LASER PERIMETRY: COMPARISON OF CONVENTIONAL AND LASER DATA IN THE CHIASMAL SYNDROME

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Campimetric pictures in several cases of chiasmal syndrome are presented. Comparison between white light and laser visual field data shows that earlier and more precise evidence of visual field defects is obtained with the latter method.

As its name suggests, laser perimetry involves the employment of a laser as the light source. Its use in visual field determination answers the criticisms levelled against coloured light perimetry in recent years on account of the chromatic features of its targets. It has also proved a highly effective means of obtaining early warning of the presence of defects.

The choice of a laser for this purpose was taken after examination of the physiological, physical, and mathematical bases underlying a perimetry technique making use of a strictly monochromatic coloured light. This matter has been discussed elsewhere (Liuzzi and Bartoli 1972*a*, 1972*b*, 1973).

The apparatus in question consists of a laser source fitted to a Goldmann perimeter (Fig. 1). The laser is of the continuous, helium-neon type, with an emission band in the red region (6328 Å). Other technical features are: band width 0.1 Å ; maximum power 0.5 mW; beam width 0.8 mm; spread 1 milliradian. A series of filters was used to obtain 40 different brightness levels. Positive and negative lenses were also interposed to increase or decrease the area of the projected targets, so that spatial summations could be obtained.

TECHNIQUE

The typical Goldmann technique was used in determining the visual field. We have already employed this method in kinetic perimetry. Comparative data were obtained by determining the visual field with both white light and the laser. Objective assessment was achieved by looking for isopter coincidence. Either one or the other source was first employed to establish a certain number of isopters. After a sufficient interval to prevent the possible influence of fatigue, the examination was repeated with the other method, using luminance levels that resulted in perfect correspondence with the previously obtained isopters in unimpaired areas of the field. The large number of brightness levels offered by the apparatus made this easy to accomplish. The examinations were subsequently repeated in the reverse order. The more effective method, of course, was clearly that which gave the earlier warning of the presence of defects in the field.

The possible influence of artifacts was guarded against by following the progress of defects. It was found that white-light evidence of laser-detected impairment was eventually obtained in progressive cases as opposed to stationary processes.

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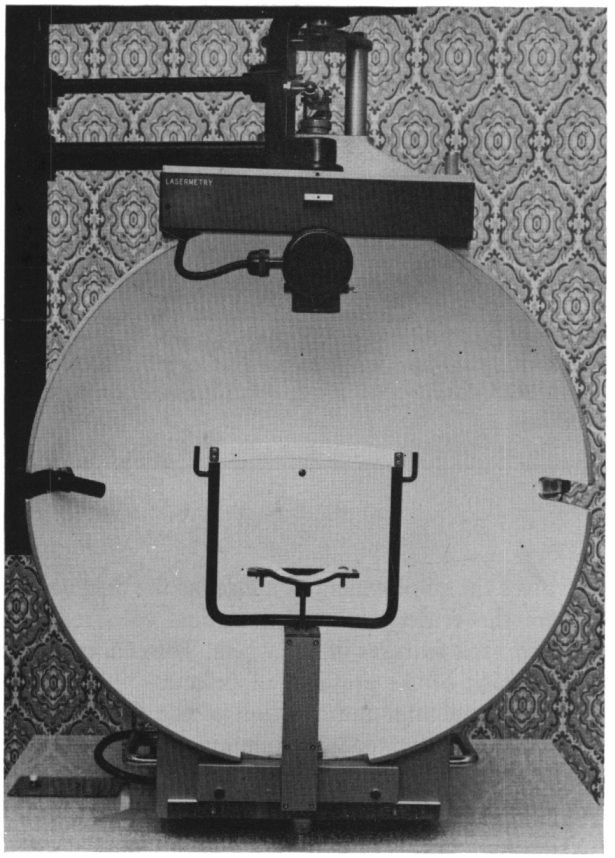

Fig. 1. Laser perimetry apparatus: a laser source fitted to a Goldmann perimetry.

