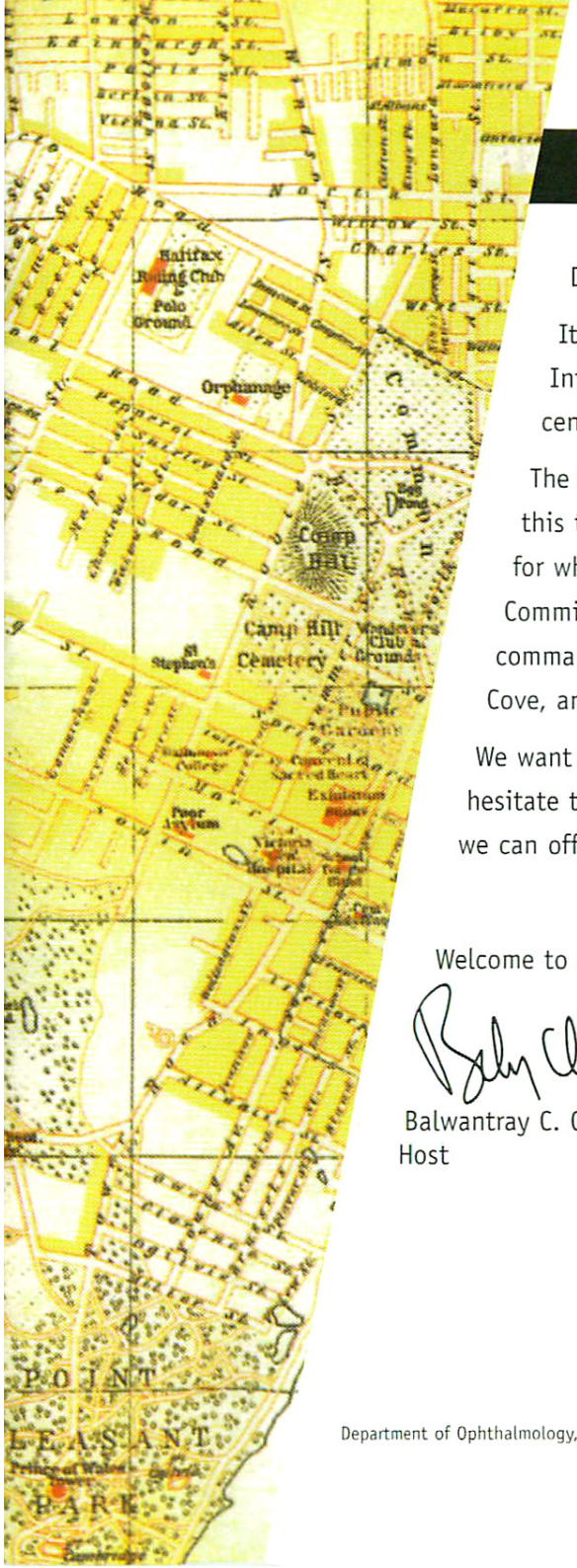
Final Program and Abstracts

The Visual Field Symposia

The International Perimetric Society (IPS) is an organization concerned with research in perimetry and optic disc imaging related to glaucoma, neuro-ophthalmology, epidemiology and therapy of visual system disorders. The Society was founded in 1974 and has organized biannual meetings in the following locations:

1974 Marseilles, France
1976 Tübingen, Germany
1978 Tokyo, Japan
1980 Bristol, UK
1982 Sacramento, USA
1984 Santa Margherita Ligure, Italy
1986 Amsterdam, the Netherlands
1988 Vancouver, Canada
1990 Malmö, Sweden
1992 Kyoto, Japan
1994 Washington, D.C., USA
1996 Würzburg, Germany
1998 Gardone Riviera, Italy
2000 Halifax, Canada

Table of Contents



Welcome to Halifax!

Dear Colleague:

It gives me great pleasure to welcome you to Halifax and to the 14th Visual Field Symposium of the International Perimetric Society (IPS). The meeting will be held at the World Trade and Convention centre in downtown Halifax on September 6-9, 2000.

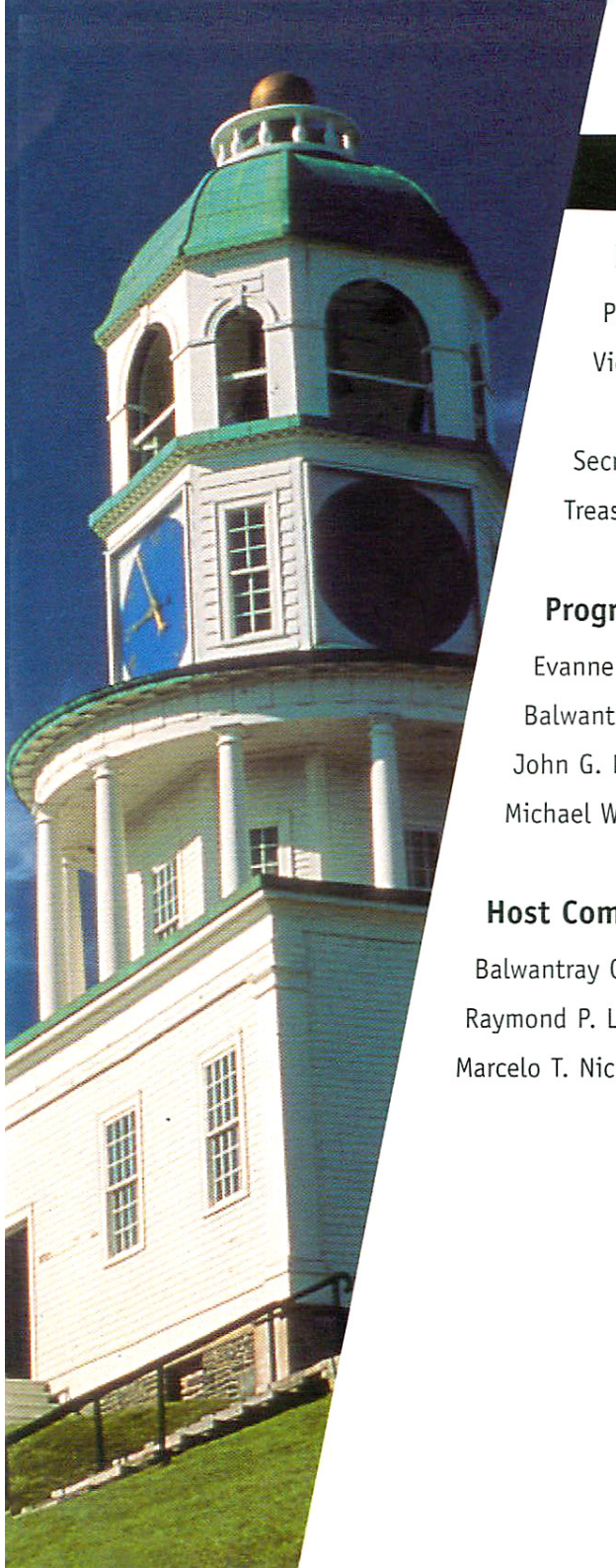
The Program Committee has put together an excellent scientific program, including the first IPS lecture, this time to be given by Stephen M. Drance, OC, MD. We have major commitments from many companies for what promises to be a superb technical exhibit for perimetry, imaging and medical therapy. The Host Committee has planned an exciting social program including a welcoming dinner on Citadel Hill with a commanding view over the harbour and city, a visit to the newly opened Pier 21 museum and Peggy's Cove, and a benefit concert at St. George's Round Church.

We want you to enjoy this symposium and make your visit to Halifax a memorable one. Please do not hesitate to contact the symposium organiser, Mr. Michael Ardenne and his excellent team, or myself, if we can offer any assistance during your stay here.

Welcome to Halifax!

Balwantray C. Chauhan, Ph.D.
Host

Department of Ophthalmology, Dalhousie University, 2nd Floor, Centennial Building, 1278 Tower Road, Halifax, Nova Scotia, Canada B3H 2Y9 E-mail: bal@is.dal.ca



Committees and Honorary Members

Executive Committee of the IPS

President: John M. Wild, Ph.D., Birmingham, UK

Vice-Presidents: Anders Heijl, M.D., Mälmo, Sweden

Yoshiaki Kitazawa, M.D., Gifu, Japan

Secretary: Michael Wall, M.D., Iowa City, USA

Treasurer: Richard P. Mills, M.D., Lexington, USA

Program Committee

Evanne J. Casson, Ph.D., Ottawa, Canada

Balwantray C. Chauhan, Ph.D., Halifax, Canada

John G. Flanagan, Ph.D., Waterloo, Canada

Michael Wall, M.D., Iowa City, USA

Host Committee

Balwantray C. Chauhan, Ph.D.

Raymond P. LeBlanc, M.D.

Marcelo T. Nicolela, M.D.

Honorary Members of the IPS

Prof. Elfriede Aulhorn*

Prof. Stephen Drance

Prof. Jay Enoch

Prof. Franz Fankhauser

Prof. Erik Greve

Prof. Alan Friedmann

Prof. Hans Goldmann*

Prof. Heinrich Harms

Prof. Harutake Matsuo

*deceased

IPS INTERNATIONAL PERIMETRIC SOCIETY

Meeting Information

Venue

World Trade & Convention Centre
1800 Argyle St., Halifax, Nova Scotia
Canada B3J 3N8

Meeting Contact

Michael Ardenne
Ardenne International
Suite 444, World Trade & Convention Centre
1800 Argyle St., Halifax, Nova Scotia
B3J 3N8 Canada
Tel: (902) 492 8000 or (902) 454-7964
Fax: (902) 423-2143
Email: mardenne@ardenneinternational.com

During the Meeting

Letters and messages to participants during the meeting should be directed to the above address.

Language

The official language of the meeting is English.

Scientific Program

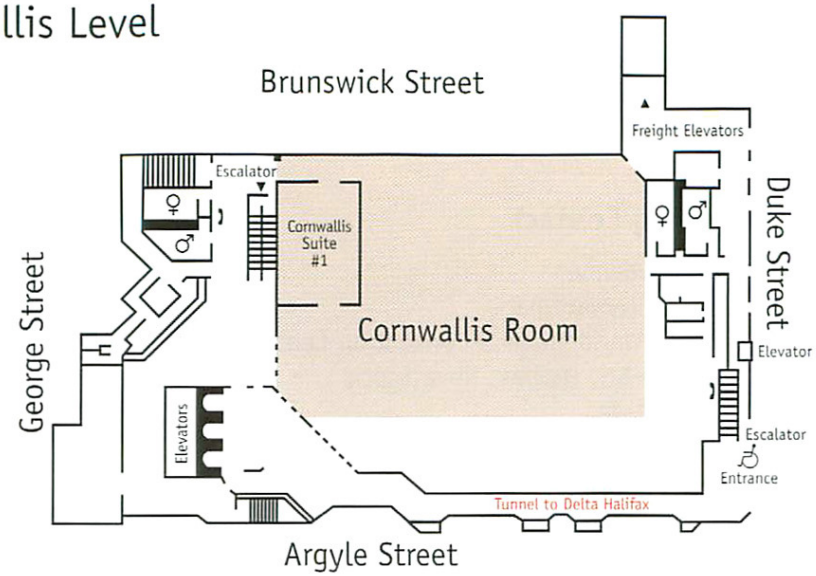
The 14th Visual Field Symposium will feature scientific papers and posters. Approximately 90 papers and posters have been selected for presentation by the Program Committee. We invited abstracts in the areas of clinical perimetry, new developments in perimetry and visual psychophysics, imaging, and relevant research in glaucoma, retinal and neuro-ophthalmological diseases. Posters will be exhibited during the entire meeting. The IPS Lecture, the first in IPS history, will by given by Stephen M. Drance, OC, MD.

Technical Exhibition

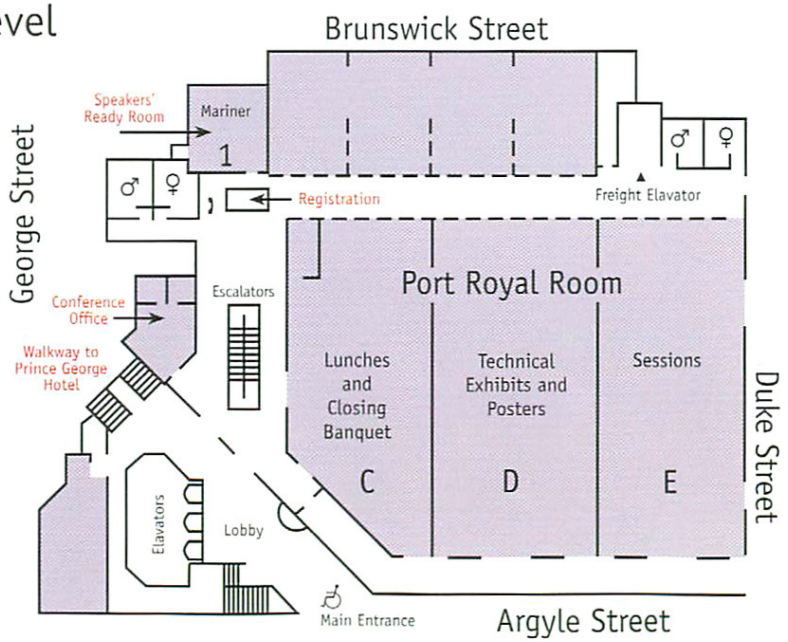
A technical exhibition featuring the latest in perimetric equipment, imaging devices, and pharmaceutical agents will take place during the meeting.

Floor Plan

Cornwallis Level



Port Royal Level



Registration Information

Registration

The on-site registration fee schedule is as follows:

IPS Members	US$325
Non Members	US$400
Residents/Fellows	US$265
Accompanying Persons	US$195

Registration fee for IPS Members, Non members, Residents/Fellows includes:

- Attendance at all scientific sessions and technical exhibit
- Lunch during conference
- Opening Reception and Dinner, Concert and Closing Banquet
- Conference materials, including the program booklet and abstracts.
- Right to purchase tickets for the Halifax City Tour/Peggy's Cove outing, and Pier 21 Tour and Lobster dinner.

Registration fee for Accompanying Persons includes:

- Lunch during conference
- Opening Reception and Dinner, Concert and Closing Banquet
- Right to purchase tickets for the Halifax City Tour/Peggy's Cove outing, Pier 21 Tour and Lobster dinner, South Shore Tour, and Discover the Waterfront Tour.

Please Note:

- Tickets available while quantities last
- Tickets for meal functions must be ordered a minimum of 48 hours in advance

Registration Desk Hours

September 6	12 noon-6 pm
September 7	7:30 am-5 pm
September 8	7:30 am-2 pm
September 9	7:30 am-5 pm

Form of payment

- Credit card (VISA, Mastercard or American Express)
- Institutional (i.e., university, hospital, etc.) cheque or money order payable to IPS 2000

We regret we cannot accept personal cheques

Name Badges

Your name badge must be worn at all times, as it is your entry to all sessions and functions. Name badges will be available for pick up at the registration desk at the conference.

Technical Exhibits

Sponsors

Alcon – Alcon is the world leader in ophthalmology. We offer a full range of glaucoma medications and continue to research and develop new products to treat this disease state. For further information on our products and services, please visit the Alcon web site at www.alconlabs.com.

Heidelberg Engineering – Heidelberg Engineering manufactures the Heidelberg Retina Tomograph II. It is the leading scanning laser technology for measurements of the optic nerve. Clinically proven with over 200 peer-reviewed papers, its technology is designed for early detection of glaucoma and progression monitoring. It is cost effective and easy to use. Other products include the Heidelberg Retina Angiograph and the Heidelberg Retina Flowmeter.

Interzeag AG – Today Interzeag celebrates 25 years of Octopus perimetry. The Octopus 101 is the only 90° full field perimeter capable of performing both static and Goldmann kinetic perimetry. With its direct projection optics, the Octopus 123 is the number one in central field perimetry. Both Octopus perimeters offer a choice of three threshold strategies—the Normal (4-2-1dB) Strategy, the Dynamic Strategy and Tendency Oriented Perimetry. With TOP the test duration is reduced to less than 2:30 min.

Pharmacia & Upjohn – Located in Mississauga, Ontario, Pharmacia & Upjohn is a global research-based pharmaceutical company with primary areas of focus in ophthalmology, cancer, women's health, infectious diseases, urology and critical care. At our booth this year we will be displaying the latest information on Xalatan and Healon 5.

Zeiss Humphrey/Welch Allyn – The broad Zeiss Humphrey product lines include solutions for glaucoma, retina,refractive and surgical applications and through our alliance with Welch Allyn, developers of the patented FDT, we take pride in being in the forefront of the most dynamic technological developments, changing the way doctors treat and manage ocular disease.

Exhibitors

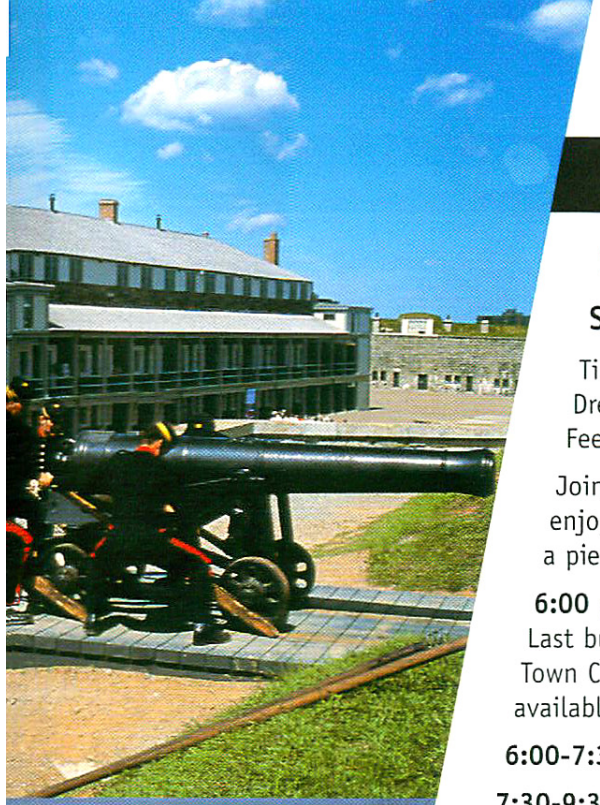
Allergan Inc. – Allergan Inc. headquartered in Irvine, California, is a technology-driven, global health care company providing eye care and specialty pharmaceutical products worldwide.

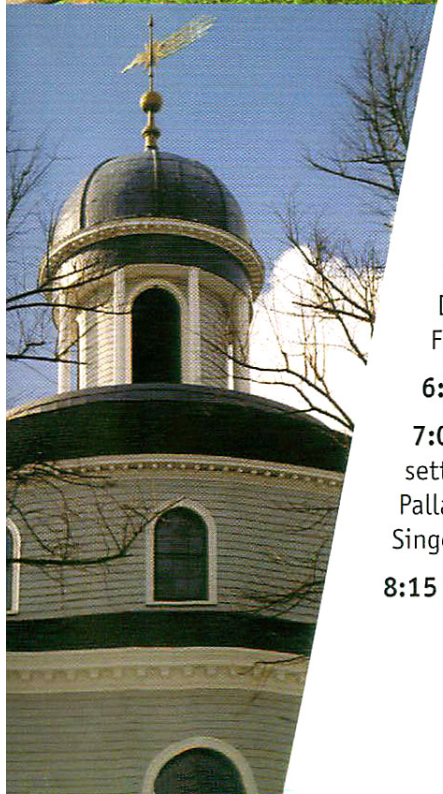
Merck Frosst – Merck Frosst Canada & Co. is Canada's leading research-based pharmaceutical company and a recognized leader in the treatment of glaucoma. Scientists at the Merck Frosst Centre for Therapeutic Research discovered, in the 1970s, the first beta-adrenergic blocking agent used in the treatment of glaucoma. In the 1990s, Merck Frosst brought to the Canadian market the first topical carbonic anhydrase inhibitor and, more recently, Merck Frosst combined these two agents in a single, more convenient formulation. For more than a century Merck Frosst has helped improve the quality of life of Canadians and people around the world, by developing medicines that help alleviate pain and prevent diseases.

Oculus Optikgeräte Gmbtt – Oculus is presenting three state of the art perimeters, the Twinfield full field perimeter, the Centrefield perimeter with fields to 70° and the new Easyfield compact static perimeter which offers full, fast and suprathreshold strategies in a small package, with no moving parts, and which meets the Goldmann standards of a 30 cm radius bowl and 10 candela background luminance while weighing less than 16 pounds. Please visit our booth for a personal demonstration.

Exhibit Schedule

September 7	08:00 – 18:00
September 8	08:00 – 14:00
September 9	08:00 – 14:00





Social Program

September 6, 2000

Storming the Fortress – Opening Reception and Dinner on Citadel Hill

Time: 6:00-10:00 pm
Dress: Casual – Sweater/light jacket and flat shoes recommended
Fee: Included in registration

Join us as we "Storm The Fortress" and officially open the 14th Visual Field Symposium. Delegates will enjoy a reception and dinner inside Halifax's famous fortress – the Citadel. Step back in time and discover a piece of Halifax's history. Historical reenactments and guided tours are all part of the evening.

6:00 pm Buses will depart from the main entrance of the World Trade & Convention Centre on Argyle St. Last bus departs at 6:30. Should you miss the bus you may simply walk straight up the hill towards the Old Town Clock and take the stairway to the Fortress. For anyone who requires to leave early a bus will be available to return to the WTCC, Prince George Hotel or Delta Halifax Hotel.

6:00-7:30 pm Reception, Tours and demonstration by 78th Highlanders

7:30-9:30 pm Dinner with the background music of the Celtic Harps of Ardyth and Jennifer. Following dinner the artists will provide a short concert featuring songs and music from their most recent recording.