Choice of the optic chiasma as a subject for investigation was suggested by the fact that its fibres are nothing more than a continuation of those of the optic nerve. These, in turn, originate as axons from the retinal gangliar cells. Chiasma fibre impairment will thus be followed by gangliar cell distress, resulting in enhancement of the excitation threshold. The monochromatic light obtained with a laser is thus equally indicated on physiological grounds, namely the increased inhibition displayed by amacrine cells in the presence of light of this kind.

CLINICAL MATERIAL

Our series was composed of 9 cases: 3 chromophobe adenoma, 3 acromegaly, 1 craniopharyngioma, 1 encephalohypophyseal syndrome, 1 atheroma of the arterial circle.

Many of the clinical data that were in themselves of interest in focusing attention on the campimetric findings have been omitted.

Case 1

Caterina P., aged 53, chromophobe adenoma. Admitted to the San Giovanni Hospital for the third time on 3-2-1973.

Vision: B.E., 9-10/10 without glasses and normal ophthalmoscope picture.

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Visual field: R.E.: White light shows slight flattening of the upper temporal quadrant (middle isopter); this becomes temporonasal in the inner isopter.
Upper temporal flattening is already evident in the peripheral isopter when the laser is used, and becomes temporonasal and horizontal in the middle and inner isopters respectively.

L.E.: White light: upper temporonasal flattening in the inner isopter only; no sign of impairment in the others.
Laser: signs of inwardly-increasing involvement in all isopters.

CASE 2

Adelina R., aged 47, chromophobe adenoma. Campimetry on 8-1-1973 during first period of hospitalisation.

Vision: B.E., 8-9/10 without glasses and normal ophthalmoscope picture.

Visual field (Fig. 2 *a*, *b*): R.E.: White light: notch in upper and lower temporal quadrants (middle isopter); temporal hemianoptic defect (inner isopter).
Laser: defect present in peripheral isopter and increasingly evident toward the inner isopter.

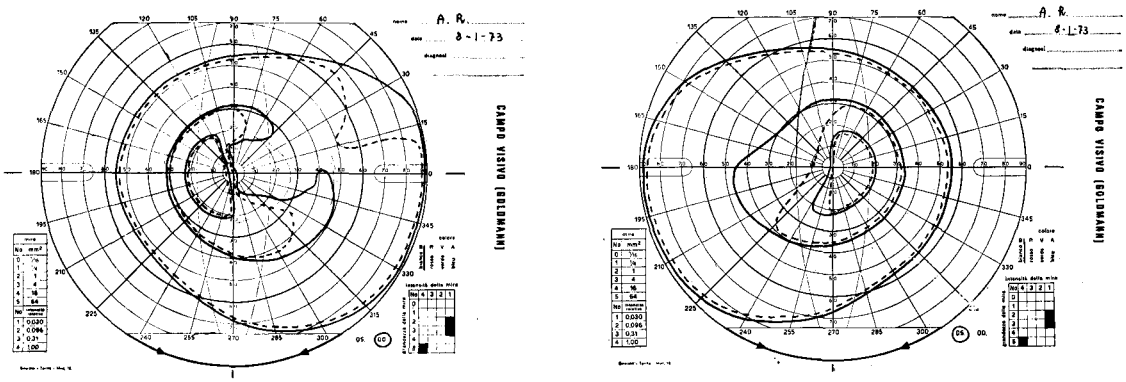

Fig. 2 *a*, *b*. Visual field of A.R. (Case 2) on first admission: *a*, right eye; *b*, left eye.
Continuous lines = white-light findings; broken lines = laser findings.