9:30 pm Buses will return to Prince George Hotel and the Delta Halifax Hotel

September 7, 2000

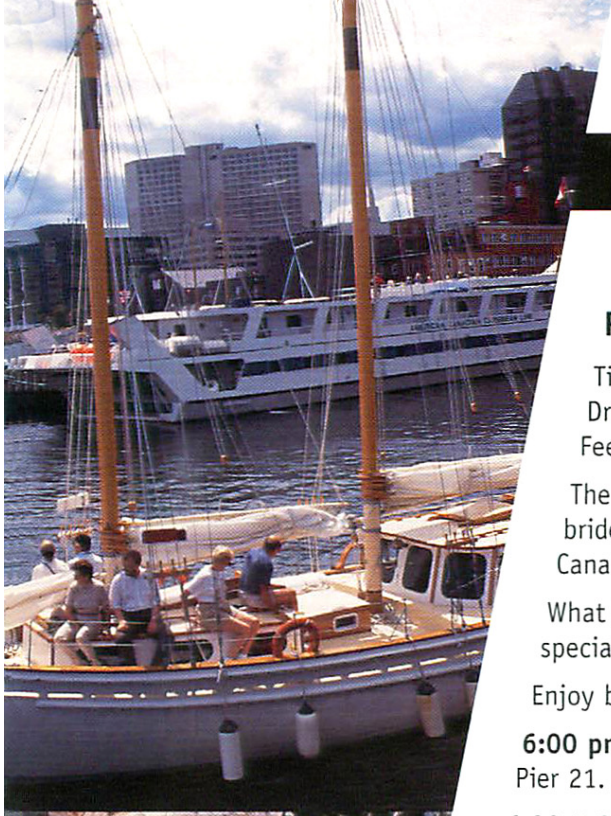
An Evening of Music at Saint George's Round Church

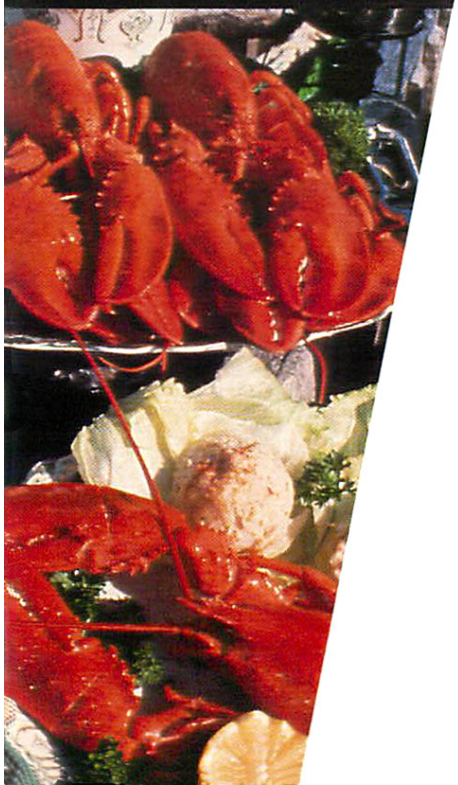
Time: 7:00-8:00 pm
Dress: Casual
Fee: Included in registration

6:30 pm Buses will depart from the main entrance of the World Trade & Convention Centre on Argyle St.

7:00-8:15 pm You are invited to enjoy an evening of fine Renaissance and Baroque music in a historical setting. Saint George's Round Church was built in 1800 and is an elegant example of a wooden circular Palladian church. Music will be performed by members of Symphony Nova Scotia and the Halifax Camerata Singers. Proceeds to benefit the Saint George's Restoration Fund.

8:15 pm Buses return to Prince George Hotel and Delta Halifax Hotel





Social Program

September 8, 2000

Pier 21 Tour and Maritime Lobster Dinner

Time: 6:00-10:00 pm – Lobster Dinner at Pier 22
Dress: Casual – Non slip shoes are recommended
Fee: US$75.00

The evening will begin with a tour of Pier 21 – the site where 1.6 million immigrants, refugees and war brides saw Canada for the first time. This National Historic Site has been transformed into a testament to Canada's profoundly emotional immigration experience.

What better way to end the day than a traditional lobster feast at Pier 22. Enjoy the Nova Scotian specialty with traditional Maritime entertainment.

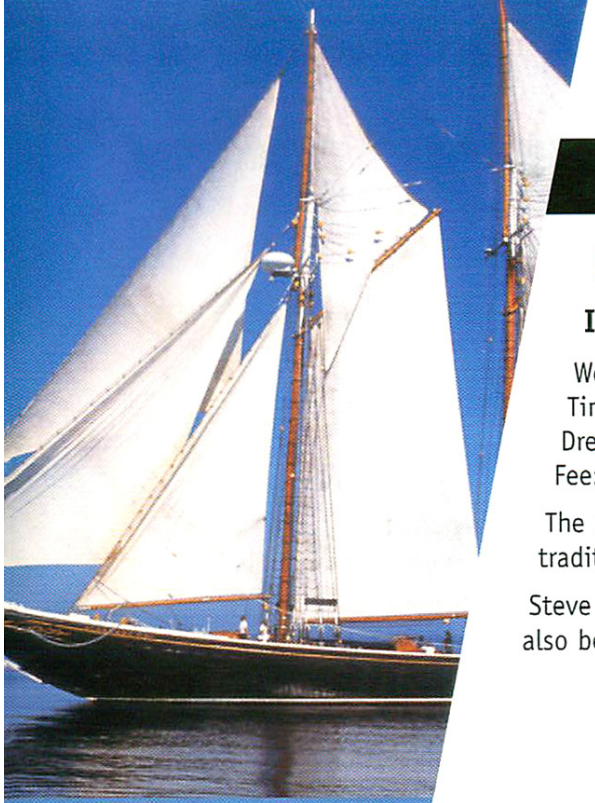
Enjoy both the afternoon and evening events for US$95.00.

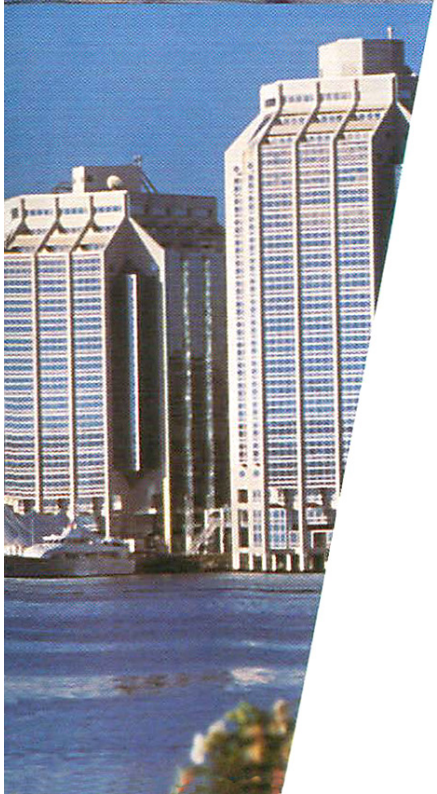
6:00 pm Buses will depart from main entrance of World Trade & Convention Centre on Argyle St. to go to Pier 21.

6:00-7:30 pm Reception at Pier 21

7:30-10:00 pm Dinner and entertainment with Gordon Stobbe Trio and Celtic entertainers, Lochaber

10:00 pm Buses return to Prince George Hotel and Delta Halifax Hotel





Social Program

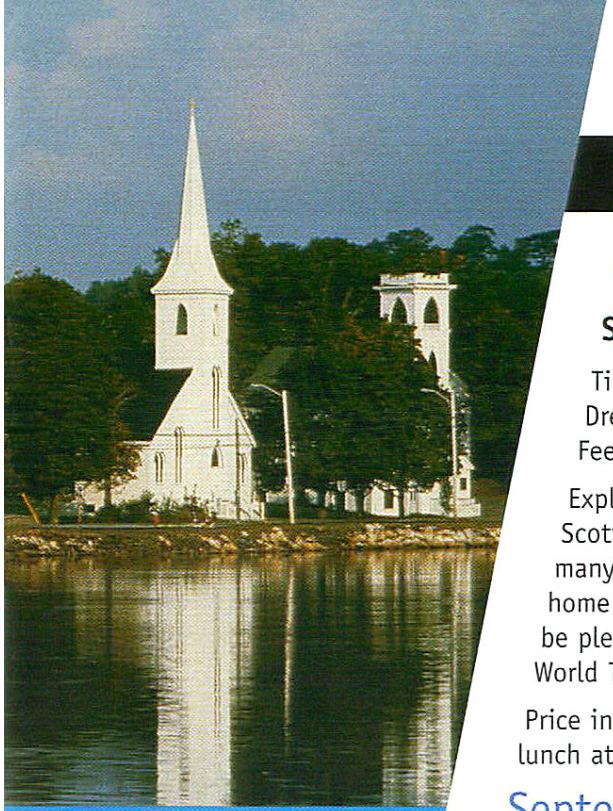
September 9, 2000

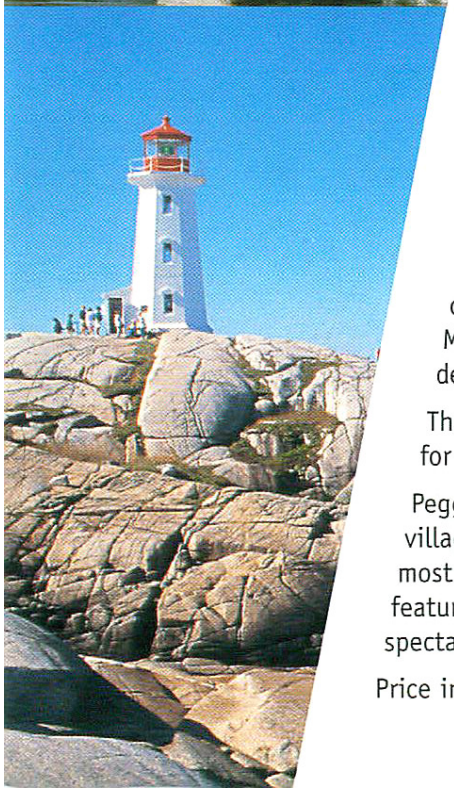
IPS Closing Banquet with Traditional National Singing

World Trade and Convention Centre
Time: 7:00-11:00 pm
Dress: Business attire
Fee: Included in registration

The 14th International Perimetric Annual Meeting will conclude with a gala dinner followed by traditional national folk singing.

Steve Dooks, one of Halifax's most popular pianists will provide background music during dinner and also be available to accompany those who wish to use his talents to support their presentations.





Accompanying Persons' Program

September 7, 2000

South Shore Tour

Time: 9:00 am-4:00 pm
Dress: Casual. Walking shoes and sweater/light jacket recommended.
Fee: US$60.00

Explore the fishing villages and the rugged coastal beauty of Nova Scotia on this all day tour along Nova Scotia's South Shore. Visit Mahone Bay, famous for its three historical churches along the waterfront and many unique craft shops. Enjoy Lunenburg, recognized in 1996 as a UNESCO World Heritage Town and the home port of the famous schooner *Bluenose II* as well as the Fisheries Museum of the Atlantic. There will be plenty of time to explore, shop and enjoy lunch. Buses will depart from the main entrance of the World Trade and Convention Centre.

Price includes: transportation, guide, on-site coordinator, Fisheries Museum admission and a three course lunch at the Boscowan Inn.

September 8, 2000

Halifax City Tour/ Peggy's Cove

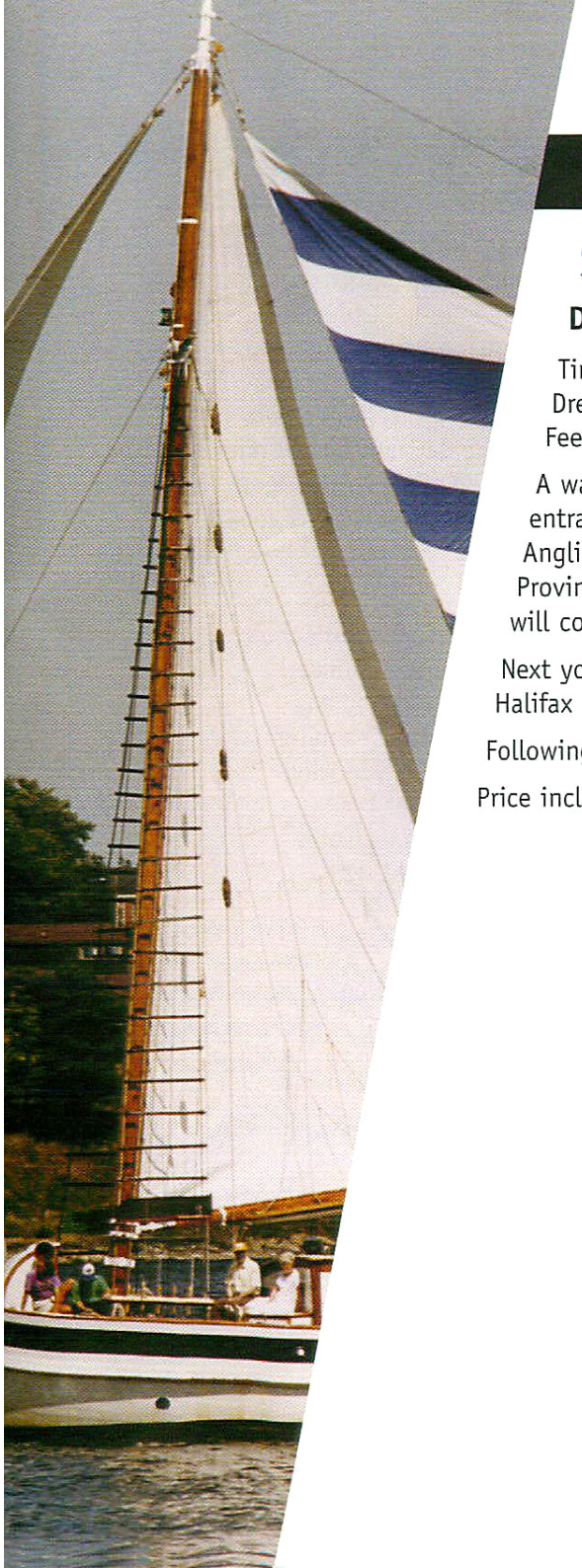
Time: 12:30-5:00 pm
Dress: Casual – Sweater/light jacket and flat shoes recommended
Fee: US$35.00

This historical ride through the streets of Halifax will introduce you to one of North America's most unique and captivating destinations. Hear of the days of rum-running and privateering, the Titanic connection and the exploits of heroism during the Halifax Explosion in 1917. Sites visited include the Maritime Museum of the Atlantic and the memorial to the victims of the Halifax Explosion. Buses will depart from the main entrance of the World Trade and Convention Centre.

The tour will then take you through the downtown area, and the residential districts before leaving town for Peggy's Cove via the Northwest Arm area.

Peggy's Cove has been an authentic working fishing village for well over 150 years. The picture postcard village on the rugged Atlantic shoreline stands on rock above the crashing surf. The lighthouse is the most photographed in the world and the only one in North America to house a post office. The coastline featuring a spectacular glacial outcropping of granite, is famous for pirates, shipwrecks, rum running and spectacular sunsets. There will be plenty of time for exploring.

Price includes: transportation, guide, on-site coordinator, admission to the Maritime Museum



September 9, 2000

Discover the Waterfront Tour

Time: 10:00 am-1:00 pm
Dress: Casual
Fee: US$40.00

A walking tour of Halifax's historical downtown will start this half day excursion. Starting at the main entrance of the World Trade and Convention Centre, you will visit St. Paul's Church – the oldest Anglican Church in Canada. Next, enjoy Halifax City Hall and the history of Province House – site of the Provincial Legislature. A stroll through the quaint shops and heritage buildings of Historic Properties will complete this hour long tour.

Next you will board the *Mar II*, a 75-foot wooden sailing vessel. The hour long cruise will take you to Halifax Harbour and the beautiful North West Arm.

Following the sail, lunch will be served at Salty's, a popular waterfront restaurant.

Price includes: guide, sailing cruise and three course lunch.

Pre- and Post Conference Tours

Prince Edward Island (2 days)
Discover one of the world's greatest islands on this fun-filled tour from Halifax. After a short ferry ride, you'll soon see what sparked Lucy Maud Montgomery's imagination to pen the romantic novel "Anne of Green Gables". Pass by beautiful farmlands with hundreds of hectares of lush green fields of grains and potatoes growing in rich PEI soil. Visit the Green Gables House, PEI National Park and Beaches, Charlottetown City tour, Woodleigh Replicas, Musical "Anne", PEI Preserves Factory, enjoy a traditional lobster lunch and travel the world's longest multi-span bridge.

Whale Watch and Puffin Tour (5 hours)
So much to Sea! A fully regulated passenger boat will take you out onto St. Margaret's Bay in search of whales, puffins and natural beauty. Tour includes trained and experienced naturalists to help you enjoy your three hour marine adventure.

Titanic Tour – The Halifax Connection
(2 hours)
When the Titanic sank 750 miles east of Halifax on April 15, 1912, Halifax served as the base for the Titanic recovery operation and received the bodies of 209 victims. This tour will move you with accurate historical facts and information on how Halifax became forever connected to the tragic event. Tour includes a visit to the Maritime Museum of the Atlantic, which has a permanent display of artifacts recovered by the cable ships.

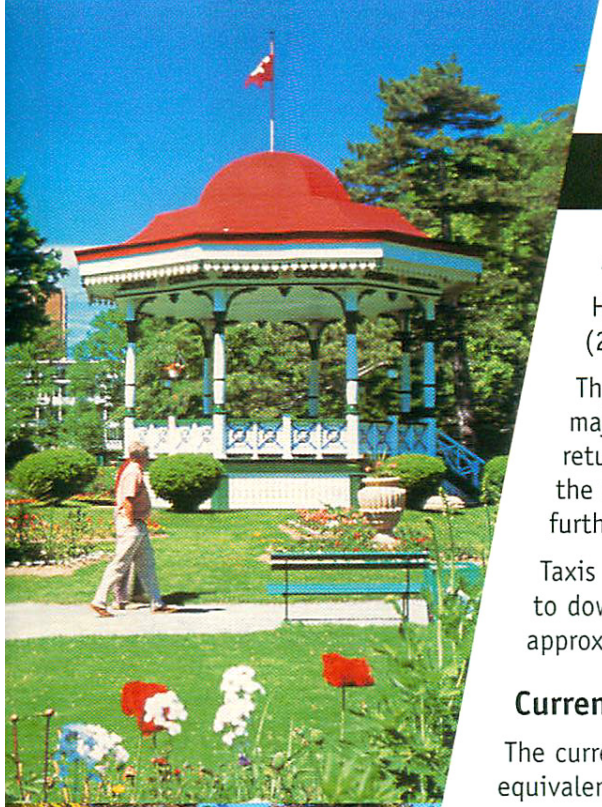
Cape Breton Cabot Trail Tours

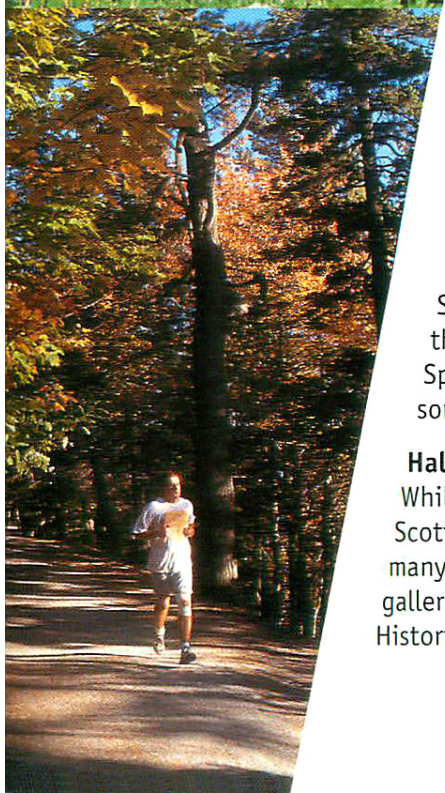
Scenic Rail Tour (3 days)
This tour combines a tour of the famous Cabot Trail with a day on board the Bras d'Or – VIA Rail's new first class sightseeing train from Sydney to Halifax. Enjoy an escorted tour which includes the Ceilidh Trail, whale watching boat tour, the famous Cabot Trail, the Cape Breton Highlands National Park, Baddeck, the Alexander Graham Bell Museum and Sydney. Return to Halifax on board VIA Rail's Bras' d'Or, a day long scenic rail journey where stops are made along to way for sightseeing and photos. All accommodations and meals are included.

Cabot Trail Tour (3 days)
Explore the beauty of Cape Breton's famous Cabot Trail on this three day tour. Visit the Alexander Graham Bell Museum in Baddeck and enjoy an Eagle Watching Boat Tour. Discover the beauty of Cape Breton Highlands National Park as you wind along the Cabot Trail. Go back in time at the Fortress Louisbourg. This reconstruction recreates one fifth of the town of 1744 and is filled with history and reenactments.

Cabot Trail Tour (2 days)
Discover the famous Cabot Trail on this exciting 2-day tour. Visit the Acadian community of Cheticamp where you will embark on a whale watching boat tour (weather permitting). Drive along the Cabot Trail, one of the world's most scenic drives and visit Cape Breton National Historic Park where stops are made at the numerous look offs of the rugged coastline. You will also visit Baddeck and the Alexander Graham Bell Museum.

For departure times, rates and reservations please contact Atlantic Tours Gray Line at (902) 425-9999 or toll free 1-800-565-7173 (from anywhere in North America). You can also visit their website at www.atlantictours.com





General Information

Airport Transportation

Halifax International Airport is about 35 km (21 miles) from downtown Halifax.

The Airport bus drops passengers off daily at all major Halifax hotels (CDN$12 one-way, CDN$20 return), beginning at 6:30 am. The last bus leaves the airport at 11:15 pm. Call (902) 873-2091 for further information.

Taxis are available at the airport with a transfer time to downtown Halifax of 25 minutes at an approximate cost of CDN$40.00

Currency and Banking

The currency is the Canadian dollar (CDN$, equivalent to 0.70 cents US at time of printing).

Many major international banks or their agencies have branches in Halifax. Normal banking hours are 9:00 am-4:00 pm. ATMs are widely available.

Major credit cards are commonly accepted for shopping, in restaurants and entertainment venues.

Shopping

Shopping in Halifax is a unique experience – from the fine shops on the waterfront to the charm of the Spring Garden Road area. There is certainly something for everyone.

Halifax Waterfront including Historic Properties

While shopping on the waterfront you will find Nova Scotian souvenirs, excellent quality apparel and many unique gifts. There are outdoor kiosks, galleries, gift shops and restaurants. Stores in The Historic Properties are open seven days a week.

Spring Garden Road Area

The Spring Garden Road area is home to restaurants, sidewalk cafes, a variety of shops and the Public Gardens.

Spring Garden Place Shops is located on Spring Garden Road and is home to 25 shops and services including boutiques, unique gifts and tempting foods. The shops are open Monday to Wednesday 9:00 am-6:00 pm, Thursday and Friday 9:00 am-9:00 pm and Saturday 9:30 am-5:30 pm.

Park Lane is situated across the street from Spring Garden Place Shops and contains specialty retailers for clothing, giftware, home furnishings, art, etc. It also includes a multi-screen cinema. Park Lane is open Monday, Tuesday, Wednesday and Saturday 9:30 am-6:00 pm, Thursday and Friday 9:30 am-9:30 pm.

Scotia Square

Scotia Square is located in the heart of downtown Halifax. With great views of Halifax, Scotia Square has been remodeled and renovated to meet your every need. Scotia Square has a variety of stores, the Delta Halifax Hotel and Atlantic Canada's newest and largest open food court. Hours of operation are Monday-Wednesday & Saturdays 9:30 am-6:00 pm. Thursday & Friday 9:30 am-9:00 pm

Electrical Supply

Electricity in Canada is 110 V. Most hotels have a limited number of adaptors to convert appliances from 220 V to 110 V.

Weather

September in Halifax brings an average daily high of 19°C and a low of 10°C.