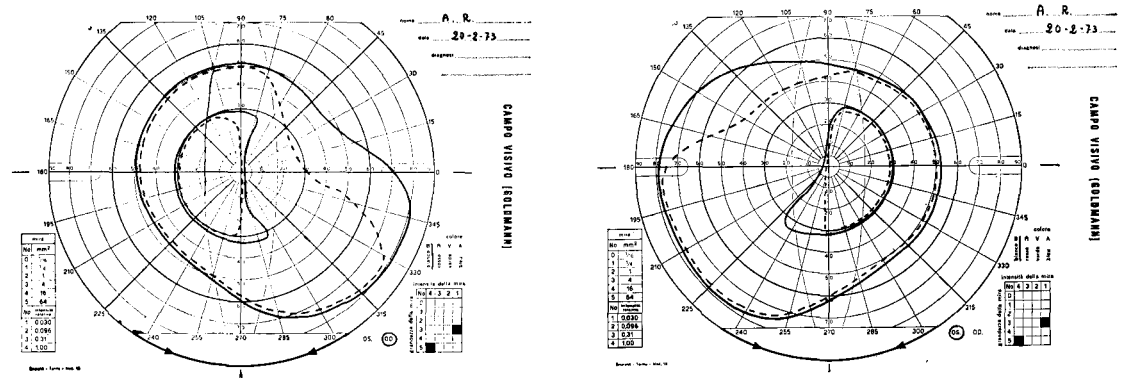

Fig. 2 *c*, *d*. Visual field of A.R. (Case 2) on second admission: *c*, right eye; *d*, left eye.
Continuous lines = white-light findings; broken lines = laser findings.

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L.E.: White light: upper temporal flattening (middle isopter); hemianoptic defect (inner isopter).
Laser: these defects are even more apparent and there is a tendency towards temporal hemianopsia.

Second examination on readmission about 40 days later (Fig. 2 *c, d*):
Vision: B.E., 5-6/10 without glasses.

Ophthalmoscopy: slight temporal pallor of both disks.

Visual field: B.E.: White light: the defects observed during the 1st examination have become more pronounced in all isopters, the picture is similar to that first observed with the laser.
Laser: defects still more pronounced in all isopters.

CASE 3

Pasqualina P., chromophobe adenoma, admitted to the Turin University Endocrine Surgery Centre.

Vision: B.E., 10/10 without glasses and normal ophthalmoscope picture.

Visual field: R.E.: White light, slight flattening (inner isopter only).
Laser: flttening in the upper temporal quadrant (middle isopter) and hemianoptic defect (inner isopter).
L.E.: White light: slight notch in upper temporal quadrant (inner isopter).

CASE 4

Antonio M., aged 45, acromegaly, admitted to the Turin University Endocrine Surgery Centre.

Vision: B.E., 9-10/10 without glasses and normal ophthalmoscope picture.

Visual field: R.E.: White light: slight upper temporonasal flattening (central middle isopter); temporal hemianopsia associated with upper nasal quadrantopsia, with semisection of the central field (inner isopter).
Laser: slight temporonasal flattening (middle isopter); temporal hemianopsia (central middle isopter); the central isopter was extremely small and the central field was excluded.
L.E.: White light: slight upper temporonasal flattening (central middle isopter); temporal hemianoptic defect associated the central nasal quadrantoptic defect and semisection of the central field (central isopter).
Laser: the inner isopter was extremely small and the central field was excluded; the other isopters showed a more pronounced picture of the defects observed with white light.

CASE 5

Franco B., aged 17, giantism.

Vision: B.E., 10/10 with — 2.5 spherical correction and normal ophthalmoscope picture.

R.E.: White light: all isopters and disk within the limits of normal.
Laser: upper temporal quadrant defect (middle isopter); temporal hemianoptic defect associated with upper nasal defect (central middle isopter).
L.E.: White light: all isopters and disk within the limits of normal.
Laser: slight upper temporal quadrant defect associated with lower temporal quadrant defect of quadrantoptic type and slight lower nasal defect (central middle isopter).

CASE 6

Ida D., aged 39, acromegaly, admitted to the Turin University Medical Clinic.

Vision: R.E., 8-9/10, L.E., 7-8/10 without glasses and normal opthalmoscope picture.

Visual field: R.E.: White light: slight upper temporal quadrant defect in inner isopter only.
Laser: upper temporal quadrant defect in central middle isopter, becoming horizontal in the inner isopter.