OPENING CEREMONY 08:15–08:30

Session 1: Screening
Moderators: David Henson
Raymond LeBlanc

08:30 1/O M. Fingeret, E. Smith, L. Reminick, C.A. Johnson
Frequency doubling perimetry as a screening tool in the general population

08:45 2/O A. Iwase, E. Izumi, R. Shiraki, G. Tomita, Y. Kohno, Y. Kitazawa
The efficacy of frequency doubling technology in glaucoma screening

09:00 3/P M. Hussein, M. Fingeret, J. Liebmann, R. Ritch, G. Harmon, C.A. Johnson
The evaluation of screening frequency doubling technology perimetry, intraocular pressure and optic nerve assessment in a community based glaucoma screening

09:05 4/P Y. Trigo, W.E. Sponsel
Frequency doubling technology at the 1998 & 1999 AAO sponsored VFW eye screenings

09:10 5/O E. Mutlukan
A portable visual field screener using back-projection method with a laser pointer in diagnosis of glaucomatous field loss

09:25 6/P U.M. Anicho, D. Yager, W.H. Swanson
The design of a simple, low cost perimetry instrument for visual field screening in developing regions of the world

09:30 7/O P.H. Artes, D.B. Henson, S.J. Chaudry
Pointwise pass/fail criteria in suprathreshold perimetry

DISCUSSION 09:45-10:00

COFFEE 10:00-10:30

Session 2: Clinical Glaucoma
Moderators: Richard Mills
Yoshiaki Kitazawa

10:30 1/O Y. Yamazaki, T. Oshida
Influence of myopic refraction and intraocular pressure on visual field defect in normal tension glaucoma

10:45 2/O E. Ansari, J.E. Morgan, R.J. Snowden
Diffuse loss of contrast sensitivity in early glaucoma

11:00 3/P M. Osako, N. Horikoshi, H. Goto, T. Okano, M. Usui
Comparison of detection of abnormality using frequency doubling technology in primary open angle glaucoma (POAG) and normal tension glaucoma (NTG)

11:05 4/O T.W. Kim, C. Hong, H.J. Park, Y.Y. Kim
Visual field prognosis after multiple glaucomatocyclitic crisis attack

11:20 5/P R. Rejdak, J. Toczokowski, M. Kaminski, Z. Stelmasiak, P. Grieb
Effects of oral citicoline treatment on visual field and cortical responses in glaucoma (6 month followup)

11:25 6/P L. Quaranta
The effect of Ginkgo biloba extract on visual field damage in normal tension glaucoma

11:30 7/P T.W. Kim, C. Hong, H.R. Jung
Relationship between peripheral anterior synechiae and visual field damage in primary angle-closure glaucoma

11:35 8/O M. Iester
Comparison of optic disc parameters between normal tension glaucoma (NTG) and visual field matched high tension glaucoma (HTG)

DISCUSSION 11:50-12:00

12:00-12:30 IPS Lecture
S.M. Drance: Is There a Future for Perimetry?

LUNCH 12:30-13:30

O = Oral Presentation
P = Poster Presentation

Session 3: Methods & Applications
Moderators: Pamela Sample
Ulrich Schiefer

13:30 1/O K. Yamada, M. Osako, S. Osako, T. Okano, M. Usui
The effectiveness of glaucomatous visual field test using size 1 stimulus

13:45 2/O R.S. Harwerth, E.L. Smith, III
The intrinsic noise of contrast sensitivity perimetry

14:00 3/P E.R. Bowering, G.R. LaRoche
The development of the central visual field in normal children as measured by high-pass resolution perimetry (HRP)

14:05 4/O W.H. Swanson, J.R. Lynn, R.L. Fellman, L. Baidelman, M.W. Dul
Minimizing test-retest fluctuation in chromatic perimetry

14:20 5/P G. Kohler, M. Zulauf, A. Haas, F. Körner, D. Mojon
Influence of refractive correction on peripheral visual field

14:25 6/P M.W. Dul, S.E. Fischer, W.H. Swanson
Effects of mean luminance on frequency-doubling perimetry in healthy eyes

14:30 7/P R. Schwabe, R. Vonthein, U. Schiefer, N. Ata, J. Paetzold, T.J. Dietrich
Modeling the hill of vision

14:35 8/O L. Frisén
Student's visual field map

DISCUSSION 14:50-15:00

COFFEE 15:00-15:30

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Session 4: Retina
Moderators: John Flanagan
William Swanson

15:30 1/O J.M. Enoch, S. Choi
Receptor alignments and visual fields in high myopia

15:45 2/P E. Gandolfo, F. Morescalchi, S. Formenti, F. Danieli, S. Sancassani
Central retinal sensitivity assessment after laser grid fotocoagulation extended near to the foveal area

15:50 3/P E.M. Mironova, G.A. Shilkin
The influence of new medicine OKOVIDIT on visual field of patients with senile macular dystrophy

15:55 4/P T. Murata, Y. Nishida, K. Yoshida, T. Sawada, K. Kani
Evaluation of retinal sensitivity in subretinal hemorrhage using an automated fundus perimeter

16:00 5/P C. Matsumoto, E. Arimura, S. Hashimoto, S. Takada, S. Okuyama, Y. Shimomura
Quantification of metamorphopsia in patients with epiretinal membranes

16:05 6/O C. Hudson, B.M. McCreesh, G. Silvestri, J.G. Flanagan
ROC analysis of conventional perimetry and SWAP for patients with clinically significant diabetic macular edema

16:20 7/P K. Yoshida, Y. Nishida, T. Murata, T. Sawada, K. Kani
Evaluation of retinal sensitivity in retinal vascular disease using automated fundus perimetry

16:25 8/P W.M Verduin, P. Hardus, T.T.J.M. Berendschot, J.S. Stilma
Relation between vigabatrin medication and visual loss measured with the surface method

16:30 9/O E. Gandolfo, F. Morescalchi, A. Franzoni, S. Sancassani, S. Formenti
Perimetric follow-up in young patients chronically receiving vigabatrin

16:45 10/O J.M. Wild
Characteristics of Vigabatrin-attributed visual field loss

DISCUSSION 17:00-17:15

Session 5: Objective Measures
Moderators: Ronald Harwerth
Ted Garway-Heath

08:15 1/O S.L. Graham, A.I. Klistorner
A new method of objective VEP perimetry

08:30 2/O R.H. Kardon, D.C. Hood, M. Wall, S.J. Givre
Comparison of threshold and multifoca VEP perimetry following recovery of optic neuritis

08:45 3/O M.A. Bearse Jr., R.L. Stamper, E.E. Sutter
Detection of glaucoma with a new multifocal ERG paradigm

09:00 4/O B. Fortune, C.A. Johnson, G.A. Cioffi, Y. Kondo, K. Mochizuki, Y. Kitazawa
Does the multifocal electroretinogram (mERG) provide a topographic, objective measure of ganglion cell function in glaucoma?

09:15 5/P J.G. Flanagan, N. Hutchings, H. Liu, S.L. Hosking, C.R. Ethier
Canny edge detection of scanning laser tomography images of the optic nerve head

09:20 6/P R.H. Kardon, S. Anderson, S. Hong
Integration properties of the pupil light reflex as a function of stimulus area of the visual field

09:25 7/P G. Takahashi, M. Ida, M. Yoshida, T. Koike, K. Kitahara
Examination of retinotopy in the primary visual cortex with functional magnetic resonance imaging

09:30 8/P P. Brusini, C. Tosoni, F. Miani
Retinal thickness measurements in chronic glaucoma and ocular hypertension

09:35 9/O N. Hutchings, J.G. Flanagan, C. Hudson, T. Holmes
Image processing of SLT images to determine retinal thickness

DISCUSSION 09:50-10:00

COFFEE 10:00-10:30

O = Oral Presentation
P = Poster Presentation

Session 6: Structure/Function
Moderators: Marcelo Nicolela
Stephen Drance

10:30 1/O D.F. Garway-Heath, G.E. Holder, F.W. Fitzke, R.A. Hitchings
Relationship between electrophysiological, psychophysical and anatomical measurements in glaucoma

10:45 2/P C. Frenander, P. Åsman
Visual field changes in Graves' disease with and without infiltrative ophthalmology

10:50 3/P S.A. Newman
Automated perimetry and recovery of optic nerve function

10:55 4/O R. Asaoka, M. Osako, K. Tachibana, T. Okano, M. Usui
Relation between retinal nerve fiber layer thickness and static visual field in glaucoma

11:10 5/O J. Piltz-Seymour, J.E. Grunwald, J. DuPont
Optic nerve blood flow in patients with asymmetric visual field and optic disc damage

11:25 6/P E.J. Casson, K.F. Damji, R. Buhrmann, J. Wu, K.C. Shah, S.K. Gupta
Comparing visual field vs optic nerve head criteria for diagnosis of glaucoma

11:30 7/P Y. Inoue, T. Inoue, K. Hayashi, T. Maeda
Central visual impairment in glaucoma

11:35 8/O F.A. Ennis, R.S. Anderson, S.J.A. Rankin
Correlation of Tumbling-E resolution perimetry and conventional perimetry with optic disc dimensions in early glaucoma

DISCUSSION 11:50-12:00

Session 7: New Ideas
Moderators: Evanne Casson
Randy Kardon

08:15 1/O S. Demirel, R. Anderson
Detection and resolution acuity of the short wavelength system in foveal and peripheral vision

08:30 2/P T. Sawada, T. Murata, Y. Nishida, K. Kani
A new automated perimeter that can display fundus images on a screen

08:35 3/P G.M. Verdon-Roe, M.C. Westcott, A.C. Viswanathan, F.W. Fitzke, R.A. Hitchings
Optimum number of stimulus oscillations for motion displacement detection in glaucoma

08:40 4/P M.C. Westcott, G.M. Verdon-Roe, A.C. Viswanathan, F.W. Fitzke, R.A. Hitchings
Optimum stimulus duration for motion displacement in glaucoma

08:45 5/O S.J. McKinnon, D.K. Sanford, G.R. Paris, Y. Trigo, W.E. Sponsel
Frequency doubling perimetry using isoluminant chromatic gratings

09:00 6/O M. Gonzalez-Hernández, A. Pareja Ríos, M. Rodríguez, M. González de la Rosa
Combined spatial resolution and contrast perimetry in normal subjects

09:15 7/P Z.F. Veselovskaya, T.V. Mygal
Multi-fixation campimetry in complex examination of patients with diabetes mellitus

09:20 8/P A.J. Anderson, A.J. Vingrys
The effect of blur on lumincance-pedestal flicker thresholds

09:25 9/P A. Schnyder, O. Bergamin, A. Hagopian, A. Schötzau, J. Flammer, M. Zulauf
The ramp stimulus in pupil perimetry: first results

09:30 10/O U. Schiefer, J. Schiller, T.J. Dietrich, J. Paetzold, R. Vonthein
Evaluation of advanced visual field loss with computer-assisted kinetic perimetry (C-AKP)

DISCUSSION 09:45-10:00

COFFEE 10:00-10:30

Session 8: Comparing Techniques
Moderators: Chris Johnson
Enrico Gandolfo

10:30 1/O F. May, J.P. Renard, J.C. Rigal-Sastourné, F. Meyer, C. Dot, J.F. Maurin
FDT C20.5 versus Humphrey 24.2 in hypertonia and open angle glaucoma

10:45 2/P M. Iester, A. Mermoud, C. Schnyder
Frequency doubling technique and Octopus perimeter indices

10:50 3/P G. Milano, G.C.M. Rossi, A. Djeugoue, A. Clemente
Comparison among achromatic automated perimetry short-wavelength-automated-perimetry and frequency doubling technology in early glaucoma diagnosis

10:55 4/O C.T. Langerhorst, L.L. Carenini, D. Bakker, T.J.T.P. van den Berg
Comparison of B/Y and FDT in glaucoma patients, glaucoma suspects and normals

11:10 5/P M. Altieri, M. Iester, P. Capris, C.E. Traverso, P. Vittone, M. Zingirian
High pass resolution perimetry and frequency doubling technology indices in glaucomatous patients and ocular hypertension subjects

11:15 6/O M. Wall, K. Woodward
Frequency doubling perimetry in hemianopias

11:30 7/O C. Matsumoto, S. Okuyama, S. Takada, E. Arimura, S. Hashimoto, Y. Shimomura
The influence of cataracts on perimetric threshold values in light-sense perimetry and flicker perimetry

11:45 8/P W.L. Membrey, F.W. Fitzke
Effect of lens opacitiy on white on white perimetry, frequency doubling perimetry and motion detection perimetry

11:50 9/P A.C. Viswanathan, M.C. Westcott, G.M. Verdon-Roe, F.W. Fitzke, R.A. Hitchings
Validation of a new motion test

11:55 10/P E. Ayala, M. Sánchez, M. González-Hernández, M. González de la Rosa
White-white, blue-yellow and blue-blue perimetry in normal subjects

12:00 11/P C. Birt, F. Malam
High-pass resolution vs. light sensitivity perimetry in ocular hypertensives: a prospective study of sensitivity

12:05 12/O P.A. Sample, J. Williams, C.F. Bosworth, C. Vasile, R.N. Weinreb
Identifying the best parameters for abnormality in various types of perimetry

DISCUSSION 12:20-12:35

LUNCH & Business Meeting 12:35-13:30

Session 9: Progression
Moderators: Douglas Anderson
Mario Zingirian

13:30 1/O G. Corallo
Monitoring 'healthy' areas of visual field in glaucoma patients with deep perimetric defects

13:45 2/O H. Suzumura, K. Harasawa
The rate of progression of visual field defects in normal tension glaucoma

14:00 3/P E. Gramer, D. Spata
Staging of the glaucomatous disease using frequency doubling technology

14:05 4/P M. Sehi, N. Hutchings, J.G. Flanagan
Evaluation of methods for determining glaucomatous visual field progression

14:10 5/P E. Vesti, P.G.D. Spry, B.C. Chauhan, C.A. Johnson
Sensitivity differences between real patient and computer simulated visual fields

14:15 6/P C.T. Langerhorst, A.B. Safran
Progressive shrinkage of the visual field during automated perimetry following traumatic brain injury

14:20 7/O Y. Kono, S. Liou, A. Iwase, T. Yamamoto, Y. Kitazawa
Agreement of Humphrey glaucoma change probability and pointwise linear regression analyses on glaucomatous visual field progression

14:35 8/O P.G.D. Spry, C.A. Johnson, A.B. Bates, B.C. Chauhan
Discriminatory power of pointwise linear regression for detection of glaucomatous visual field defect progression

DISCUSSION 14:50-15:00

COFFEE 15:00-15:15

Session 10: New Thresholding Strategies
Moderators: Chris Hudson
Steven Newman

15:15 1/O C.A. Johnson, A. Turpin, P.G.D. Spry
Development of a maximum likelihood procedure for short wavelength automated perimetry (SWAP)

15:30 2/P J. Rodríguez, L. Cordovés, A. Abreu, M. González de la Rosa
Top-flicker fluctuation in ocular hypertension

15:35 3/P M. González de la Rosa, F. Mesa, V. Arteaga, M. González-Hernández
Second generation of the tendency oriented perimetry algorithm: top+

15:40 4/P N. Hutchings, S.K. Archibald, J.A. Killoran, J.G. Flanagan
Performance evaluation of Octopus standard and TOPS algorithms

15:45 5/O J. Morales, S.M. Brown
The feasibility of short automated static perimetry in children

16:00 6/P B. Wabbels, R.O.W. Burk, G. Kolling
CLIP: a new strategy in automated static perimetry

16:05 7/P C.L. Prokopich, M. Fingeret, J.G. Flanagan
The validity and repeatability of SITA threshold estimation algorithms versus standard full threshold testing in glaucoma

16:10 8/O E. J. Casson, W.A. Sanford
Impact of fatigue on full threshold and SITA algorithms

16:25 9/O J.G. Flanagan, J.A. Killoran, S.K. Archibald, C.L. Prokopich, N. Hutchings
Short- and long-term fluctuation for SITA standard and SiTA fast

DISCUSSION 16:40-17:00

O = Oral Presentation
P = Poster Presentation

1/O FREQUENCY DOUBLING PERIMETRY AS A SCREENINGTOOL IN THE GENERAL POPULATION

M. Fingeret[1,2], E. Smith[1], L. Reminick[1], C.A. Johnson[3]
[1]Department of Veterans Affairs New York Harbor Health Care System, Brooklyn, NY; [2]SUNY College of Optometry, New York, NY, [3]Devers Eye Institute, Portland, OR

Introduction: Visual field screening examinations have not routinely been performed as part of a comprehensive examination. The Welch Allyn Humphrey Frequency Doubling Technology (FDT) perimeter can screen the central 200 field in 45-60 seconds per eye. The purpose of this study is to evaluate the FDT's ability to detect visual field defects when used as a screening instrument and correlate its findings with Humphrey Threshold 24-2 perimetry.

Methods: 100 consecutive patients (196 eyes) presenting for a comprehensive eye examination at a Veterans Hospital underwent a FDT C 20-5 visual field screening examination. All patients were male with a mean age of 65 years (range 35-81 years). Individuals failing the FDT 20-5 screening test were examined with a Humphrey 24-2 SITA Standard threshold visual field. In addition, 20% of the group passing the screening underwent 24-2 Humphrey threshold perimetry. The FDT screening field's probability plot was overlaid on the Humphrey 24-2 field's total deviation pattern diagram. A comparison of flagged locations for each form of perimetry was made on a quadrant-by-quadrant basis.

Results: Of the 100 patients (196 eyes) screened, 23% (45 eyes) had abnormal FDT 20-5 screening visual fields. 84% (38 eyes) of the 45 abnormal screening fields demonstrated a field abnormality on Humphrey 24-2 SITA perimetry (84% sensitivity) that correlated with the screening field. 27 of the 29 eyes with a normal screening field (93% specificity) were also full on SITA standard threshold perimetry.

Conclusions: A population of elderly individuals presenting for routine comprehensive ophthalmic examinations found that 23% (45 eyes) had some form of visual field deficit upon a FDT screening examination. Upon further follow-up with Humphrey 24-2 SITA standard threshold fields, 84% (38 eyes) of defects were confirmed. FDT perimetry appears to be an efficient method to detect visual field defects in the general population.

2/O THE EFFICACY OF FREQUENCY DOUBLING TECHNOLOGY IN GLAUCOMA SCREENING

A. Iwase[1], E. Izumi[1], R. Shiraki[2], G. Tomita[3], Y. Kohno[4], Y. Kitazawa[2]
Department of Ophthalmology,; [1] Tajimi Municipal Hospital, Tajimi, Japan; [2] Gifu University School of Medicine, Gifu, Japan; [3] The University of Tokyo School of Medicne,Tokyo, Japan; [4] Gifu Municipal Hospital, Gifu, Japan

Purpose: In ophthalmological health screenings, we evaluated the efficacy of Frequency Doubling Technology (FDT) to detect glaucomatous optic nerve damages.

Methods: FDT testing with C-20 screening program was performed for 300 eyes of 300 subjects as a part of health screenings in a public health care program of Tajimi Municipal Hospital. Besides FDT, subjects also underwent fundus photography with a nonmydriatic fundus camera, noncontact tonometry and slit-lamp biomicrosopy in the same day. We judged as abnormal when a patient showed FDT results with one or more test-points with probability score P<0.01, an intraocular pressure > 20mmHg, or glaucomatous fundus changes such as nerve fiber layer bundle defects, thinning of the neuroretinal rim, or enlargement of the optic disc cupping. Such subjects judged as abnormal were asked to revisit our clinic to examine intraocular pressure with an applanation tonometer, visual field with a Humphrey automated perimeter.

Results: Eleven of 18 eyes (61.1%) diagnosed as glaucoma and 2 of 5 ocular hypertensive eyes had abnormal FDT results. Conclusion: FDT screening program may be useful to screening some glaucoma eyes , particulary in ocular hypertensive eyes.

3/P THE EVALUATION OF SCREENING FREQUENCY DOUBLING TECHNOLOGY PERIMETRY, INTRAOCULAR PRESSURE AND OPTIC NERVE ASSESSMENT IN A COMMUNITY-BASED GLAUCOMA SCREENING

M. Hussein[1], M. Fingeret[2,3], J. Liebmann[4], R. Ritch[4], G. Harmon[5], C.A. Johnson[6]
[1]Dept Prevent Med, SUNY HSC, Stony Brook, NY [2];DVAMC Brooklyn, NY; [3]SUNY Optometry, [4]NYEE NY, NY; [5]Dept Ophthal NY Presbyterian Med Center NY, NY; [6]Devers Eye Inst, Portland, OR

Introduction: To a)present pilot results of a community-based glaucoma screening, and b)evaluate the sensitivity and specificity of the tests used in the screening for the detection of glaucoma.

Methods: 195 individuals (age: mean + sd = 53.24 + 17.5 years) completed the screening. The screening consisted of frequency doubling perimetry, Goldmann applanation tonometry, and undilated optic nerve assessment. Those failing any portion of the screening were asked to undergo a follow-up examination that consisted of Humphrey 24-2 threshold perimetry, Goldmann tonometry and dilated optic nerve assessment. For every individual failing the screening, the next individual who passed all portions (normal) was asked to undergo the same examination. Thirty-six failures and 6 normals consented to this later examination. Positive criteria for screening were any of the following: 1) IOP greater than 21 mm Hg in either eye, 2) signs of glaucomatous optic nerve damage (focal rim loss, cupping equal to or greater than 0.6, flame hemorrhage), or 3) two points flagged at any probability level on C 20-5 FDP screening test for two repeated tests, with one point repeatable on both.

Results: 89 individuals failed (45.6%) the initial screening with 6 individuals (3.1%) not determined. For the failures, 39 (43.8%) failed FDP alone, 14 (15.7%) failed ON alone and 6 (6.7%) failed IOP alone. The remaining 30 (33.7%) failed a combination of FDP, ON and/or IOP tests. Irrespective of the method of screening, sensitivity was calculated at 62.2% with 95% CI: (44.8%, 77.5%). Sensitivity (and 95% CI) for screening IOP alone, FDT alone and ON alone, were 33.3% (0.8%, 90.6%), 53.3% (26.6%, 78.7%) and 66.7% (22.2%, 95.7%), respectively. Sensitivity of the combination of FDP with either IOP or ON was calculated at 75% (43%, 95%). Specificity (and 95% CI) for FDP, IOP and ON was calculated as 83.3% (36.9%, 99.6%), although based on very small numbers.

3/P Continued

Conclusions: The precision of sensitivity and specificity estimates was affected by sample size and selection issues. Overall, the combination of FDP with either IOP or ON provided the most sensitive screening measures. However, these screening tools require additional evaluations with larger sample size and performed in community based setting which offer different results when conducted in office-based evaluations. In particular the assessment of specificity requires further study in a population.

4/P FREQUENCY DOUBLING TECHNOLOGY AT THE 1998 & 1999 AAO SPONSORED VFW EYE SCREENINGS

Y. Trigo, W.E. Sponsel
University of Texas Health Science Center, San Antonio, Texas

Purpose: To determine in large screening environments the effectiveness of Frequency Doubling Technology (FDT) to correctly identify individuals with abnormal visual fields.

Methods: All participants underwent an FDR C 20-1 screening test in both eyes. Participants missing 2 or more stimuli in either eye (Quigley, AJO, 1998) immediately underwent a Humphrey visual field (HVF) 24-2 SITA fast test.

Results: A total of 1071 (748M;323F) participants were screened. 574 (421M;153F) in 1998, and 497 (327M, 170F) in 1999. In 1998 73/574 (13%) and in 98/497 (20%) failed the FDT. Among the FDT failures 95% demonstrated HVF visual field defects in 1998, and 94% FDT failures demonstrated HVF loss in 1999.