L.E.: White light: upper temporal and upper and lower nasal quadrant defects (central middle isopter).
Laser: sinuous pattern, with upper temporal and upper and lower nasal quadrants (middle isopter); horizontal flattening in both lower and upper quadrants (central middle isopter).

Case 7

Benilde A., aged 39, silent encephalohypophyseal syndrome following continuous treatment lasting about 2 yers.

Vision: R.E., 10/10; L.E., 10/10 without glasses and normal ophthalmoscope picture.

Visual field: B.E.: Identical defect picture given by white light and the laser. As stated earlier, both methods are equally effective in displaying defects in cases with stationary pictures.

Case 8

Anna C., aged 32, craniopharyngioma, admitted to the Turin University Endocrine Surgery Centre.

Vision: R.E., 8-9/10; L.E., 8/10 without glasses and normal ophthalmoscope picture.

Visual field: R.E.: White light: sinuous defect in temporal and upper nasal quadrants (middle isopter); upper temporal and upper and lower nasal defect (central middle isopter; upper temporal quadrantoptic defect and less evident lower nasal defect (inner isopter).
Laser: more pronounced defects confirming the sinuous pattern of the isopters.

L.E.: White light: slight upper temporal flattening (middle isopter); sinuous temporal hemianoptic defect, associated with slight upper temporal and lower nasal defect (inner isopter).
Laser: more pronounced defects confirming the sinuous pattern of the isopters.

Case 9

Giorgio P., aged 73, arterial circle atheroma.

Vision: B.E., 7-8/10 without glasses and normal ophthalmoscope picture.

Visual field (Fig. 3 *a*, *b*): R.E.: White light: upper temporal quadrantoptic defect (central middle isopter).
Laser: defect already visible in middle isopter, with increase to hemianoptic defect in central middle isopter.

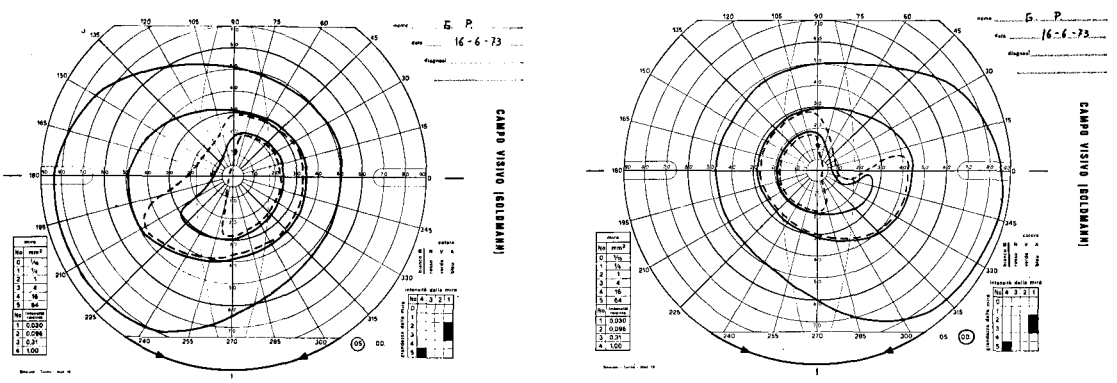

Fig. 3 *a*, *b*. Visual field of G.P. (Case 9): *a*, right eye; *b*, left eye.
Continuous lines = white light findings; broken lines = laser findings.

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L.E.: White light: upper temporal quadrantoptic defect progressing to hemianoptic defect (central middle isopter).
Laser: extensive upper and lower temporal defect in middle isopter, with increase to hemianoptic defect in central middle isopter.

CONCLUSION

Comparison between white light and laser visual field data shows that earlier and more precise evidence of visual field defects is obtained with the latter method. Three types of results may be observed:

1) Those in which fields apparently normal in white light prove defective when examined with the laser;

2) Those in which the laser shows that defects observed in conventional campimetry are in reality more serious and in the process of spreading to parts of the field that are apparently unimpaired when examined with white light;

3) Those in which both methods give exactly the same picture; in such cases, the process responsible is in a stationary phase.

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