Conclusion: The importance of having perimetry testing available at eye screenings was demonstrated both in 1998 and in 1999. The rapid, portable FDT has proven to be a good screening tool.

5/O A PORTABLE VISUAL FIELD SCREENER USING BACK-PROJECTION METHOD WITH A LASER POINTER IN DIAGNOSIS OF GLAUCOMATOUS FIELD LOSS

E. Mutlukan
Ophthalmology, UMASS Memorial Health Center, Worcester, MA 01655

A portable instrument was designed using a semitranparent plastic screen overlaid by a plain sheet of paper indicating stimulus locations up to 30 degree eccentricity and allowing recording of seen and missed stimuli. The suprathreshold single intenstity test stimuli were projected briefly behind the paper by the examiner using a standard laser pointer light at each test location. Patient answers were marked on the paper after each stimulus exposure. Eighty-four right and 75 left eyes of 90 consecutive patients with glaucoma or suspicion of glaucoma and past experience in reliable perimetry were examined. A minimum of three adjacent abnormal locations with P>0.5% or one locations with P<0.5% on total deviation results were considered an abnormality. One missed location on the screening campimeter were regarded abnormal. Point-by-point comparisons were performed between the automated and screening field results. The sensitivity, specificity and 50% detection thresholds in terms of Humphrey VFA decibels for the laser pointer stimulus were established for the right and left eyes separately. 45 eyes (26 right and 19 left; age 61+16 yrs., min. 19, max. 90 yrs) had normal and 114 eyes (58 right and 56 left; 66+13 yrs, min.19, max.90 yrs.) had abnormal Humphrey VFA results. The screening method produced a normal result in all eyes with normal automated perimetry, yielding 100% Specificity and 100% Positive Predictive Value. The detection Sensitivity was 38% when MD>-3dB, 50% when MD was between –3 to –5 dB and 100% when MD<-5dB. The 50% detection threshold for the 2 Hz. 3.5mW. red laser pointer stimulus was 22 dB on Humphrey VFA. A simple, low-cost, hand-held field screener utilizing back-projected laser pointer light as the suprathreshold test stimulus enables the detection of moderate and advanced visual field loss.

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P = Poster Presentation

6/P THE DESIGN OF A SIMPLE, LOW COST PERIMETRY INSTRUMENT FOR VISUAL FIELD SCREENING IN DEVELOPING REGIONS OF THE WORLD

U.M. Anicho, D. Yager, W.H. Swanson
Glaucoma Institute, SUNY State College of Optometry, New York, NY

Our simple, low cost perimetry instrument is intended to provide economically emerging populations with a means to assess visual function in patients with disorders causing peripheral vision loss, such as glaucoma. The perimeter is powered by a random access slide projector, outfitted with a shutter control to project suprathreshold standardized Goldmann-type stimuli (200 ms duration) onto a uniform adapting tangent screen background (10 cd/m2). The test field is a configuration of 56 test points covering the central 27-degree field. We compared the results of our screening paradigm with a similar screening protocol (program C-76) in conventional perimetry with the Humphrey Field Analyzer, model 630 (HFA) in both patients with glaucoma (n=16) and age-matched normal controls (n=15). The mean number of points missed by the patients was 13.5 (±12.3) for the new perimeter versus 8.8 (±9.7) for the HFA, while for the normal controls the mean points missed was 1.6 (±1.5) for the new perimeter versus 1.6 (±1.4) for the HFA. Areas under ROC curves were 0.95 for the new perimeter and 0.68 for the HFA. The data suggest that our novel, budget-conscious instrument might provide an effective method for visual field screening.

7/O POINTWISE PASS/FAIL CRITERIA IN SUPRATHRESHOLD PERIMETRY

P.H. Artes, D.B. Henson, S.J. Chaudry
School of Medicine (Ophthalmology), Manchester, UK

Purpose: To investigate the influence of different pass/fail criteria on the performance (precision and accuracy) of single-stimulus suprathreshold perimetry.

Methods: Computer simulation was used to establish the 5% and 95% confidence limits for the number of defective test points in a 52 point suprathreshold test. The number of 5 dB suprathreshold presentations per location as well as the pass criterion (stimuli seen/presented) were varied between 1 and 5. The number of truly defective (8 dB defect) visual field locations of the simulated observers was varied between zero and 25. The response variability of the simulated observers was based on empirical frequency-of-seeing curves and response error data.

Results: The criterion used in many suprathreshold tests (HFA, Henson VFA) is geared towards specificity and leads to an underestimation of field loss. Different pass criteria (2/3, 3/5) result in higher sensitivity to defects and a more accurate estimation of loss with little or no loss of specificity.

Conclusions: The performance of suprathreshold visual field screening techniques can be improved by applying different pass/fail criteria without increasing the total number of presentations over that of modern threshold strategies.

Supported by the Wellcome Trust (PHA, DBH) and Guide Dogs for the Blind Association (SJC, DBH).

Notes

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1/O INFLUENCE OF MYOPIC REFRACTION AND INTRAOCULAR PRESSURE ON VISUAL FIELD DEFECT IN NORMAL TENSION GLAUCOMA

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Purpose: To investigate the influence of myopic refractive error and IOP on the VF defect in NTG.

Methods: One hundred and two NTG patients were classified into the three groups according as spherical equivalent refraction; 33 patients with hyperopia (_0D), 60 with physiological myopia (0D>__-8D), 9 with pathological myopia (-8D>). All subjects had 24-hour IOP measurements (diurnal IOP), axial-length measurement, and the VF examination with HFA program 30-2. The influence of refraction and IOP on the difference of VF defect was evaluated in both eyes.

Results: In physiological myopia group, the more damaged eyes showed significantly higher lowest-diurnal IOP and more myopic refraction compared with the less damaged eyes, the differences of axial-length revealed significant correlation to those of VF defect, and those of spherical equivalent refraction and lowest-diurnal IOP were used in the multiple correlation model as factors significantly related to those with VF defect.

Conclusions: Both myopic refractive error and IOP may contribute to the VF defect in NTG with myopia.

2/O DIFFUSE LOSS OF CONTRAST SENSITIVITY IN EARLY GLAUCOMA

E. Ansari, J.E. Morgan, R.J. Snowden[1]
Dept. Ophthalmology, University of Wales College of Medicine, Cardiff; Dept. of Psychology, Cardiff University, Cardiff, U.K.

Purpose: To establish if there is a significant diffuse loss of contrast sensitivity throughout the visual field in patients with early glaucoma using temporally modulated sinusoidal gratings.

Methods: Six subjects with primary open angle glaucoma (POAG) with early nasal field loss (24-2 programme of the Humphrey Field Analyser ,San Leandro, CA) were tested with sinusoidal gratings of 0.5 cycles/degree drifting at 8 Hz. The test locations were distributed in 15-degree steps at 15-45 degrees nasal to fixation in the horizontal meridian and 15-60degrees temporally. Other locations were at 15 degrees superotemporal, inferotemporal, superonasal and inferonasal to fixation. The POAG group was compared to a group of six age-matched normal controls. All patients had clear media and corrected visual acuity of 20/30 or better.

Results: The mean difference in age between the two groups was 1.6 years ($p>0.5$). The mean deviation values (mean; standard deviation; range) in the POAG group were -2.12dB; 2.39dB; -0.39 to -6.27dB. Contrast sensitivity was reduced at all location tested in the glaucoma group that were classed as normal by automated Humphrey perimetry, though this failed to reach significance ($F[1,10]=0.4$, $p=0.5$) when all test locations were compared. When the test location corresponding to the superonasal defect was excluded, contrast sensitivity was reduced at all locations in the glaucomatous eyes (mean reduction 3.8dB; SD 1.7dB). When all test locations are considered this failed to reach significance (ANOVA-$F[1,10]=2.1$, $p=0.2$). However, comparison of matched locations in the normal and glaucomatous eyes showed significant reductions in sensitivity superior and inferior to the optic disc (t-test, $p<0.001$).

Conclusion: In patients with early POAG, contrast sensitivity testing revealed diffuse, mild reduction in sensitivity across the visual field. At this stage of the disease, these defects are not detected using conventional automated perimetry.

3/P COMPARISON OF DETECTION OF ABNORMALITY USING FREQUENCY DOUBLING TECHNOLOGY IN PRIMARY OPEN ANGLE GLAUCOMA (POAG) AND NORMAL TENSION GLAUCOMA (NTG)

M. Osako, N. Horikoshi, H. Goto, T. Okano, M. Usui
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Larger ganglion cells are selectively damaged in chronic ocular hypertension, and it is thought that the magnocellular system would be damaged in the early stage of glaucoma. Although the main cause of POAG is mechanical damage to the optic nerve due to high IOP, other factors may be related to the pathology of NTG. We compared the detection of abnormality by the frequency doubling technology (FDT) in POAG and NTG. Subjects comprised 29 eyes of 29 POAG patients and 27 eyes of 27 NTG patients. No significant differences in mean age, mean deviation (MD) and pattern standard deviation (PSD) measured by Humphrey Field Analyzer (HFA) were observed between the two groups. All subjects underwent C-20 program of FDT. The correlation for MD between HFA and FDT was shown as $=0.60x-2.7$ ($r=0.78$) in the POAG group, and $y=0.59x+0.6$ ($r=0.81$) in the NTG group. Although the average MD in the POAG group was significantly lower than that in the NTG group ($p<0.05$), no significant difference in average PSD was found between the two groups. In early glaucoma cases (MD_-5dB), a larger proportion of cases in the POAG group showed lower significance level of MD detected by FDT than that by HFA, compared to the NTG group. At some test points mainly at the temporal periphery in FDT, the mean sensitivities were lower for the POAG group than the NTG group, whereas no significant difference was found at all points in HFA. FDT detected more sensitively visual field abnormalities in POAG than those in NTG. This indicates that the degree of damage to My-cell is different between POAG and NTG.

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4/O VISUAL FIELD PROGNOSIS AFTER MULTIPLE GLAUCOMATOCYCLITIC CRISIS ATTACK

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Purpose: To investigate the visual field (VF) prognosis and it's possible risk factors after multiple glaucomatocyclitic crisis attack.

Method: VF with Humphrey VF Analyzer and medical records of 12 patients with unilateral multiple glaucomatocyclitic crisis attack were reviewed.

Results: The mean interval from the first attack to the last VF examination was 7.0 years (range 0.5 to 15.1 years). Glaucomatous VF defect was developed in 6 patients.

Age at the first attack, systemic hypertension, diabetes mellitus, the interval from the first attack to VF examination, mean intraocular pressure (IOP) during attack, peak IOP during attack, and number of attacks were not associated with the development of VF defect.

Conclusion: Our results suggest that glaucomatous VF defect may develop in half of the patients with multiple glaucomatocyclitis crisis attack during the mean follow-up period of 7 years. The development of VF defect seems to be not related with IOP profile and known risk factors of glaucoma.

5/P EFFECTS OF ORAL CITICOLINE TREATMENT ON VISUAL FIELD AND CORTICAL RESPONSES IN GLAUCOMA (6 MONTHS FOLLOW UP).

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In glaucoma patients citicoline injected intramuscularly has been reported to induce the objective response consisting of a significant improvement of visual field sensitivity assessed perimetrically (Pecori Giraldi J. et al., 1989) and the visual pathway function assessed by the analysis of visual evoked potentials (Parisi V. Et al., 1999). The aim of the present study was to evaluate the long term effects of the oral treatment with citicoline on visual field and cortical responses in patients with glaucoma.

15 POAG patients were treated orally with citicoline at the dose of 500 mg twice daily given in six cycles, each consisting of 14 consecutive days separated by two-week no-treatment intervals. For the assessment of the baseline data, cortical responses were evaluated by recording of visual evoked potentials (VEPs) and three visual field (VF) measurements with a Humphrey automated perimeter were performed. Program 30-2 and SITA-Standard strategy were used. Evaluation of VEP parameters (P100 latency and P100 amplitude) was performed every 2 month. VF was examined every month.

70% of the patients showed significant improvement in the visual field during the treatment comparing mean deviation (MD) values before and after the treatment with CDP-choline. In 30 % of the group visual field sensitivity increased slightly during first 3 months and remained at stable level at all subsequent examinations. The oral treatment with citicoline induced significant improvement of VEP latency ($p.<0.05$) and amplitude ($p.=0.05$).

6/P THE EFFECT OF GINKGO BILOBA ON VISUAL FIELD DAMAGE IN NORMAL TENSION GLAUCOMA.

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Purpose: To determine the effect of Ginkgo biloba extract (GBE) on visual field (VF) damage of patients affected by normal tension glaucoma (NTG).

Methods: Prospective randomized, placebo-controlled, double-blind, cross-over study; n= 30 eyes of 15 patients affected by bilateral NTG. All patients received 40 mg GBE three times a day for 4 weeks. VF's (Humphrey, 24-2 strategy) done at baseline and at the end of each phase of the study, were evaluated for modifications.

Results: Ten eyes of five patients showed a marked improvement of VF after GBE administration.

Conclusion: GBE administration improves VF damage in some NTG patients.

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7/P RELATIONSHIP BETWEEN PERIPHERAL ANTERIOR SYNECHIAE AND VISUAL FIELD DAMAGE IN PRIMARY ANGLE-CLOSURE GLAUCOMA

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Peripheral anterior synechiae (PAS) has long been regarded as a clue to diagnose chronic angle-closure glaucoma. The degree of chronic obstruction with PAS along the angle circumference may be related to intraocular pressure (IOP) elevation and subsequently visual field (VF) damage in primatry angle-closure glaucoma (PACG). We evaluated the relationship between PAS and VF damage in 17 eyes, 17 patients with PACG who had visual acuity > 20/40 at the VF examinations and reliable VF results (Humphrey C24-2). PAS degrees were graded from 0 to 5 (Grade 0 = no PAS; 1=1~20%; and 5=81~100% of the angle circumference was occluded) and the VFs were classified as none (grade 0), minimal (grade 1), moderate (grade 2), and severe (grade 3) defects. There were 3 males and 14 females and the mean age was 62(8.9 years. The Spearman's correlation coefficient between the VF severity and the grades of PAS was 0.372 (confidence interval: -0.132~+0.723, .p=0.14). Our result showed that there was no correlation between the severity of VF damage and PAS. PAS may not be considered a clue to a chronicity in PACG patients.

8/O COMPARISON OF OPTIC DISC PARAMETERS BETWEEN NORMAL TENSION GLAUCOMA (NTG) AND VISUAL FIELD MATCHED HIGH TENSION GLAUCOMA (HTG)

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Background: Two years ago in a similar study no optic nerve head (ONH) differences was found between NTG and HTG even when the entire group was divided on the basis of disc area size. The entire groups was divided into subgroups on the basis of disc area because from the leterature NTG ONHs seeemed to be larger than HTG ONHs. During the IPS discussion of the paper, it was asked to try to divide the entire group on the basis of visual field.

Aim: To determine optic disc parameters in NTG and visual field matched high tension glaucoma.

Methods: One hundred and 50 patients were recruited for this study. For each patients only one eye was chosen. All the patients were classified as POAG and divided into two subgroups based on the IOP measurements obtained in at least three measurements. All the patients were assessed by confocal scanning laser and Humphrey perimeter, 30-2 program. For statistical purpose visual field indices such as MD, PSD, CPSD and SF were used. POAG group was divided into three subgroups based on the visual field. Visual field morphology was analyzed for each ONH.

Results: 110 patients had HTG and 40 had NTG. No difference was found between optic disc parameters of HTG and NTG even when the entire groups were divided into subgroups based on visual field indices.

Conclusion: No difference was found for ONH parameters between HTG and NTG. Similar visual field morphology were found between HTG and NTG.

Notes

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1/O THE EFFECTIVENESS OF GLAUCOMATOUS VISUAL FIELD TEST USING SIZE I STIMULUS

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Most visual field testing performed on automated static perimeters is usually performed using Goldmann size III stimulus. Although it is reported that the defect of visual field in the early stage of glaucoma was more detectable with size I stimulus than with size III stimulus, the relationship of retinal sensitivities between size I and III had not been documented well. We investigated the detectability of defects in the visual field using size I stimulus and the amount of spatial summation (III-I) in glaucomatous visual fields. Subjects are 14 glaucomatous eyes with mild visual field defects (average MD: -3.7±2.5dB) and 11 normal eyes. Program 24-2 of the Humphrey Field Analyzer was performed on all subjects using size I and III stimuli. Based on the mean sensitivity and standard deviation at each coordinate in normal persons, z-scores for retinal sensitivities and spatial summation were calculated in glaucoma patients (absolute scotomas were excluded). The mean z-score of retinal sensitivities for size III was less than that for size I in the abnormal lesions, in which retinal sensitivities for size III were less than the 95% confidence interval; whereas that for size I is significantly less than that for size III in the normal lesion (paired t-test, $p<0.01$). Regarding the regression line for spatial summation (III-I), spatial summation tends to increase with an increase of sensitivities of size III stimulus ($y=0.33x+0.6$, $r=0.28$). Pathological spatial summation in normal lesions was found more frequently than in abnormal lesion. These results suggest that size I stimulus is more sensitive in detecting the abnormality than size III stimulus in the lesion of mild visual field defects. The perimetry using the size I target is thought to be effective as supplementary diagnostic method to detect and follow the early glaucomatous visual field defects.

2/O THE INTRINSIC NOISE OF CONTRAST SENSITIVITY PERIMETRY

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PURPOSE: Significant visual field defects from experimental glaucoma are observed earlier with narrow-band Gabor patch stimuli than with conventional perimetry. However, the defects do not appear to be correlated with losses of ganglion cells, but rather, may reflect intrinsic noise caused by glaucoma. The purpose of the present studies was to further characterize the role of noise in contrast sensitivity perimetry.

METHOD: Visual sensitivity and intrinsic noise were studied in monkeys with unilateral, laser-induced, elevated intraocular pressures. Visual fields were obtained by conventional perimetry and by contrast sensitivity perimetry using Gabor patch stimuli. The properties of intrinsic noise were evaluated by the effects of dynamic visual noise on contrast thresholds and slopes of psychometric functions, fitted by Weibull functions.

RESULTS: The analysis of noise showed that the threshold elevations often were proportional to corresponding increases in noise and the increased noise was sufficient to explain the visual defects. However, the slopes of the underlying psychometric functions remained constant or became steeper with deeper field defects indicating that the intrinsic noise was better explained by uncertainty rather than neural noise.

CONCLUSIONS: To some extent, the visual field defects measured with Gabor patch stimuli may be explained by criterion effects associated with increased uncertainty. It is not clear whether these effects reflect the specific properties of the stimuli or can be generalized to other perimetry procedures.

3/P THE DEVELOPMENT OF THE CENTRAL VISUAL FIELD IN NORMAL CHILDREN AS MEASURED BY HIGH-PASS RESOLUTION PERIMETRY (HRP)

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We collected age norms for children tested with the CentRing program of HRP in order to better understand the normal development of the central visual field in children and to provide a standard against which to compare findings in abnormal conditions. This is the first published report of young children.

HRP was used to assess the central 6° of the monocular visual field of normal 5-, 6-, 7-, 8-, 9-, 10-, 11-, and 12-year-old children ($n = 201$), and adults ($n = 26$). After completing a visual screening exam (i.e., visual acuity, fusion, and stereopsis) to determine normality, subjects completed three tests: test of the first eye, the fellow eye, and a retest of the first eye.

There were significant differences in performance across age, field location, and test. Six-year-olds were less sensitive than adults, at least in some areas of the field. Moreover, performance improved with practice.

Sensitivity may improve in early childhood, possibly reflecting slow development of the visual pathways subserving central vision. However, other findings also might limit the usefulness of the CentRing program of the HRP technique in the clinical setting.

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4/O MINIMIZING TEST-RETEST FLUCTUATION IN CHROMATIC PERIMETRY

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At IPS 1998 we (Pearson et al.) showed that chromatic tests of peripheral visual function could have low short-term and long-term fluctuation even in glaucomatous defects. We have adapted these methods to chromatic perimetry, using 3 factors to reduce variability: large chromatic stimuli, analysis of psychometric functions, and control of subject criterion. We implemented these factors in a CRT-based testing system for routine clinical testing, using red, blue and white increments on a white pedestal. Subjects included 32 normal volunteers and 40 patients with glaucoma. For the normal group, between-subject variability was low (SD < 2.4 dB); age effects were small and were significant only for blue increments (0.6 dB/decade). For both patient and normal groups there was no learning effect between test and retest ($t < 0.83$, $p > 0.42$). Within-subject variability was low (SD < 2.2), and was not significantly different for patient and normal groups ($F < 1.21$, $p > 0.27$). To allow rapid testing of multiple locations while preserving all 3 factors, we adapted Lynn & Tate's spatial localization method.

5/P INFLUENCE OF REFRACTIVE CORRECTION ON PERIPHERAL VISUAL FIELD

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Purpose: To determine the influence of refractive errors onperipheral visual field thresholds in automated, static perimetry.

Methods: In 47 subjects (age rage: 16 to 49 years) thedifference of perimetric thresholds was tested without and with contactlens correction in the peripheral visual field using a custom made program(Stimulus size 3) with the automated perimeter Octopus 2000 R. Refractive errors ranged −16.75 to +12.5diopters. We tested 64 test locations on 3 concentric rings (30°,40°, 50°).

Results: A clinical relevant influence of −0.75 dB /diopter and −0.40 dB / diopters was found for the myopic middle ring andthe hyperopic inner ring respectiverly ($p<0.001$, $R2=0.18$ and $p<0.001$,$R2=0.18$, respectively).

Conclusions: A clinical significant association betweenrefractive error and differential light sensitivity exist in the peripheralvisual field. Contact lens wear is recommended when performing automatedperimetry of the periphery in patients with higher refractive errors.

6/P EFFECTS OF MEAN LUMINANCE ON FREQUENCY-DOUBLING PERIMETRY IN HEALTHY EYES

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Frequency doubling perimetry (FDP) measures contrast sensitivity for high-frequency flicker. Since contrast sensitivity for high-frequency flicker is highly dependent on mean retinal illuminance, it is particularly susceptible to effects of prereceptoral factors such as pupil size and lenticular density. To evaluate the potential effects of prereceptoral factors on FDP results, we manipulated retinal illuminance in healthy eyes by two methods: dilating the pupil and inserting neutral density filters in front of the eye, and instilling pilocarpine to cause pupillary miosis. For each method we tested a group of normal subjects, using the full threshold N-30 program. To reduce effects of test-retest variability, a minimum of four tests were administered to each subject. Data gathered with dilation and neutral density filters (N=11) were fit with contrast-versus-retinal illuminance functions, which indicated that for these relatively young subjects a pupil size of 2 mm would yield a mean deviation (MD) 4 dB smaller than for an 8 mm pupil, with little effect on pattern standard deviation (PSD). Data with and without pilocarpine (N=10) showed a significant effect of pupil size on MD ($t=2.4$, $p < 0.04$), but not on PSD ($t=0.51$, $p > 0.62$). The magnitude of the decrease in MD was highly correlated with the size of the miotic pupil ($r=-0.84$, $p < 0.002$).

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7/P MODELING THE HILL OF VISION

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In textbooks the central cross-section of the hill of vision of a healthy subject is usually illustrated by a smooth function exhibiting certain characteristics like the central peak, the blind spot and some plateau at an intermediate eccentricity. In contrast to that perimetric investigations are often based on a pre-specified coarse grid. Reference values are restricted to those locations resulting in models which do not allow for an overall smooth description of the hill of vision, so far. The approach presented here provides a parameter-saving model which suitably fits to age dependent local reference values obtained from a healthy population of more than eighty subjects equally spread over seven decades of age. Moreover, this model reflects nicely the above mentioned smooth characteristics, emphasizes their change during the aging process, and is essential for all spatially adaptive perimetric procedures.

8/O STUDENT'S VISUAL FIELD MAP

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Most visual field maps have been designed from researchers' perspectives and are not easily understood by students and patients. For the latter groups, there is much to speak for maps that show no more than test locations and the severity of any damage. Pies or dials or similar familiar symbols seem ideal. Symbols should be shown in one size only, deliberately hiding actual thresholds from view. Levels of damage can be represented in several ways. In the case of resolution perimetry, it is appropriate to involve inverted thresholds, which reflect numbers of working neural channels. Each inverted threshold can be validly expressed as a percentage of reference data for that location. Then, the deficit equals For example, if the inverted minimum angle of resolution in a given location is 30 per cent of age-adjusted average normal, the deficit equals 70 per cent, and the cut-out slice is set to the latter value.

The problem of inter-individual variability can be illustrated and partially managed by means of "bonus" slices. These are shown wherever observed results are better than reference and are sized as . By adjusting the reference, i e, the height of the threshold surface, bonus slices can be made to disappear. Concomitantly, any defect slices will expand and new defects may appear. Such an adjusted map reflects the subject's "true" damage.

Notes

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1/O RECEPTOR ALIGNMENTS AND VISUAL FIELDS IN HIGH MYOPIA

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There are characteristic tractional strains occurring on both sides of the blind spot in high myopia. These effects are greater the more the myopia, and the longer the axial length of the eye. Employing a Stiles-Crawford apparatus, we tracked inferred photoreceptor alignments across the retina in the region of the horizontal raffé and extended testing beyond the blind spot and the fixation point. Here, we also assess visual fields in the affected retinal areas. As controls, normal subjects were tested. We seek a coherent picture of these aspects of high myopia. (For reference, see ARVO Abstracts # 2277, 2278,Ft. Lauderdale, FL, May, 2000.)

2/P CENTRAL RETINAL SENSITIVITY ASSESSMENT AFTER LASER GRID FOTOCOAGULATION EXTENDED NEAR TO THE FOVEAL AREA

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Purpose: To evaluate the long term effect on the central retinal sensitivity of laser grid treatment extended close to the foveal avascular zone.

Methods: A group of 25 diabetic patients treated with an argon laser grid involving the macular area underwent a perimetric assessment after a mean follow up of 4 years. Only stable diabetics were considered. As controls were used a group of normal subjects having the same visus and a group of not treated diabetic patients suffering of macular oedema. Perimetric tests were conducted using the Octopus M2 program and a custom program able to evaluate the central 10° with the Goldmann stimulus size 1.

Results: Treated patients visual field was significantly stable after 4 years. In a number of them it was not possible to detect the laser scotomas using the M2. The custom program proved to be more specific. One patient suffered of subretinal neovascularization caused by the laser. It is debated the filling-in phenomenon, the quality of the vision of such patients and the advantages-disadvantages rate of the perifoveal laser grids.

3/P THE INFLUENCE OF NEW MEDICINE OKOVIDIT ON VISUAL FIELD OF PATIENTS WITH SENILE MACULAR DYSTROPHY

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The research was aimed at studying of the possibility of using OKOVIDIT(for improving of visual functions of patients with senile macular dystrophy (SMD). 47 patients with SMD (dry form) have been treated. Duration of the treatment was 10 days.

For evaluation of the results, static threshold profile perimetry with "Field Analyzer" by "Humphrey" was used as well as traditional methods. The research proved OKOVIDIT(effective to increase visual acuity and to improve visual field (to eliminate central visual field defects, to increase foveal sensitivity from 27.8(3.98 dB up to 31.6(3.75 dB).

Therefore, OKOVIDIT(can be used in complex treatment of senile macular dystrophy due to its ability to improve metabolism and eye blood circulation.

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4/P EVALUATION OF RETINAL SENSITIVITY IN SUBRETINAL HEMORRHAGE USING AN AUTOMATED FUNDUS PERIMETER

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We measured retinal sensitivity in a subretinal hemorrhage for 12 months using our automated fundus perimeter and another ordinary automated perimeter. Our automated fundus perimeter consists of an infrared fundus camera, a target device and a pursuit device. The target device can exactly stimulate the smallest point that we choose on the image of a retina because the pursuit device can detect shifts of the fundus due to eye movement and adjust for them. We measured the retinal sensitivity of the area occupied by subretinal hemorrhage and the area around it. An absolute scotoma was detected all around the hemorrhage area at the early stages. One month later, the sensitivity of the peripheral area where the hemorrhage was absorbed, was improved. Three months later, the sensitivity in that area became much better, but that of the central area was still low. We present the results which were superimposed on the fundus pictures.

5/P QUANTIFICATION OF METAMORPHOPSIA IN PATIENTS WITH EPIRETINAL MEMBRANES

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Purpose: Using a new metamorphopsia chart (M-CHARTS®) developed us, we tried to quantify the degree of metamorphopsia in patients with epiretinal membrane (ERM).

Methods: Our M-CHARTS® had 19 horizontal and vertical dotted lines where dot intervals were between 0.2° (fine) and 2.0° (coarse) of visual angles. As the dot interval was changed from 'fine' to 'coarse' there was noted a decrease in the severity of metamorphopsia. In this study, the maximum visual angle of the dotted lines needed to cause metamorphopsia disappear was measured in 68 eyes of 60 patients with ERM. The metamorphopsia scores were compared with the changes in the scanning laser ophthalmoscope (SLO) images.

Results: In patients with ERM, the metamorphopsia score increased depending on the severity of membrane proliferation classified by SLO images. The scores obtained from the horizontal dotted lines were larger than those of the vertical lines in advanced stages of ERM. They decreased when the ERM was removed by vitrectomy.

Conclusion: The use of M-CHARTS® is a very simple and useful method for evaluating the severity of metamorphopsia in patients with ERM.

6/O ROC ANALYSIS OF CONVENTIONAL PERIMETRY AND SWAP FOR PATIENTS WITH CLINICALLY SIGNIFICANT DIABETIC MACULAR OEDEMA.

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Purpose: To compare the diagnostic test performance of conventional and short-wavelength automated perimetry (SWAP) for patients with clinically significant diabetic macular oedema (DMO).

Methods: The sample comprised 31 normal subjects (mean age 54.87yrs, SD 6.58yrs), 28 patients with clinically significant DMO (mean age 61.14yrs, SD 8.02yrs) and 18 patients with non-oedematous background diabetic retinopathy (DR) (mean age 53.8yrs, SD 9.7yrs). One eye of each volunteer was selected. At each visit, volunteers underwent conventional perimetry and SWAP using HFA program 10-2 (order randomised); the results of the second visit were analysed to minimise learning. A point-wise horizontal hemifield asymmetry analysis was used for SWAP while the pattern deviation plot was analysed for conventional perimetry. Sensitivity and specificity were calculated as a function of the number of contiguous statistically significant stimulus locations ($p<0.05$ & $p<0.005$). The area of the ROC curve was used as an index of diagnostic test performance.

Results: When evaluating specificity for normal subjects, the area of the ROC curve for conventional perimetry was 0.09 and 0.00 for $p<0.05$ and $p<0.005$ stimulus locations respectively; the corresponding values for SWAP were 0.80 and 0.54 respectively. Similar values were attained when calculating specificity for patients with non-oedematous background DR.

Conclusions: SWAP provides a vastly improved level of diagnostic test performance for the detection of patients with clinically significant DMO than that of conventional perimetry. The similarity of SWAP diagnostic test performance when specificity was evaluated for normal subjects and diabetic patients with non-oedematous background DR demonstrates that the SWAP asymmetry analysis is not influenced by other diabetic disease processes.

O = Oral Presentation
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7/P EVALUATION OF RETINAL SENSITIVITY IN RETINAL VASCULAR DISEASE USING AUTOMATED FUNDUS PERIMETRY

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We measured the retinal sensitivity in retinal vascular disease using an automated fundus perimeter that we developed. This fundus perimeter can detect shifts of the retinal image due to eye movement, when viewed with an infrared camera. Therefore all measuring points can be stabilized on the retina and be checked, even if eye movement occurs during perimetry. The subjects were patients who had retinal vascular diseases, such as diabetic retinopathy, branched retinal vein occlusion, and so on. Retinal sensitivity was measured in these subjects using this perimetry, and grid-patterned stimulating points for measurement were projected on the retinal lesion. The results of retinal sensitivity on the stimulus points were overlaid on the subjects' image from fluorescent fundus angiography which as previously taken. Retinal sensitivity was evaluated with these retinal circulation disorders, and it was disclosed that retinal sensitivity in the non-perfusion area had declined.

8/P RELATION BETWEEN VIGABATRIN MEDICATION AND VISUAL LOSS MEASURED WITH THE SURFACE METHOD

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In the last 9 years more than 220 patients with vigabatrin medication were examined by the author (W.M.V) using the V/4 isopter of the Goldmann. A simple and effcient method to calculated the visual field loss in percentage of the surface of the field was developed. From more than 120 patients with a reliable drug-story, the visual field loss was calculate with this method and related to the amount of vigabatrin taken. The results are presented.

9/O PERIMETRIC FOLLOW-UP IN YOUNG PATIENTS CHRONICALLY RECEIVING VIGABATRIN

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Purpose: to evaluate the incidence and the evolution of visual field defects in 24 young epileptic patients that chronically received Vigabatrin for three years.

Methods: three groups were used as controls: 11 young patients taking Valproate, 9 patients on Carbamazepine and 10 young in good health of the same age. Visual field test was performed using the 07 Screening program of the Octopus 101 automated perimeter. The mean follow-up was 1.5 years. Statistical analysis was conducted to compare these four groups and to show any visual field defects correlation with dose, treatment duration and the association with other antiepileptic drugs.

Results: the incidence of visual field defects was statistically higher in young patients taking Vigabatrin. Six boys on Vigabatrin were found to have confirmed bilateral severe visual field defects. None of them were symptomatic. No statistical significant correlation was found with total dose, treatment duration and other drugs association. It was worthy of note the significant improvement of the visual field defects after the withdrawal of the drug in most of the patients. These results show that repair mechanisms for functional retinal disturbance may be more efficient in childhood.

O = Oral Presentation
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10/0 CHARACTERISTICS OF VIGABATRIN-ATTRIBUTED VISUAL FIELD LOSS

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Vigabatrin is a successful drug used for the treatment of epilepsy of partial onset and for infantile spasms. The anti-epileptic properties of vigabatrin are based upon increasing the whole brain concentration of GABA by the irreversible inhibition of GABA-transaminase, the enzyme which catalyses the inactivation of GABA. Vigabatrin is associated with a bilateral overall constriction of the field. The estimates for the prevalence of the field loss range between 29% and 50%. We assessed 25 consecutively presenting patients who had received, or were receiving, vigabatrin. All patients were examined with Program 30-2 and the Full Threshold strategy of the HFA 750 and either with Program 60-4 and the Full Threshold strategy or with the 135-point age-corrected three-zone suprathreshold strategy. In the central field, vigabatrin visual field loss manifested as a steeply bordered bilateral nasal annular defect extending superiorly and inferiorly with relative sparing of the temporal field. In severe cases, the defect was concentric to within approximately 15° from fixation. Visual acuity remained good. The field defect was asymptomatic in almost all patients. Consequently, vigabatrin-attributed field loss will only be detected by interventional perimetry.

Notes

O = Oral Presentation
P = Poster Presentation

1/O A NEW METHOD OF OBJECTIVE VEP PERIMETRY

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Purpose: To investigate a new method of multi-focal pattern visual evoked potential (VEP) recording for objective visual field assessment. To examine the ability of this technique to detect glaucomatous field defects.

Method: A spread spectrum technique was used for stimulus generation, providing different random patterns to each of 58 points extending out to 34° nasally. 100 normals (age 60.1(11.2) and 20 patients with confirmed glaucomatous visual field defects (age 62.2(9.8, mean MD -8.02(5.4) were tested. A multichannel VEP was recorded (four bipolar occipital electrodes, 7 mins/eye) using a cortically scaled pattern stimulus. The amplitude and inter-eye asymmetry coefficient for each point of the field was calculated. For reproducibility 15 normals were each tested on five separate days.

Results: The normals showed consistent signals from all parts of the visual field. Inter-subject variability was 29.1(4.1over all 58 points. Reproducibility within individuals for all 58 test points was 16.3(1.5 (co. var). In 19/20 (95%) glaucomas the Humphrey field defects were detected by the VEP amplitude reductions identifying a cluster of 3 or more points $p<0.05$. In the remaining case with early glaucoma, inter-eye asymmetry analysis identified the field defect. Topographic location was strongly correlated with Humphrey fields.

Conclusions: The multi-focal multi-channel VEP based on the spread spectrum technique can objectively assess the visual field and identify glaucomatous visual field defects.

2/O COMPARISON OF THRESHOLD AND MULTIFOCAL-VEP PERIMETRY FOLLOWING RECOVERY OF OPTIC NEURITIS

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Purpose. To determine whether multifocal-VEP perimetry (MVEP) can detect a clinically recovered episode of optic neuritis as defined by normalization of visual threshold perimetry.

Methods. Patients with either completely recovered optic neuritis (n =10) or recovering optic neuritis (n = 1) were tested with threshold perimetry (SITA 24-2) and MVEP1-3. An active scalp electrode placed 4 cm above the inion was referenced to the inion. The stimulus was a scaled dartboard subtending 37° diameter. Within each of the 60 stimulus elements, a checkerboard pattern was reversed in a pseudo-random fashion utilizing a binary m-sequence and the waveforms were extracted using the second-order kernel. Each eye was tested twice (7 minutes/test). The focal VEP waveforms from each of the 60 stimulus/field locations in the affected eye were compared with those from homonymous locations in the unaffected eye3.

Results. In all recovered subjects but one, threshold perimetry had completely normalized in the eye with a previous episode of optic neuritis. In all subjects but one, MVEP perimetry showed decreased amplitude, increased latency or both in the eye with a previous episode of optic neuritis as compared with the unaffected eye.

Conclusion. Multifocal VEP perimetry reveals objective evidence of recovered optic neuritis. It may be a useful clinical tool for assessing previous or subclinical demyelination, even when the patient has normal perimetry and is unaware of visual deficits.

1.Baseler et al (1998) Electro Cl Neurophysiol; 2.Klistorner et al, (1998) IOVS; 3.Hood et al (2000), IOVS.

CR: None Support: VA Merit Review, Research to Prevent Blindness (unrestricted grant), and the AOS-Knapp Fellowship (Dr. Givre).

3/O DETECTION OF GLAUCOMA WITH A NEW MULTIFOCAL ERG PARADIGM

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Purpose: A new multifocal electroretinogram (mERG) technique was utilized to examine inner retinal response components in glaucoma.

Methods: 103 retinal areas of 22 glaucomatous, 4 suspect and 8 age-matched control eyes were tested using a "global flash" multifocal paradigm (Sutter et al., 1999). The induced component of the first-order mERG was examined in 3 rings (1-4, 4-7 and 7-10 deg) around the fovea by extracting the retinal component (RC) and optic nerve head component (ONHC).

Results: The patients' ONHCs were delayed and variable in latency ($p<0.05$) in rings 1 and 3 and unidentifiable in many locations. Their RC amplitudes were smaller than normal in rings 2 and 3 ($p<0.05$). Similar ONHC results were found for ring 3 of the suspect eyes.

Conclusions: Ganglion cell dysfunction in glaucoma, as reflected in the ONHC, was most evident near the retinal center, although abnormalities were found throughout the examined regions. The "global flash" mERG paradigm may be a sensitive index of glaucomatous dysfunction.

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4/O DOES THE MULTIFOCAL ELECTRORETINOGRAM (MERG) PROVIDE A TOPOGRAPHIC, OBJECTIVE MEASURE OF GANGLION CELL FUNCTION IN GLAUCOMA?

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Purpose: To compare the spatial relationship of alterations in local electrophysiologic function in glaucoma, as measured by several different modes of mERG testing, with abnormalities defined by standard automated perimetry (SAP).

Methods: Two groups of patients were recruited for this study, all had asymmetry between upper and lower SAP thresholds: the Gifu group, 18 glaucoma patients (age±SD, 60.6±9.0) and seven controls (62.9±6.7); the Portland group, 16 glaucoma (56.7±11.2) and 22 controls (42.5±11.9). For all, mERGs were recorded using 'luminance flicker' (modulation b/w 200 cd/m2 and ~2 cd/m2). 'Pattern-reversal' and 'full-field flash insert' paradigms were also used in Portland.

Results: Implicit times of globally summed 1st-order mERG peaks (N1, P1, N2) were significantly correlated with SAP-CPSD ($p<0.01$). No significant relationships were found between mean quadrant VF threshold and any of the mERG parameters studied by quadrant. Abnormalities of central mERG responses (0-5 deg) distinguished glaucoma patients from normal controls, yet were unrelated to MD or CPSD. There was a strong effect of age on central mERG responses.

Conclusions: The mERG reveals abnormal macular retinal function in glaucoma and normally aging eyes. However, excepting rare individual examples, damage revealed by the mERG does not show topographic correspondence with the pattern of SAP VF loss.

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5/P CANNY EDGE DETECTION OF SCANNING LASER TOMOGRAPHY IMAGES OF THE OPTIC NERVE HEAD

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Purpose: To evaluate a reference plane independent method of determining optic cup margins from SLT images of the ONH for the detection of glaucomatous progression.

Methods: The edge of the optic cup was identified as the steepest portions of the ONH profile using a Canny detector in which the derivative of a Gaussian function was convolved with topography data. Quality control functions ensured removal of large vessels and adjusted for magnification errors. The algorithm determined radius and height from cup centroid and the slope for each point on the cup edge. The test sample comprised 27 glaucoma patients and 60 glaucoma suspects (mean age 61.9yrs; range 37.3 to 84.8) followed prospectively over an 18 month period. The mean cup edge values were obtained using the HRT for 3x10° image series from a baseline and an 18 month follow-up visit. Individualised confidence limits were established for mean cup radius, height and slope and grouped into thirty-six 10° sectors. The average 10° sector had 32 data points per 3x10° image series. Change from baseline was defined as a minimum cluster of 3 sectors in which the 95% CLs did not overlap.

Results: 6 of 27 glaucomas and 13 of 60 suspects showed significant increase in cup radius and 15 of 27 and 27 of 60 showed an increase in cup height. In half of the subjects showing a cup height increase (21 of 42) the change was concentric in nature. A typical example had a mean cup height at baseline of 100.3µm (SD2.9) and 134.6µm (SD1.8) at 18 months.

Conclusions: The Canny edge detection analysis was capable of detecting subtle structural change of the optic nerve. It is reference plane independent and robust to the influence of vasculature. Results will be compared to standard HRT ONH parameters and visual field progression.

6/P INTEGRATION PROPERTIES OF THE PUPIL LIGHT REFLEX AS A FUNCTION OF STIMULUS AREA OF THE VISUAL FIELD

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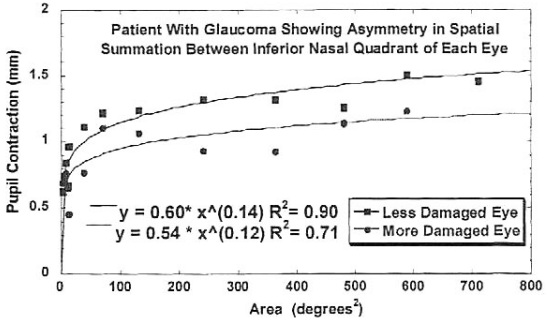
Purpose. To gain knowledge about the integration properties of the retinal neurons involved in the pupil light reflex as larger areas of the visual field are stimulated in normal eyes and eyes with damage.

Methods. The pupil light reflex was recorded using a computerized pupillometer in response to perimetric light stimuli as a function of size (0.5-30 degrees in radius) and location.in 6 normal human subjects and 6 patients with damage along the anterior visual pathway.

Results. The pupil light reflex (millimeters of contraction) was related to stimulus area by a power function ($y=a*xb$), and patients with damage revealed a different rate of spatial summation in the damaged area of visual field compared to a similar area in the other eye:



Conclusion. In normal eyes, each quadrant tested had a similar exponent "b", which implied similar spatial summation, but a different value of "a" in the power function, implying different sensitivity. The patients showed significant changes in the exponent "b", implying effects of disease on spatial summation. The power function may be useful for characterizing the effect of optic nerve disease on integration properties of ganglion cells.

CR: None Support: VA Merit Review Grant, Unrestricted Grant from Research to Prevent Blindness and the Lew Wasserman Scholar Award (R. Kardon)

7/P EXAMINATION OF RETINOTOPY IN THE PRIMARY VISUAL CORTEX WITH FUNCTIONAL MAGNETIC RESONANCE IMAGING

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Purpose: To examine retinotopy in the primary visual cortex with functional magnetic resonance imaging (MRI).

Subjects and methods: Three normal subjects were examined with a 1.5-T MR unit. Three types of stimulation were performed: fixation point only, checkerboard with 0 to 5 degrees eccentricity and checkerboard with 5 to 10 degrees eccentricity, both with fixation point

Results: The stimulation presented at eccentricity 0 to 5 degrees activated a broad area of the occipital lobe at the calcarine fissure that corresponds to the primary visual cortex. However, the stimulation presented at eccentricity 5 to10 degrees activated a narrower and more anterior area of the calcarine fissure.

Conclusion: Retinotopy in the primary visual cortex was accurately detected with a clinical MR system and a personal computer. This technique is useful for objective evaluation of the visual field.

8/P RETINAL THICKNESS MEASUREMENTS IN CHRONIC GLAUCOMA AND OCULAR HYPERTENSION

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The sensitivity of the Retinal Thickness Analyzer (RTA), which is able to measure the thickness of the retina at the posterior pole, was assessed in a group of 21 patients with chronic open-angle glaucoma, and in 24 patients with ocular hypertension and no visual field defects.

57.6% of glaucomatous eyes had a significant reduction in retinal thickness, while another 30.3% were borderline. In ocular hypertension group, 37.5% of eyes were abnormal, and 45.8% were borderline.

Considering the relationship between the retinal thickness loss and visual field defects in glaucoma patients, the following results were found: a) perfect correspondence: 9 cases (27.3%); b) partial correspondence: 18 cases (54.5%); c) no correspondence: 6 cases (18.2%).

As the posterior could be the first area to be affected by chronic glaucoma, the RTA could become a useful device to diagnose this disease before the onset of functional damage. However, long-term longitudinal studies are needed to clarify whether patients with ocular hypertension and losses in retinal thickness subsequently develop significant visual field defects.

9/O IMAGE PROCESSING OF SLT IMAGES TO DETERMINE RETINAL THICKNESS

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Purpose: Analysis of SLT images (BJO, 1998. 82:121-130.) has been able to provide an objective, relative measure of diabetic macular edema (DME) using edema maps (EM). The purpose of the study was to produce absolute (ie. microns), topographic edema maps (TEM) for scanning laser tomography (SLT) images of subjects with DME.

Methods: DME was used as a model of retinal thickening. The sample comprised 24 patients with clinically significant DME defined by the ETDRS criteria (mean age 59.75 years; range 45-75yrs) and one eye with DME was assigned to the study. The sample was examined on seven separate occasions. Visits 1 and 2 were pre-laser, followed by visits at 3 days, 1, 2, 4 and 12 weeks post-laser photocoagulation. Two image processing models were adopted to obtain absolute measures of retinal thickness from the SLT series images. The first was a component analysis (Appl Opt, 1998. 37:2021-33), comprising an extended registration algorithm and blind deconvolution. The second was an impulse model consisting of two reflectors separated by turbid media. The outcomes of the TEM with each procedure and of the EM were compared.

Results: The immediate post-treatment magnitude of DME (determined by EM) significantly increased from baseline in 18 of 24 patients and peaked at 1-2wks post-treatment. In 20 patients, DME had decreased at 12 weeks post-treatment. Comparative retinal thickness maps obtained with each procedure will be presented to illustrate the utility of the techniques.

Conclusion: Image processing techniques can enhance the SLT image resolution along the z-axis and allow an absolute measure of retinal thickness.

O = Oral Presentation
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1/O RELATIONSHIP BETWEEN ELECTROPHYSIOLOGICAL, PSYCHOPHYSICAL AND ANATOMICAL MEASUREMENTS IN GLAUCOMA

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Purpose: to evaluate the nature of the relationship between electrophysiological, psychophysical and anatomical measurements in glaucoma.

Methods: 34 normal subjects (mean age 58 ±11 years, average visual field MD -0.09 ± 1.36 dB) and 36 patients with early glaucoma (mean age 67 ± 10 years, average visual field MD −3.70 ± 1.96 dB) underwent a central 16° x 20° pattern electroretinogram (PERG), Humphrey 24-2 full threshold perimetry (HP) and imaging with the Heidelberg retina tomograph (HRT). Tests were performed within 4 months of each other. Parameters considered were the amplitude of the N95 and P50 waves (N+P) of the PERG, the mean sensitivity (MS) of the 16 test points in the central 20° of the HP, and the neuroretinal rim area (NRRA) of the temporal half of the optic disc in the HRT. Visual field MS was recorded in dB and the antilog of dB (10(dB/10) = 1/Lamberts).

Results: the relationship between dB MS and N+P and dB MS and NRRA was curvilinear. 1/Lambert MS was linearly related to N+P and NRRA (R2 = 0.40 and 0.29, respectively). The relationship between NRRA and N+P was linear (R2 = 0.14).

Conclusions: the 1/Lambert scale for perimetric light sensitivity reflects the degree of glaucomatous damage, as measured by the PERG and NRRA, better than the dB scale. PERG and perimetry correlate better with each other than do either with NRRA. Perimetry correlates better with NRRA than does the PERG.

2/P VISUAL FIELD CHANGES IN GRAVES' DISEASE WITH AND WITHOUT INFILTRATIVE OPHTHALMOPATHY

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The efficacy of various tests for optic nerve function in Graves' disease is unclear. We have evaluated field results obtained with the Humphrey SITA standard program in two consecutive tests in one eye of each of 60 patients with Graves' disease. Based on non-perimetric criteria 32 patients had infiltrative ophthalmopathy and the remaining 28 had no ophthalmopathy. All patients had perimetric experience. The Glaucoma Hemifield Tesr was used to identify visual field abnormalities. About half of the tests in each group had field abnormality in at least one field test. Reproducible field loss occurred in 19% in the infiltrative group and in 14% in the group with no ophthalmopathy. Location and shape were important in differentiating the two groups.

3/P AUTOMATED PERIMETRY AND RECOVERY OF OPTIC NERVE FUNCTION

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Purpose: Central acuity and extrafoveal visual function often spontaneously improve in optic neuritis and with surgical decompression in compressive optic neuropathies. While central visual function improves spontaneously in a significant percentage of patients with anterior ischemic optic neuropathy (AION), field improvement is unusual. Central scotomas are classically seen in toxic, metabolic, and hereditary optic neuropathies. Recovery has been variable. Automated perimetry may shed light on the mechanism of functional recovery.

Methods: A retrospective study of visual function recovery in toxic, metabolic, and hereditary optic neuropathies.

Results: Cases of ethambutol toxicity, B12 nutritional deficiency, and Leber's optic neuropathy demonstrate improvement in central visual function, accompanied by improvement in fine grid automated perimetry. In spite of central functional improvement there was no evidence of recovery of nerve fiber layer, improvement in optic atrophy, or resolution of afferent pupillary defect when present.

Conclusions: Recovery of response on fine grid automated static perimetry (10-2 program) in absence of restoration of lost ganglion cells suggests potential recovery of functionally abnormal neuronal activity in the setting of toxic, metabolic, and hereditary optic neuropathies.

O = Oral Presentation
P = Poster Presentation

4/O RELATION BETWEEN RETINAL NERVE FIBER LAYER THICKNESS AND STATIC VISUAL FIELD IN GLAUCOMA

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Previous report has indicated that more than 20% of retinal ganglion cells are lost by the time visual field defect is detected by automated perimetry. In this study, we investigated relationship between retinal nerve fiber layer (RNFL) thickness and static visual field in glaucoma. Six normal eyes, 7 ocular hypertensive eyes and 72 glaucomatous eyes were studied. Peripapillary RNFL thickness was measured using optical coherence tomography. Average RNFL thickness was calculated from the values obtained in more than three scans. Program 24-2 of the Humphrey Field Analyzer was performed on all subjects. The visual field was divided into upper and lower hemifields, and into 6 sectors corresponding to the divisions of the optic disc. We also compared the correlation of RNFL thickness with visual field in early glaucoma (MD_-5dB) and in moderate or advanced glaucoma (MD<-5dB). There was a nonlinear relation between RNFL thickness and MD and between RNFL thickness and MS (r=0.66-0.68). The correlation between the RNFL thickness and MS in early glaucoma (r=0.36) was weaker than that in moderate or advanced glaucoma (r=0.65). Likewise, the correlation between RNFL thickness and hemifield MS was weaker in early glaucoma (r=0.25-0.42) than in moderate or advanced glaucoma (r=0.62-0.72). Applying sector classification of optic disc to early glaucoma, the superotemporal and inferotemporal sectors correlated strongly with the visual field in all sectors (r=0.54-0.70). Although the correlation between RNFL thickness and whole visual field was weak in early glaucoma, sector division of the optic disc was useful for the analysis of early glaucomatous visual field.

5/O OPTIC NERVE BLOOD FLOW IN PATIENTS WITH ASYMMETRIC VISUAL FIELD AND OPTIC DISC DAMAGE

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Purpose: To evaluate the relationship between asymmetric glaucoma damage and optic nerve blood flow.

Methods: Sixteen patients were selected that exhibited asymmetry between their two eyes in automated visual fields and/or optic nerve appearance. Laser Doppler flowmetry was used to measure optic nerve head blood flow, velocity and volume in the superotemporal and inferotemporal neuroretinal rim and cup. Paired t-tests were used to compare measurements.

Results: Flow and velocity were significantly lower in eyes with worse damage. The mean flow and velocity of the three measurement sites were 19% and 13% lower, respectively, in eyes with greater damage versus eyes with less damage ($p<0.005$).

Conclusions: Circulation in the optic nerve and cup was significantly related to the extent of glaucomatous damage when comparing two eyes of a patient with asymmetric disease.

6/P COMPARING VISUAL FIELD VS OPTIC NERVE HEAD CRITERIA FOR DIAGNOSIS OF GLAUCOMA

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Purpose: This study examines the agreement between optic nerve head (ONH) and visual field-based (VF) criteria for the diagnosis of glaucoma.

Methods: We compared VF criteria based on indices and point clusters in standard and B/Y, 30-2, full-threshold fields to ONH criteria based on C/D ratio and evidence of focal damage in stereo disc photographs. We assessed 112 eyes of 58 patients: 19 normal subjects (38 eyes), 24 glaucoma suspects (47 eyes) and 15 glaucoma patients (27 eyes). Each eye was classified as either normal, suspect of abnormal in terms of VF and ONH by masked observers. The agreement between the ONH and VF classifications was examined for three decision levels.

Results: The agreement between the VF and ONH classification varied between 38% (liberal criteria) to 75% (conservative criteria). For moderate criteria, which are similar to those used clinically, almost half the eyes classified as being glaucomatous based on VF results were classified as having normal based on ONH photos.

Conclusions: These results point to the difficulty in making diagnostic decisions based on cross-sectional VF and OHN data.

O = Oral Presentation
P = Poster Presentation

7/P CENTRAL VISUAL IMPAIRMENT IN GLAUCOMA

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Early visual field loss in glaucoma commonly occurs within the arcuate area, but the progression of central visual field defects (CVFD) is scarcely observed. The correlation between the optic disc and CVFD was investigated.

The material comprises 50 eyes of 50 cases with CVFD. The distribution of CVFD is as follow; central scotoma; 15 eyes, double bjerrum scotoma; 19 eyes, superior paracentral scotoma; 9 eyes, inferior paracentral scotoma; 2 eyes, and ring scotoma; 5 eyes.

Among these eyes the peripapillary atrophy around optic disc was characterized and fluorescein angiography indicated that the filling defect of optic disc and the decrease of radial epipapillary capillaries was markedly observed.

According to the results of this study, the ischemic optic neuropathy was suggested on the pathogenesis of these eyes with CVFD.

8/O CORRELATION OF TUMBLING-E RESOLUTION PERIMETRY AND CONVENTIONAL PERIMETRY WITH OPTIC DISC DIMENSIONS IN EARLY GLAUCOMA.

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Vision Science Research Group, School of Biomedical Sciences, University of Ulster at Coleraine, Northern Ireland, UK.

Purpose. Peripheral resolution acuity is directly related to the density of the responding retinal ganglion cell population. Since glaucoma results in cell death we would expect a correlation between peripheral resolution acuity and nueroretianl rim volume in glaucoma. For conventional perimetry, however, it has been shown that significant loss of ganglion cells can exist before a field defect can be recorded. The aim of this stduy is to ascertain which form of perimetry (conventional or resolution) relates best with the optic disc dimensons in early glaucoma.

Methods. Visual fields for 15 early glaucomatous eyes were recorded using the Humphrey 24-2 test and the new Tumbling-E resolution perimeter (eight locations at 10 and 20 degrees eccentricity). Optic disc measurements were obtained using the Heidelberg Retinal Tomograph.

Results. Mean Tumbling-E resolution thresholds showed a significant ($p<0.05$) negative correlation with neuroretinal rim area ($r=-0.65$) and volume ($r=-0.70$), and a positive correlation with cup area ($r=0.72$), cup shape ($r=0.70$) and CD ratio ($r=0.72$). Conventional perimetry mean deviation showed an insignificant correlation with all optic disc parameters ($r=0.31$, 0.25, -0.27, -0.33 and -0.28 repectively).

Conclusions. In early glaucoma, conventional perimetry is a poor predictor of neuroretianl rim loss (i.e. loss of ganglion cell fibres) but resolution acuity perimetry shows a strong correlation with these changes. This implies that resolution perimetry may provide a better method of detection and monitoring of early glaucomatous change.

Acknowledgements: This work is supported by the Wellcome Trust and the Guide Dogs for the Blind Association (UK).

Notes

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P = Poster Presentation

1/O DETECTION AND RESOLUTION ACUITY OF THE SHORT WAVELENGTH SYSTEM IN FOVEAL AND PERIPHERAL VISION

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Indiana University, Bloomington[1], University of Ulster, Coleraine[2]

Purpose: Resolution acuity for luminance gratings in peripheral vision seems to be limited by ganglion cell density. We aimed to isolate the short wavelength system to determine if peripheral resolution is similarly limited for blue-yellow gratings. This should allow valid measurement of the density of blue-yellow RGCs.

Methods: Detection and resolution acuity was measured at the fovea and at 20° in the nasal field of 4 normals using luminance gratings and blue gratings presented on an intense yellow background.

Results: For blue-yellow gratings, detection acuity was significantly higher than resolution acuity at the fovea (8.5 vs. 6.9 c/°) and was significantly higher than resolution at 20° (2.6 vs. 1.8 c/°), indicating that resolution is sampling limited at both locations when using this stimulus. As has be shown previously for luminance gratings, resolution was only sampling limited peripherally. The ratio of blue-yellow resolution to luminance resolution at 20° was 0.39 indicating that blue-yellow ganglion cells account for approximately 20% of cells that will respond to this type of stimulus at 20° in normals. Furthermore, the resolution acuity at 20° agrees with that predicted from retinal histology.

Conclusions: Blue-yellow resolution acuity is a test with a strong theoretical link to the density of blue-yellow RGCs in foveal and peripheral vision and should be useful for the detection of glaucoma.

2/O A NEW AUTOMATED PERIMETER THAT CAN DISPLAY FUNDUS IMAGES ON A SCREEN

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We have developed a new automated perimeter for static perimetry along with the KOWA Company Model (AP-5000) that can display a fundus image on a screen. The fundus image is downloaded from a CCD camera and displayed on a monitor as a mirrored image. The examiner can select the measuring points that match the area of retinal lesion by observing the fundus image. We examined 5 patients with nerve fiber bundle defects (NFBD) using this perimeter. Two had wide retinal NFBD and three had narrow retinal NFBD. Although low retinal sensitivity was detected in those with wide NFBD, it could not be found in those with narrow NFBD. On the other hand, when two cases with narrow NFBD were measured using our automated fundus perimeter, was presented out the last IPS meeting, low retinal sensitivity was detected in the narrow NFBD. This automated perimeter could not detect low retinal sensitivity in narrow NFBD. A regular fundus perimeter was also used for the same purpose. Measurement using this perimeter was much simpler than our fundus perimeter.

3/P OPTIMUM NUMBER OF STIMULUS OSCILLATIONS FOR MOTION DISPLACEMENT DETECTION IN GLAUCOMA

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We are developing a new PC operated test for the detection of Glaucoma using the principal of the motion displacement test. In this experiment we investigate whether it is possible to shorten the test duration by reducing the number of stimulus oscillations whilst maintaining sensitivity to detect glaucoma.

Method: Frequency of seeing curves were obtained for a line stimulus presented in the temporal field, moving between 2 and 18 min arc displacement, at a duration of 200msec, through one, three or five oscillations, for control and glaucomatous eyes.

Results: The mean test time was 7 min 47 sec for five oscillations, with a saving of 32 sec and 82 sec for the three and one condition. There was no statistical significant between the threshold measurements of the two groups for three and five oscillations. However, thresholds were significantly higher for one oscillation when compared with three and five ($P<0.01$).

Conclusion: Similar motion displacement thresholds may be achieved by testing with three oscillations compared to five, with the advantage of a reduced test duration and maintenance of test sensitivity to detect glaucoma.

This project was supported by IGA, LORS and MRC

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4/P OPTIMUM STIMULUS DURATION FOR MOTION DISPLACEMENT IN GLAUCOMA

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The Institute of Ophthalmology and Moorfields Eye Hospital, London

We are developing a new PC operated test for the detection of Glaucoma using the principal of the motion displacement test. In this experiment we investigate whether it is possible to shorten the test by reducing stimulus duration whilst maintaining sensitivity to detect glaucoma.

Method: Frequency of seeing curves were obtained for a line stimulus presented in the temporal field, moving between 2 and 18 min arc displacement, through 5 oscillations, with a stimulus duration of 400, 200 or 100 msec per cycle, for control and glaucomatous eyes.

Results: The mean test time was 7 min 50 sec for the stimulus duration of 400 msec per cycle. There was a test time saving of 54 sec and 63 sec for the 200 and 100 msec condition. Results to date show little change in threshold for the different durations while continuing to discriminate between groups.

Conclusion: Comparable motion displacement thresholds may be achieved when testing with stimulus durations of 400, 200 or 100msec per cycle. There is a test time advantage when using the shorter stimulus presentations with maintenance of test sensitivity to detect glaucoma for all durations.

This project was supported by IGA, LORS and MRC

5/O FREQUENCY DOUBLING PERIMETRY USING ISOLUMINANT CHROMATIC GRATINGS

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Purpose: To develop an internet-ready computerized frequency doubling perimeter, using novel isoluminant chromatic targets presented on a standard 24-2 presentation grid in an interactive fashion.

Methods: The frequency doubling effect, exploited in perimetry to isolate large ganglion cell (My) pathways, was thought to depend only on luminance. We report the effect can also be seen with isoluminant chromatic targets. The circular targets consist of device-independent bitmaps with a diameter of 1.6o, spatial frequency of 0.80 cycles/o, and temporal frequency of 42 Hz. The bitmap pixels are isoluminant, with hue constrained to the blue-yellow axis and saturation varying radially as a sinusoidal function of distance from the center of the grating. The CFDP targets are presented in an interactive manner on a 24-2 grid, and thresholds determined using a modified binary staircase algorithm. A preliminary normative database (n=90) allowed calculation of age-related probability distributions. The VisionRx.com CFDP(and HFAII((24-2 thresholds) were compared in 13 eyes of 11 glaucoma subjects and 11 eyes of 11 normal subjects.

Results: The frequency doubling effect using isoluminant chromatic gratings is identical in appearance to luminance gratings. Individual and mean CFDP thresholds showed a linear decrease with age. Individual point variances increased during later decades (>60 yo). Comparison of CFDP and HFA fields showed high degrees of correlation between mean thresholds, cluster analysis and confidence intervals.

Conclusions: Hue and saturation information appears to be processed in a similar fashion as luminance information at high temporal frequencies by the My ganglion cell-mediated pathway. Point-by-point comparisons of CFDP and HFAII fields showed high degrees of correlation. The CFDP represents a new internet perimeter for in-home and clinical use.

6/O COMBINED SPATIAL RESOLUTION AND CONTRAST PERIMETRY IN NORMAL SUBJECTS

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Purpose: To measure normal thresholds for each age group, using stimuli that combine spatial resolution (SR) and contrast (C), shown as static, moving or pulsing in phase and counter-phase.

Methods: A CTR screen was used to show white round stimuli, 5(in diameter, 500 msec. long, shaped as a wave decreasing in amplitude, and with a mean luminance equal to that of the background. Stimuli increasing in difficulty, taken from a scale of 35 logarithmic combined units (cu), ranging from SR=0.5 cycl/deg and C=100% to SR=6.3 cycl/deg and C=6% were used. 56 normal subjects (one eye per patient) were examined twice with three stimulus types: static (CP-SW perimetry), centrifugal wave movement at 8 cyl/deg (CP-K6W), and pulse in phase and counter-phase at 30 Hz (CP-T30W) using the TOP strategy in the central visual field (30x24o of eccentricity).

Results: Mean examination time was 3:37 minutes. The difference between the thresholds in the central and peripheral visual field was higher than in conventional perimetry. This difference was particularly increased in the nasal field. The results for CP-SW, CP-K6W and CP-T30W were respectively: MS for 20 years 25.8, 25.3 and 24.7 cu; loss per year 0.108, 0.083 and 0.089 cu; threshold correlation coefficient with age (and error of estimation of Y over X) -0.68 (1.81cu), -0.68 (1.61cu) and –0.72 (1.66cu); threshold fluctuation between both examinations 2.38, 1.81 and 2.21cu; percentage of points deviated more than 5cu from the predicted value for the age 7.5, 5.9 and 6.7%.

Conclusions: Contrast perception, in relation to spatial resolution can be estimated in the visual field with a precision comparable to that of conventional perimetry, providing normal patterns with little dispersion, mostly with moving stimuli.

O = Oral Presentation
P = Poster Presentation

7/P MULTI-FIXATION CAMPIMETRY IN COMPLEX EXAMINATION OF PATIENTS WITH DIABETES MELLITUS

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We used multi-fixation campimetry (MFC) in complex examination of patients with diabetes mellitus (DM) for revealing the most early symptoms of diabetic retinopathy (DR).

We researched MFC in 152 DM patients (304 eyes) and 20 healthy persons (40 eyes). According to a retina condition, all patients were divided into 5 groups.

It was found that paracentral scotoms of I-III stage, blind spots enlarging is determined in 72.5% patients with DM even without any clinical evidence of DR.

Our results indicate that the progression of DR correlates with the presence of varying stages of paracentral scotoms ($r = 0.98(0.12$; $p<0.001)$; it confirms the relationship between changes in central field of vision and pathological changes in eyeground in diabetic patients.

So, MFC can be recommended in complex examination of patients with DM for early DR stage diagnosis and dynamic control.

8/P THE EFFECT OF BLUR ON LUMINANCE-PEDESTAL FLICKER THRESHOLDS

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Purpose. We evaluated the effect that image blur has on luminance-pedestal flicker perimetry thresholds.

Methods. Luminance-pedestal and mean-modulated flicker thresholds were obtained using 0.5(spots and gaussian patches ((=0.43() that had 76% of their energy with 0.5(, for temporal frequencies ranging from 4-30 Hz. The luminances of the mean-modulated condition (4, 25.5 cd/m2) were chosen to equate surround and local adaptational effects to the luminance-pedestal flicker stimulus. One subject was extensively studied across a range of variables and their trends were confirmed on another 3 people using a limited variable set.

Results. Image blur had no significant effect on mean-modulated thresholds. We found a significant decrease (0.25 log unit) in the luminance-pedestal flicker thresholds for a gaussian patch.

Conclusion. Image blur can increase luminance-pedestal flicker sensitivity under certain states of adaptation. We propose that our findings differ from the literature due to adaptational factors.

9/P THE RAMP STIMULUS IN PUPIL PERIMETRY: FIRST RESULTS

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Purpose: To evaluate the basic properties of a ramp stimulus (RS) in pupil perimet-ry, i.e., a stimulus increasing in luminosity during its presentation. Hypothesis: RS offers a larger dynamic range of pupillary responses and increases latencies in pa-thological condition compared with standard square stimuli, i.e., stable luminosity.

Methods and materials: Several pilot studies were conducted on healthy subjects to explore the technical possibilities offered by a modified Octopus 1-2-3.

Results: RS with a luminosity increasing from 40 to 16 dB was convenient for tes-ting the central test location as well as two eccentric test locations at –8/-8 and 20/20 deg. By repeating the program 8 times with stimulus size V and background 10 cd/m2, both the stimulus duration of 125 and 500 ms showed reliable results.

Conclusion: RS of the above-mentioned properties can be generated, and, the re-sulting pupillary light responses can be measured with the present Octopus 1-2-3.

Clinical validation of the RS is necessary by comparing it with the square stimulus.

O = Oral Presentation
P = Poster Presentation

10/0 EVALUATION OF ADVANCED VISUAL FIELD LOSS WITH COMPUTER-ASSISTED KINETIC PERIMETRY (C-AKP)

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Manual kinetic perimetry is an effective examination technique, especially in cases of advanced visual field loss. However, its examiner-dependance is a major drawback.

In computer-assisted automated kinetic perimetry (C-AKP), an indivdual set of vectors is designed, each crossing the presumed local scotoma border almost perpendicularly. Presentations of kinetic stimuli with a constant angular velocity of 2°/s are repeated six times in a randomized order. Patients´ responses are recorded, and a local kinetic threshold (MEAN) and a related parameter for dispersion (SD) is assessed. Results are additionally corrected for mean individual reaction time.

Typical results of 15 patients suffering from advanced visual field loss are presented: 5 subjects with retinal pathologies (retinitis pigmentosa or Vigabatrin-associated visual field loss), 5 with optic neuropathies, and 5 with postchiasmal lesions were included.

Dispersion varied remarkably, depending on subject and vector location (0.05°-1.93°). Mean individual reaction times showed a considerable interindividual variation (345-855 ms). Intersession retest reliability was assessed in 3 patients and did not exceed 1.2°. C-AKP is an effective, examiner-independent method for evaluation and follow-up of advanced visual field loss.

Notes

O = Oral Presentation
P = Poster Presentation

1/O FDT C20.5 VERSUS HUMPHREY 24.2 IN HYPERTONIA AND OPEN ANGLE GLAUCOMA

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Purpose: To evaluate the performance characteristics of the Frequency-Doubling-Technology C20.5 screening test versus Humphrey 24.2 threshold test, for intraocular hypertonia and open angle glaucoma.

Methods: FDT C20.5 test is performed on 417 eyes of 213 patients (mean age: 60,9 years), consisted of 252 hypertonias without 24.2 visual field defect, 139 glaucomatous eyes with 24.2 early field loss (MD>-6), 17 eyes with 24.2 moderate field loss (-12<MD>-6), 9 eyes with 24.2 severe field loss (MD<-12).

Results: For the 417 eyes, C20.5 detects more defects than 24.2. Proportion of arciform defects is greater with C20.5. For the 252 hypertonias, 32% present a defect with C20.5 (1/3 are arciform). For early OAG, C20.5 has a sensitivity of 63%; proportion of arciform defect is greater with C20.5: 59% (33# with 24.2). For moderate OAG, sensitivity increases to 100%; all C20.5 defects are arciform. For severe OAG, sensitivity stays at 100%; defects are similar in both tests: double arciform defects only.

Conclusions: For OAG, C20.5 test has a global sensitivity of 69%. For each 24.2 defect, the C20.5 correspondant defect is similar or more extended. C20.5 defects are detected in 32% of hypertonias, according to the specific ability of FDT to detect My ganglion cell lesion.

2/P FREQUENCY DOUBLING TECHNIQUE AND OCTOPUS PERIMETER INDICES

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Purpose: To compare frequency doubling technique (FDT) indices to Octopus threshold perimeters

Methods: Thirty nine glaucomatous patients and 41 subjects with ocular hypertension or suspect glaucoma were recruited consecutively. The visual field of the study subjects was assessed by FDT program C-20 full threshold, and Octopus program dG1X. Only one eye of each subject was randomly selected. Pearson's r correlation coefficient was calculated among the FDT and Octopus indices.

Results: In the entire population a statistically significant correlation (Pearson's r, P<0.001) was found between FDT-MD and both MS (0.77) and MD (-0.80) and between FDT-PSD and both LV (0.50) and CLV (0.45). When the glaucoma group was considered alone, similar significant correlation was found between the indices. In the ocular hypertensive and glaucoma suspect group, no significant correlation was found. A significant (P<0.001) difference was found between FDT and Octopus for the time needed to perform the visual field test.

Conclusion: Significant correlation and no different scale values were not found between the two techniques.

3/P COMPARISON AMONG ACHROMATIC AUTOMATED PERIMETRY, SHORT-WAVELENGTH-AUTOMATED-PERIMETRY AND FREQUENCY DOUBLING TECHNOLOGY IN EARLY GLAUCOMA DIAGNOSIS.

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The early glaucomatous damage is mainly due to a loss of large ganglion cells (M and/or larger P). Frequency Doubling Technology (FDT) and Short-Wavelength-Automated-Perimetry (SWAP) are recent types of automated perimetry testing able to isolate the function of M and larger P ganglion cells respectively. In this phase Achromatic Automated Perimetry (AAP) can be even normal while FDT or SWAP can point out signs of the disease. The aims of the study are to compare the sensitivity of AAP, SWAP and FDT in the detection of the early visual field defect and to verify the early cellular damage (M and/or P).

We selected a group of glaucomatous suspect patients with normal AAP. We submitted them also to SWAP and FDT.

We observed that: $\neg\sum$ the defect pointed out with SWAP and FDT is more evident than the AAP one; $\neg\sum$ the defect is more common with the FDT (71%) than with the SWAP (50%); $\neg\sum$ few patients present both FDT and SWAP altered (10%). In conclusion FDT and SWAP are more sensitive than AAP in the detection of early glaucomatous visual field damages. Different patients present different aspects of cellular defects (M or P); the M-cells damage is probably the most common. FDT is consequently the most sensitive perimetric diagnostic testing.

O = Oral Presentation
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4/O COMPARISON OF B/Y AND FDT IN GLAUCOMA PATIENTS GLAUCOMA SUSPECTS AND NORMALS

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We wished to compare two tests designed to measure specific large ganglion cell activity in glaucoma. Forty-eight glaucoma patients with early to late damage, 58 ocular hypertensives and glaucoma suspects, and 16 normals were tested with Humphrey Field Analyzer Blue/Yellow full threshold and with FDT (Zeiss-Humphrey) full threshold tests. As classical reference the HFA 30-2 white/white SITA STANDARD program was used.

Both B/Y and FDT showed larger MD and PSD that w/w perimetry, in all groups except the normals. However, after a per point analysis (statistical comparison with normal values) and use of a classification system (Hodapp et al*), the FDT was much more accuate than B/Y, as was also visible from the ROC curve characteristics.

* Hodapp E, Parrish RK, Anderson DR: Clinical Decisions in Glaucoma, pp 52-61, St. Louis, MO: CV Mosby 1993

5/P HIGH PASS RESOLUTION PERIMETRY AND FREQUENCY DOUBLING TECHNOLOGY INDICES IN GLAUCOMATOUS PATIENTS AND OCULAR HYPERTENSION SUBJECTS

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Purpose: To determine correlation between the indices of two different perimetric techniques such as High-Pass Resolution Perimetry (HRP) and Frequency Doubling Technology (FDT).

Method: Fifty-three eyes of fifty-three patients were randomly recruited from the out patients of our glaucoma clinic. All the subjects were examines with the HRP , program Ring, and with the FDT, program C-20. A statistical analysis was then calculated by Student's t test and Pearson's r correlation coefficient. Glaucomatous patients and ocular hypertension subjects were classified by visual field, optic disc and IOP. Visual field and optic disc were classified abnormal by 1998 European Glaucoma Society guidelines.

Results: Thirty-two eyes were classified as glaucomatous and twenty-one eyes were classified as ocular hypertension subjects. When the entire group was analyzed, significant correlation was found between HRP and FDT indices for HRP Global Deviation versus FDT Mean Deviation ($r=-0.59$, $p<0.001$) and for HRP Local Deviation with FDT Correted Pattern Standard Deviation ($r=0.54$, $p<0.001$). Similar correlation was found in the glaucomatous group too.

Discussion: Although these two techniques use different visual pathways, in this study significant correlation was found between indices.

6/O FREQUENCY DOUBLING PERIMETRY IN HEMIANOPIAS

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Purpose: Frequency doubling perimetry (FDP) was developed as a screening test for glaucoma. Hemianopia defects unlike glaucomatous ones, usually respect the vertical midline. Our goal was to determine if FDP also is sensitive as a screening test for hemianopias.

Methods: We tested both eyes of 19 consecutive patients with neuroimaging proven lesions causing hemianopias due to chiasmal or retrochiasmal disease with both conventional automated perimetry (CAP) with the Humphrey 24-2 test and FDP>

Results: CAP showed defects along the vertical in 15/19 patients (79%); FDP defects in 10/19 patients (53%). Five patients had obvious hemianopic defects with CAP that were missed with FDP. In one patient, FDP was superior but noise (scattered abnormal test locations) made interpretation difficult. Noise impaired interpretation in two other patients with FDT.

Conclusions: FDT with its present stimulus placement and configuration can miss defects along the vertical midline due to chiasmal and retrochiasmal lesions detected with CAP. This is probably due to scatter of light from the stimulus across the vertical midline into the opposite hemifield.

O = Oral Presentation
P = Poster Presentation

7/O THE INFLUENCE OF CATARACTS ON PERIMETRIC THRESHOLD VALUES IN LIGHT-SENSE PERIMETRY AND FLICKER PERIMETRY

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Purpose: To study the influence of cataracts on perimetric threshold values in light-sense perimetry and flicker perimetry.

Subjects and methods: Thirty eyes of 30 cataract patients and 32 eyes of 27 glaucoma and cataract patients were examined by both light-sense perimetry and flicker perimetry. Light-sense perimetry was performed using the program No.32 of the Octopus 101._ Flicker perimetry was performed using the Octopus 1-2-3 and its remote software package with our own program._ Both examinations were performed before and after cataract surgery.

Results: The diffuse sensitivity loss was detected by light-sense perimetry in all cataract patients._ However, when the loss of differential light sensitivity was within 19 dB, most of the critical fusion frequency (CFF) values were within the normal range. In cataract and glaucoma patients, a diffuse loss was accentuated in light-sense perimetry. However, in most cases there was almost no sensitivity loss, or rather a slight increase of CFF values in flicker perimetry.

Conclusion: Critical fusion frequency in flicker perimetry is less influenced by media opacities than differential light sensitivity in light-sense perimetry.

O = Oral Presentation
P = Poster Presentation

8/P PERIMETRY, FREQUENCY DOUBLING PERIMETRY AND MOTION DETECTION PERIMETRY.

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Purpose: To investigate the effects of cataract on standard white on white, frequency doubling and motion detection perimetry.

Methods: Subjects were identified who were due to have routine cataract extraction, had a visual acuity of 6/24 or better and no evidence of other ocular pathology. They were invited to undergo 1. Standard white on white automated perimetry on the Humphrey field analyser (HFA) using the 24/2 program. 2. Frequency doubling perimetry using the N30 program on the Humphrey (FDT) visual field instrument. 3. Motion detection perimetry (MDT) using a vertical line stimulus undergoing lateral displacements. Testing was done in random order prior to and at 3 to 4 weeks after cataract surgery. LogMAR visual acuity testing and the Pelli-Robson contrast test were also performed together with ocular examination.

Results: Ten subjects with a mean age of 66.5 years (range 55.8-79.5) underwent testing. The mean whole field sensitivities were calculated for the HFA and FDT results. Results were compared pre and postoperatively using the Wilcoxon signed ranks test. Median LogMar acuities were 0.25 (IQ range 0.1-0.43) preoperatively and 0.1 (IQ range 0.0-0.2) postoperatively, p=0.008. Median number of Pelli-Robson letter triplets were 13 (IQ range 13-14) preoperatively and 11 (IQ range 10-12.3) postoperatively, p=0.007. There was an improvement in HFA sensitivities from a median of 19.0dB (IQ range 15.8-23.4) preoperatively to a median of 24.2dB (IQ range 19.1-27.1) postoperatively, p=0.007. There was an even greater improvement in FDT sensitivities from a median of 13.6dB (IQ range 10.9-25.2) preoperatively to a median of 22.8dB (IQ range 21.6-27.2) postoperatively p=0.007. There was no significant difference in MDT thresholds between a median of 6.9 mins of arc (IQ range 5.9-24.9) preoperatively and a median of 8.2 mins of arc (IQ range 3.3-14.8) postoperatively, p=0.645.

Conclusion: Our findings show that lens opacity has a marked effect on frequency doubling and conventional white on white perimetry but little effect on motion detection perimetry.

9/P VALIDATION OF A NEW MOTION TEST

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Purpose: To compare a new PC-based system of motion detection testing against the previous 'gold standard' (Fitzke, 1987).

Methods: Frequency of seeing (FOS) curves were obtained for 9 normal volunteers using both the 'gold standard' test and the new PC-based system for a line stimulus in the temporal field undergoing displacements of between 2 and 18 minutes of arc.

Results: The 50% seen threshold for the 'gold standard' test was 6.13(2.34 min.arc (mean (SD) and for the new test 5.19 (2.86 min.arc. These are not significantly different (p=0.1222, paired t-test). The power of the study was 0.8.

Conclusion: Previous results obtained with the 'gold standard' test may be taken to apply to the new test during its further development.

This project was supported by IGA, LORS and MRC

10/P WHITE-WHITE, BLUE-YELLOW AND BLUE-BLUE PERIMETRY IN NORMAL SUBJECTS

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Purpose: The "Retinex theory" for color vision by E. Land describes three different color pathways for low, medium and high wavelengths each. This way chromatic perception is explained as being independent from the type illumination. The purpose of this paper is to compare blue contrast perimetry (BB), which has previously been described (*), with white-white perimetry (WW) and blue-yellow perimetry (BY or SWAP) in normal subjects.

Methods: An Octopus 101 perimeter was modified to do BB perimetry, using a 4 cd/m2 background and a Goldman V stimulus. 50 healthy subjects (10 per decade, aged from 20 to 70 years, one eye per patient) were examined twice with the three types of perimetry, using the TOP strategy.

Results: The results for WW, BY and BB were respectively: Loss per year 0.13, 0.27 and 0.13 dB; threshold correlation coefficient (r) with age (and error of estimation of Y over X) -0.63 (2.24 dB), -0.70 (3.77 dB) and -0.80 (1.32 dB). The values for threshold fluctuation between the first and second examination were 2.21, 3.03 and 2.03 dB. Percentage of points with a deviation 5dB higher than the predicted value from the regression equation for the different ages were 8.1, 16.0 and 4.2%.

Conclusions: BB perimetry provides more stable results than the other two types. Threshold reduction with age is similar to that for WW, but the thresholds seem to be more clearly grouped, so that points with sensitivity away from the mean predicted value are less common. BY perimetry gives the worst results. The threshold reduction with age is twice higher, individual fluctuation 50% higher and points with thresholds deviated more than 5 dB are much more frequent.

(*) Gonzalez de la Rosa M, Mesa, C, Aguilar J, Serrano M. Automatic perimetric exploration of the differential threshold for different coloured lights. Doc. Ophthalmol. Proc. Series 1987; 46: 275-285.

11/P HIGH-PASS RESOLUTION VS LIGHT SENSITIVITY PERIMETRY IN OCULAR HYPERTENSIVES: A PROSPECTIVE STUDY OF SENSITIVITY

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Purpose: This study prospectively compared two perimetry systems (Humphrey vs Ophthimus) to assess which was more sensitive at detecting visual field change.

Methods: 17 patients with ocular hypertension were tested between 1194 and 1998. The outcome measure was the likelihood that the software "flagged" the probability of the perimeters outcome measures as abnormal, and the changes that occurred during the follow-up period.

Results:

	MD/GD	PSD/LD	SF/RSD	FL/Blindspot	FP/Blank
Test	-2.15, 0.034	-1.67 ns	6.62 <0.0001	-2.28 0.025	2.44 0.015
Time	3.75, 0.0002	0.98 ns	2.58 0.001	-5.21 <0.0001	0.20 ns -
Eye	0.97 ns	1.07 ns	0.00 ns	1.60 ns	-0.79 ns

Discussion: High-pass resolution perimetry may be more sensitive at detecting change than conventional differential light sensitivity perimetry.

12/O IDENTIFYING THE BEST PARAMETERS FOR ABNORMALITY IN VARIOUS TYPES OF PERIMETRY

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Purpose. To determine the best parameters for abnormality for each visual field procedure: Short Wavelength Automated Perimetry (SWAP), Frequency Doubling Technology (FDT), and Motion Automated Perimetry (MAP), and standard automated perimetry (SAP).

Methods. Normal and age-matched GON eyes were evaluated. Two glaucoma experts, using masked simultaneous stereophotographs, classified eyes as GON if they demonstrated rim thinning, excavation, nerve fiber layer defects, and/or disc hemorrhage. Field results were not included in the classifications. Perimetric parameters were evaluated alone and in combination as input values to linear discriminant functions with ROC analysis to determine separation of GON from normal eyes.

Results. For SWAP and MAP, combining the PSD, MD and number of abnormal points provided the best separation of groups (approximately 80% and 73%, respectively), while the number of abnormal field points alone provided the best separation (82%) for FDT.

Conclusion. SWAP, FDT, and MAP are comparable in their ability to separate GON from normal, but different field criteria were optimal for the various perimetric techniques.

Support: RPB and NEI grant EY08208 (PAS), Foundation for Eye Research (CV)

O = Oral Presentation
P = Poster Presentation

1/O MONITORING "HEALTHY" AREAS OF VISUAL FIELD IN GLAUCOMA PATIENTS WITH DEEP PERIMETRIC DEFECTS.

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AIM OF THE STUDY: to perform a good monitoring of "healthy" areas of glaucomatous visual fields (VF) showing co-existence of deep defects and normal sensitivity areas.

MATERIALS AND METHODS: twelve series of VFs from 12 patients affected by primary open angle glaucoma (POAG) were selected in a retrospective study from the data of a Humphrey 640 VFA automated perimeter, collected since 1986. Inclusion criteria were: 1) at least 12 examinations available for each eye (program "Central 30-2 threshold test", full threshold strategy); 2) diagnosis of POAG; 3) deep, localized VF defects co-existing with normal areas; 4) topographical stability of defects during part of the follow-up. In each VF, the pathological and the normal areas were separated, according to pre-defined criteria, and a mean deviation (MD) value was calculated within each area.

RESULTS: the MD of "healthy" areas in the 4 cases that showed a good stability during all the follow-up, showed almost no variations. In 7 of the 8 cases that showed a worsening, this was first signaled by a MD increase in "healthy" areas, which was detectable before the appearance of probability symbols on the "total deviation" probability maps.

DISCUSSION AND CONCLUSIONS: variability heavily affects VF with large scotomas, making it difficult to distinguish between real changes and simple fluctuations. Changes in normal residual VF areas seem to be more consistent. The method we propose seems to be able to facilitate the early detection of the true changes of the VF.

2/O THE RATE OF PROGRESSION OF VISUAL FIELD DEFECTS IN NORMAL TENSION GLAUCOMA

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Purpose: To know the rate of progression of visual field defects in normal tension glaucoma (NTG) patients.

Subjects: Thirty one eyes of 26 NTGs were selected by the following criteria ; 1) no operation including laser trabeculoplasty, 2) following up over a period of 5 years, 3) good reliability for all visual fields, 4) no significant opacity media, 5) no other disease with visual field defects except NTG.

Methods: The rate of visual field progression was calculated by two methods : 1) For each eye, the periods to keep the same stage with boxplots classification(stage1-5) were decided. At each stage, the average period was calculated. These average periods of all stages were totaled. 2) The rate of visual field progression was decided by the MD slope of the HFA Statpac2.

Results: The eye with progression of the visual field defects were 74.2% in the boxplots classification and were 38.7% in the MD slope. The average rates of visual field progression with the boxplots classification were 7.4 years in the early stage(stage1-2), 10.3 years in the middle stage(stage 3a-4a), and 6.9 years in the late stage(stage4b-4c). The average period to reach the end stage(stage5) was 24.6 years. On the other hand, the average period to reach the end stage was 25.5 years in the eyes with the statistically significant MD slopes.

Conclusion: It was suggested that NTG would take an approximate 25 years to progress to the end stage and that the rates of visual field progression at each stage were different.

3/P STAGING OF THE GLAUCOMATOUS DISEASE USING FREQUENCY DOUBLING TECHNOLOGY. A PROSPECTIVE STUDY

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Methods: 88 patients/eyes with Ocular Hypertension (OH) or glaucoma were examined with Humphrey FDT/N-30 threshold test and full threshold computer perimetry and divided into five groups: OH and glaucoma stages I-IV of visual field loss (VFL) (Aulhorn classification). By means of the Kruskal-Wallis test we evaluated whether there is any correlation between the stage of VFL and 1. the number of regions differing from age-related standard value, 2. the MA-value , 3. the NM-value, 4. the central test field and 5. the examination time of the FDT.

Results: The higher the stage of the disease, 1.the higher was the number of test-regions differing from age-related standard value (p=0,0023), 2. the lower was the MA-value (p=0,00042), 3. the higher was the NM-value (p=0,00005), 4. the lower was the dB-value of the central test field (p=0,091). There were no significant changes in examination time (p=0,35) with increasing stage of VFL.

Conclusion: It is possible to determine the stage of the glaucomatous disease using Frequency Doubling Technology measurements.

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4/P EVALUATION OF METHODS FOR DETERMINING GLAUCOMATOUS VISUAL FIELD PROGRESSION

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Purpose: To determine the agreement between 5 methods for evaluating glaucomatous visual field progression, when compared to a clinically defined, standardized sample of 30 POAG patients.

Methods: The sample comprised 15 stable and 15 progressive glaucoma patients with 5 annual Humphrey fields. One clinical and 4 statistical methods for the analysis of progression were used: the clinical criteria of Hodapp et al (H); total deviation Glaucoma Change Probability (Hodapp criteria) (TDGCP); pattern deviation GCP (PDGCP) (using TDGCP criteria); and the Early Manifest Glaucoma Treatment (EMGT) study criteria for pattern deviation GCP and modified criteria for pattern deviation GCP (PD) that identifies early nasal step defects and defects approaching fixation. The number of patients exhibiting visual field progression was determined for each.

Results: Three subjects, two progressive and one stable, could not be judged by pattern deviation GCP methods since the change map points were outside the database. Progressing patients were identified as follows: 23 by H; 17 by TDGCP; 13 by PDGCP, 8 by EMGT and 18 by PD. The agreement between each method and expert clinical evaluation of progression and stability was as follows: H 14 and 6, TDGCP 10 and 8, PDGCP 9 and 10, EMGT 6 and 12, and PD 13 and 10. The total agreement among all the methods was 9, of which 4 were stable and 5 were progressive. PD had the highest sensitivity (87%) and EMGT had the highest specificity (86%) with respect to the "gold standard" of expert clinical evaluation.

Conclusions: The PD criteria were the most sensitive of all the methods and had a reasonable specificity (67%). However, the shortcomings of the "gold standard" were emphasized by these criteria and will be illustrated.

5/P SENSITIVITY DIFFERENCES BETWEEN REAL PATIENT AND COMPUTER SIMULATED VISUAL FIELDS

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Objective: To study with the aid of computer simulation which fluctuation properties are important in determining the thresholds of stable glaucomatous visual fields.

Methods: Four patients with different types of stable glaucomatous visual fields with 6 to 7 years follow-up and tested every 6 months were chosen: early glaucoma with (i) localized and (ii) diffuse field defect, advanced glaucoma with (iii) minimal and (iv) considerable amount of fluctuation during the follow-up period. Using the first and last real visual fields, interim (6 monthly interval) fields were simulated for each patient using a variety of short- (SF) and long- (LF) term fluctuation parameters. Pointwise sensitivity differences between real and simulated fields were analyzed.

Results: In all 4 cases the variance of pointwise differences was lowest when only defect related short-term fluctuation was used in the simulation. With increasing SF the variance increased in the 4 groups by 135%, 138%, 80%, and 70% respectively. Increasing amounts of SF caused monotonic increase in the variances but LF seemed to have only a minimal effect.

Conclusion: Defect depth related SF alone produced the least difference between real and simulated fields suggesting that it explains most of the total variability in stable visual fields.

6/P PROGRESSIVE SHRINKAGE OF THE VISUAL FIELD DURING AUTOMATED PERIMETRY FOLLOWING TRAUAMTIC BRAIN INJURY

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Purpose: To establish a distinction between the visual field and the attentional field in patients with traumatic brain injury.

Methods: We retrospectively reviewed the 30-degree visual field printout of six patients with concentric contraction and analyzed their visual fields by comparing the two consecutive stages of the Octopus N1 screening and threshold program. The recorded fields were compared with the results of clinical confrontational field testing.

Results: The visual fields showed various degrees of contraction, some severe. All six showed progressive shrinking of the field during the perimetric evaluation procedure. However, no defects were apparent with confrontational field testing. False-negative catch trials ranged from 0 tot 50 % (mean 18.1 % %). When asked, the three patients had all described a striking progressive darkening of the background and shrinkage of the visual field during the automated perimetric examination.

Conclusions: During automated perimetry, patients with traumatic brain injury may develop progressive concentric contraction. This is associated with the experience of dramatic obscuration of the visual field. This may reflect an organic disturbance in attentional mechanism, revealed when executing dual task demands. When analyzing results from automated perimetry in such patients, a distinction should be made between visual and attentional fields.

O = Oral Presentation
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7/O AGREEMENT OF HUMPHREY GLAUCOMA CHANGE PROBABILITY AND POINTWISE LINEAR REGRESSION ANALYSES ON GLAUCOMATOUS VISUAL FIELD PROGRESSION

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Purpose. To assess the agreement of two methods of determining visual field progression: Humphrey Glaucoma Change Probability (GCP) and pointwise linear regression (PLR) analyses.

Methods. Sixty-three eyes of 63 normal-tension glaucoma patients were enrolled who had at least five reliable Humphrey visual fields (central 30-2) within the follow-up period of more than 24 months. PLR analysis was done using Total Deviation values of the fields at each test point. Five progression criteria for PLR analysis were evaluated: 1) negative slope with $p < 0.05$, 2) negative slope with $p < 0.01$, 3) decrease in sensitivity greater than 0.50 dB/year, 4) greater than 1.00 dB/year, and 5) greater than 2.00 dB/year. GCP analysis was, also, used to identify the progressed points in the last field compared to the baseline fields. Agreement between GCP analysis and each of PLR criteria was assessed for each test point and the percentage of agreement was calculated.

Results. The mean percentage of agreement between GCP analysis and the above mentioned five PLR criteria was 83% (range: 39-100), 87% (46-100), 69% (18-100), 76% (29-100) and 83% (38-100), respectively.

Conclusion. On determining glaucomatous visual field progression the results of GCP analysis generally conformed to those of PLR analyses, especially when judged according to the criteria at significance level of $p<0.01$.

8/O DISCRIMINATORY POWER OF POINTWISE LINEAR REGRESSION FOR DETECTION OF GLAUCOMATOUS VISUAL FIELD DEFECT PROGRESSION

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Purpose: To quantify the sensitivity and specificity of pointwise linear regression as a tool for detection of glaucomatous visual field loss.

Methods: A visual field simulation model was used to generate longitudinal threshold field data with and without glaucomatous levels of variability. Progressive visual field series with test locations exhibiting different rates of progressive loss (-1dB/yr to −2.5dB/yr) were produced. Data simulated without variability were used as a 'gold standard'. Data were analysed using pointwise linear regression analysis. Two regression outcome criteria were evaluated, (1) slopes of -1 dB/yr. or worse and (2) statistically significant slopes of -1 dB/yr. or worse ($p<0.05$).

Results: When slopes of -1dB/yr. or worse were used as an outcome measure specificity appeared dependent on number of available test results, increasing from (70% after 4 results to (95% after 10 results for all rates of progression. When statistical significance was added to this criterion, specificity appeared independent of number of available test results and remained at (98%. For both regression outcome measures, sensitivity increased with number of fields present in analysis and the rate of increase was greater with higher true progression rates. For true progression rates of −1dB/yr., sensitivity did not exceed 50% for either outcome measure.

Conclusions: When using slopes of −1dB/yr or worse as an outcome measure, pointwise linear regression detected true progression rates of −2 or −2.5dB/yr with acceptable levels of sensitivity and specificity after 7-8 visual fields. Acceptable specificity levels were present for 4 or more fields when a significance criterion was used, although this reduced sensitivity such that 7-8 visual fields were required to detect locations with true progression rates of −2 or −2.5dB/yr. Neither criterion exhibited reasonable sensitivity levels for points progressing at −1 or −1.5dB/yr.

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Notes

1/O DEVELOPMENT OF A MAXIMUM LIKELIHOOD PROCEDURE FOR SHORT WAVELENGTH AUTOMATED PERIMETRY (SWAP)

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Purpose: To develop a maximum likelihood procedure for SWAP and compare its performance with conventional staircase procedures in normal observers.

Methods: Probability density functions for each visual field location were generated by combining data from a prior data set of 402 normal eyes (20 to 85 years) and 175 eyes with early glaucomatous visual field loss. SWAP frequency-of-seeing curve slopes were based on similar experiments with FDP, and tuned using computer simulation. The maximum likelihood test procedure was performed on a Humphrey Field Analyzer I controlled through the Gateway interface by a custom computer program running on a 486 clone with 640Kb of RAM. Our initial evaluations were performed on 22 normals aged 28 to 79.

Results: Thresholds for both procedures were comparable, with average staircase thresholds 3.14 dB lower than those obtained with the maximum likelihood procedure. 60% of the threshold estimates for the two procedures were within 3 dB, 82% were within 5 dB and 93% were within 7 dB. Test-retest variability for the maximum likelihood procedure was about 40-45% lower than for the staircase procedure. The staircase procedure took an average of 33% longer than the maximum likelihood procedure.

Conclusions: Maximum likelihood procedures for SWAP appear to produce significant reductions in both test time and test-retest variability in comparison to conventional staircase procedures. Results for patients with early glaucomatous visual field loss will also be presented.

2/P TOP-FLICKER FLUCTUATION IN OCULAR HYPERTENSION

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Purpose: The precocity of the TOP-Flicker defect in a big number of ocular hypertensive patients has previously been reported (Perimetry Update 1998-99). Our purpose now is to study the reproducibility of these defects.

Methods: 11 normal and 30 ocular hypertensive eyes were examined three times: once with luminous threshold perimetry (TOP-S) and twice with Flicker perimetry (TOP-F).

Results: All examinations showed MD<2dB and LV<6dB2 with TOP-S. With TOP-F one normal eye had abnormal MD and LV; 66.7% of the ocular hypertensive cases presented one of the indexes over the cut off level previously described. 36.7% of the cases had both indexes higher in both examinations. For 46% one of the indexes was higher in both examinations. The mean MD values were-0.34(1.1dB with TOP-S (range: -2.51 to 1.39dB) and 3.63(4.94dB with TOP-F (range: -2.47 to 17.07dB) ($p<0.001$). The mean LV values were 2.07(1.69 dB2 with TOP-S (range: 0.28 to 5.98dB) and 17.75(17.86 dB2 with TOP-F (range: 0.27 to 63.43) ($p<0.001$). Threshold fluctuation for TOP-F was 1.13(1.10dB (range: 0.05 to 3.70dB) for normal eyes and 3.62(2.17dB (range: 0.05 to 7.68dB) for the hypertensive cases ($p<0.001$). The fluctuation was highly correlated with the MD ($r=0.66$). For MD values of 0dB, fluctuation was 2.6dB and for MD=10dB it was 5.5dB. The correlation between the MD and the LV in TOP-S and TOP-F was low ($r=0.17$ and 0.20). The MD and sLV were well correlated in TOP-F ($r= 0.83$).

Conclusions: TOP-F was abnormal in half the ocular hypertensive eyes. Similarly to luminous threshold perimetry, threshold fluctuation in this procedure increases with the MD. Finally, the MD and sLV showed a close relation in TOP-F.

3/P SECOND GENERATION OF THE TENDENCY ORIENTED PERIMETRY ALGORITHM: TOP+

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Purpose: The TOP strategy divides the points of the visual field in four intercalated matrices. Each point is examined once and each answer is applied to the surrounding points. In the case of scotomas with sharp edges, smoothening and hence reduction of the loss variance (LV) is produced. The algorithm has been modified in order to eliminate this effect.

Methods: In a previous paper (*) we proved that the threshold at a certain point has a high relationship with those nerve fibers that follow a similar path towards the optic disc, even when located far from each other. Patient's answers to each matrix allow threshold estimation, considering the answers to both proximal and distant related points. These values are used to examine the next matrix. The equations have been calculated using step by step multiple regression and 1116 Octopus bracketing 32 visual fields (309 normal, 581 glaucoma, 309 neurological patients and 28 subjects with chorioretinal lesions).

Results: Theoretically, the new algorithm provides results very close to real thresholds. The correlation coefficient (and error of estimation of Y over X) for the MD and the sLV were 1.00 (0.45 dB) and 0.98 (0.44 dB) respectively. The average of the differences between the 82584 pairs of examined thresholds (actual and estimated) was 1.4 dB. The number of absolute scotomas coincided at 99% and the mean sLV at 96%. Conservation of border contrast was seen in sharp scotomas, such as the nasal steps in glaucoma and hemianopsias.

Conclusions: TOP+ corrects TOP's tendency to smooth the edges of sharp scotomas and improves LV estimation.

(*) González dela Rosa M, González-Hernández M, Abraldes M, Azuara-Blanco A.Quantification of topographic correlation of thresholds values in glaucomatous visual field. Invest Ophthalmol Vis Sci. (ARVO Abstract). 2000;41: Abstract nr 444.

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4/P PERFORMANCE EVALUATION OF OCTOPUS STANDARD AND TOPS ALGORITHMS

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Purpose: To evaluate the comparative performance of the TOPS algorithm to the standard (Std) algorithm of the Octopus perimeter in white-on-white (W-W) and blue-on-yellow (B-Y) automated perimetry. METHODS: Fifteen experienced normal subjects (mean age=31.2 years; SD=4.1 years) underwent two perimetric algorithms (Std & TOPS) with two different stimulus parameters (W-W & B-Y) at two visits. At each visit, each examination was separated by a minimum of ten minutes. The examination duration and visual field indices of mean sensitivity (MS) and loss variance (LV) were compared between algorithms and between stimulus parameters.

Results: The mean duration of the TOPS algorithm (mean=2.07 mins; SD=0.21) was shorter than that of the Std algorithm (mean=10.42 mins; SD=1.38; $p<0.0001$), regardless of stimulus parameters ($p=0.003$). The mean sensitivity of TOPS (mean MS=26.71dB; SD=1.43) was slightly higher than the Std algorithm (mean MS=26.21dB; SD=1.38) but this difference did not reach statistical significance for either stimulus parameter ($p=0.174$). The root mean square error of the test-retest threshold values was larger for the Std B-Y procedure than for TOPS B-Y ($p=0.002$), but this difference was not observed between the algorithms for the W-W stimulus parameters ($p=0.55$). The B-Y procedure identified larger LV than the W-W procedure (mean LV B-Y= 4.35dB, SD=2.16; mean LV W-W=3.93dB; SD=1.96; $p=0.003$) but the magnitude was not significantly different between the TOPS and the Std algorithm ($p=0.60$). Comparative data for subjects with abnormal visual fields will also be presented.

Conclusions: The TOPS algorithm in W-W and B-Y perimetry has significantly shorter examination duration. In young normal subjects, this time saving is not achieved at a loss of accuracy or repeatability.

5/O THE FEASIBILITY OF SHORT AUTOMATED STATIC PERIMETRY IN CHILDREN.

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Objective: To evaluate the feasibility of short automated static perimetry using tendency-oriented perimetry in the pediatric population.

Material and Methods: Fifty normal children age 6 through 12 years underwent testing with the Octopus TOP-32 program on the Octopus 1-2-3 automated perimeter. Each eye was tested twice. Analysis included: Mean sensitivity, mean defect, and loss of variance; grayscale and numeric representations of the field; duration of each test and of the entire session; subjective assessment of each test as normal or abnormal and specificity.

Results: All subjects successfully completed all 4 tests. The mean duration for each test was 2:30 + 0.23 minutes. The average time for the whole session including training, testing both eyes twice and rest periods was 25.8 + 4.87 minutes. Improvement in the specificity of the test (fewer abnormal tests in normal children) occurred in direct relation to subject age ($R = 0.5$).

Conclusions: Automated static perimetry using short, tendency-oriented programs can be successfully performed in normal children age 6 through 12 years in a typical clinical setting. Age was the best predictor of the mean sensitivity, reproducibility, and accuracy of the test, with the most reliable results obtained after 7 years of age. In children 6-7 years old, significant inter-individual variability was present and testing success was more dependent on the child's maturity and ability to concentrate. Short automated perimetry appears to be a promising tool for the evaluation of peripheral vision in pediatric patients.

6/P CLIP: A NEW STRATEGY IN AUTOMATED STATIC PERIMETRY

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CLIP-strategy (continuous light increment perimetry) is performed on an Twinfield-perimeter. Stimulus intensity is continuously raised (1 dB per reaction time) beginning from a start position 5 dB added to the presumed age-correlated threshold until recognition. CLIP was compared to 4/2-strategy and fast threshold (FS) program (Twinfield) and to SITA (Humphrey). Ten normal subjects (aged 20 to 30 years) were tested ten times with all four strategies on 26 locations within the central 30°-visual field.

Mean test time was shortest with CLIP (104s) as compared to 4/2 (245s), FS (164s) and SITA (124s). Averaged mean sensitivity of CLIP-strategy was 24.6 dB, 22.5 dB for 4/2-strategy, 23.2 dB for FS and 22.0 dB for SITA (corrected for maximum luminance) respectively. Averaged standard deviations for all 26 positions (intraindividual variability) for the ten subjects were 1.18 dB (CLIP), 1.44 dB (4/2), 1.51 dB (FS), and 1.25 dB (SITA).

CLIP showed comparable results with SITA and performed better than 4/2 and FS in a significant shorter time. All test subjects preferred CLIP-strategy. Possibly relevant summation or adaptation phenomena in patients are subject to further clinical studies.

O = Oral Presentation
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7/P THE VALIDITY AND REPEATABILITY OF SITA THRESHOLD ESTIMATION ALGORITHMS VERSUS STANDARD FULL THRESHOLD TESTING IN GLAUCOMA

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Purpose. To determine the validity and repeatability of SITA-Standard, SITA-Fast and Humphrey standard Full Threshold perimetric algorithms in glaucoma patients.

Methods. One randomly chosen eye from each of 42 glaucoma subjects (16 early, 11 moderate, and 15 severe visual field defect; mean age 69.6, SD 7.5) was assessed with the 30-2 program of SITA-Standard (SS), SITA-Fast (SF), and the standard Full Threshold (FT) estimation algorithms. Three visits were scheduled over a 4-week period.

Results. Comparison of Algorithms (visit 2): The average test time for SS was 8:58 minutes (SD 1:33), SF was 5:26 (SD 1:04), and FT 17:03 (SD 2:53), with all test times being significantly different ($p<0.001$). Both the Mean Deviation (MD) and the number of Pattern Deviation points at all probability levels were greater for SS but this did not reach statistical significance. The Pattern Standard Deviation (PSD) values were significantly different for all methods ($p<0.05$ with SF<SS<FT). Repeatability of Algorithms (visit 2 to 3): The Coefficient of Repeatability (CoR) for MD and PSD was similar for FT (41%, 33%) and SS (40%, 36%), but was worse for SF (52%, 49%). For 0.5% and 1% probability points, the CoR was similar for SF (77%, 78%) and FT (74%, 65%), but was better for SS (54%, 45%).

Conclusion. In a sample of glaucoma subjects, the SS and SF strategies demonstrated significantly decreased test times when compared with FT (48% and 69% respectively). SS and FT demonstrated similar repeatability in the MD and PSD indices between visits whereas SF was less repeatable. SS alone demonstrated greater repeatability for the assessment of the pointwise pattern deviation visual field defect. The confidence limits for change are narrower for SITA-Standard; therefore it should detect glaucomatous visual field defects as well as progression earlier than both FT and SF.

8/O IMPACT OF FATIGUE ON FULL THRESHOLD AND SITA ALGORITHMS

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Purpose: Differences in HFA sensitivity values for SITA and full threshold (FT) algorithms have been attributed to differences in visual fatigue. We examine the effect of cumulative fatigue on visual field sensitivity and defect size in 24-2 fields using both SITA and FT algorithms

Methods: We tested one eye of reliable, well-practised patients with glaucomatous or neuro-ophthalmological field defects with 4 consecutive SITA fields and 2 consecutive FT fields in two sessions. Session order was randomized across patients.

Results: Preliminary results (5 patients) suggest that average mean deviation (MD) decreases ascros test time for both algorithms and the number of abnormal points in the total deviation (#TD) and pattern deviation (#PD) increase. As expected, the average MD for the initial SITA field was slightly better than for the initial FT field (-5.87 vs. −6.71) while defect size was quite similar (#TD=21.0 vs. 21.2 and #PD-18.4 vs. 18.0). However, while the average MD at the end of the testing sessions were similar (-7.69 SITA and −7.61 FT), SITA fields consistently had a slightly larger number of defective points than the FT fields (#TD=30.6 vs. 28.8; #PD-23.0 vs. 21.2).

Conclusions: These preliminary results suggest a complex interaction between fatigue and the type of thresholding algorithm.

9/O SHORT- AND LONG-TERM FLUCTUATION FOR SITA STANDARD AND SITA FAST.

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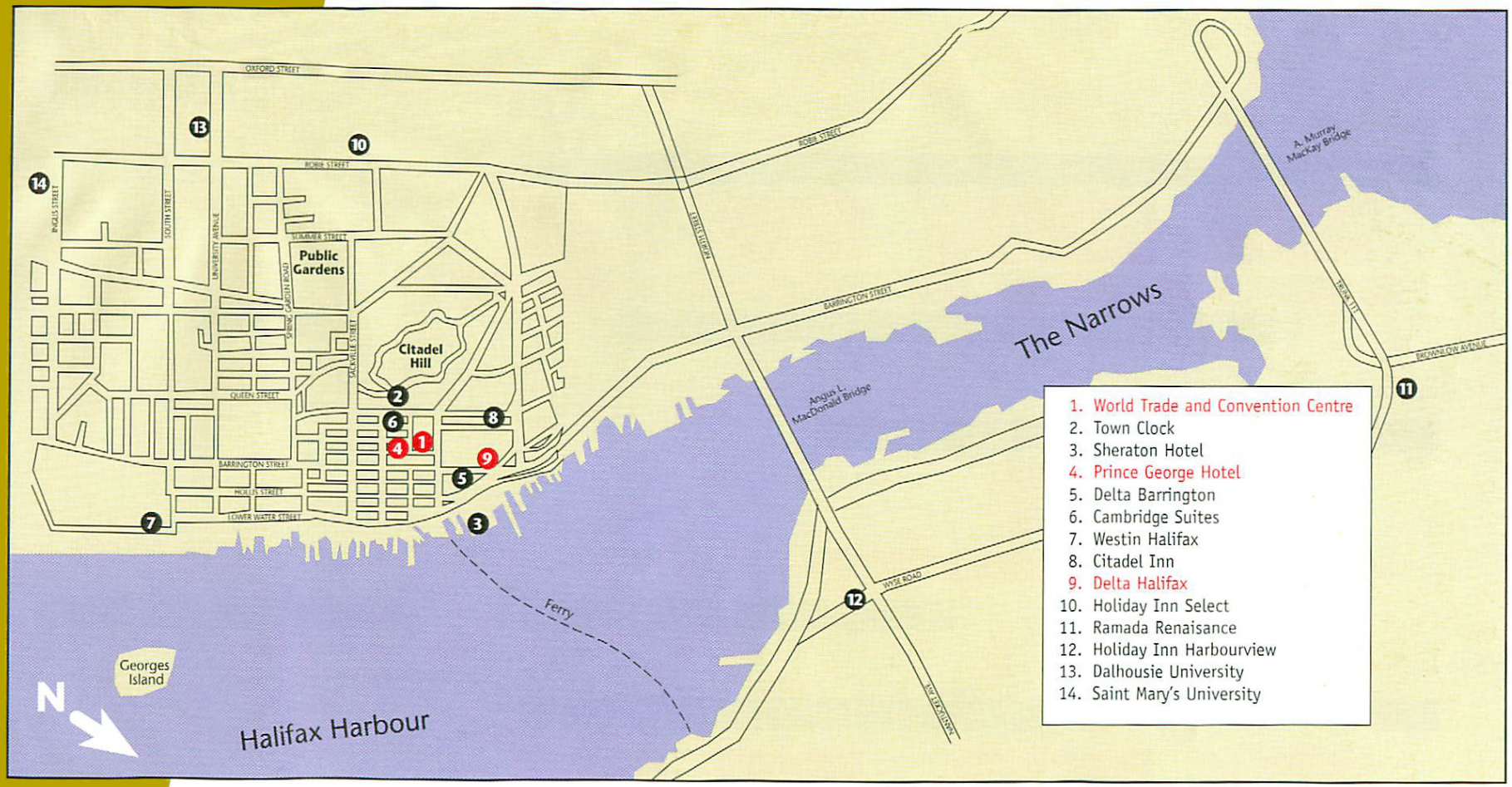
Purpose: To determine the magnitude of the unweighted short-term fluctuation (SF) and the homogeneous and heterogeneous components of long-term fluctuation (LF(Ho) and LF(He) respectively) in normal subjects using the Humphrey Field Analyzer SITA standard (SITA-Std) and SITA fast (SITA-Fast) algorithms.

Methods: The initial sample comprised 20 young, normal subjects (mean age=23.5 years; SD=3.25 years). In order to determine the traditional indices of fluctuation, each subject performed three perimetry cycles at each visit, with a cycle consisting of two consecutive examinations with each procedure. The order of cycles was randomised between subjects and each subject attended for three visits separated by a minimum of one day (mean interval=9.68 days; SD=8.88 days). The magnitude of the unweighted SF, the LF(Ho) and LF(He) were calculated using all points from a technique cycle. 20 older, normal subjects were also recruited (mean age=62.4 years)

Results: The group mean SF for the young subject group, across all examinations was 1.43dB (SD=0.46dB) and 1.28dB (SD=0.35dB) for SITA-Std and SITA-Fast respectively. For the LF(Ho), the corresponding data was 0.80dB (SD=0.57dB) and 0.64dB (SD=0.53dB); and for the LF(He), 0.89dB (SD=0.59dB) and 0.99dB (SD=0.54dB). There was no significant difference between the unweighted SF ($p=0.291$) or the LF indices ($p=0.416$) of SITA-Std and SITA-Fast, irrespective of the order of the perimetric tests.

Conclusions: Both the SITA-Std and SITA-Fast algorithms exhibit similar levels of repeatability in young normal subjects. The magnitude of the LF components based on all locations was considerably less than that of the standard full threshold HFA algorithms.

Map of Downtown Halifax



Program at a Glance