Electrophysiology of type II mesangiocapillary glomerulonephritis with associated fundus abnormalities

C O'Brien, J Duvall-Young, M Brown, C Short, M Bone

Abstract

The retinal electrophysiology is reported in four patients with type II mesangiocapillary glomerulonephritis and partial lipodystrophy with associated fundus abnormalities and no visual symptoms. The histological hallmark of the condition is that of widespread electron dense deposits in the renal glomerulus and in the choriocapillaris and Bruch's membrane of the eye. Three of the four patients had the typical fundal appearance of multiple, yellow, drusen-like lesions at the posterior pole of the eye with normal visual acuity. These three patients had abnormally low Arden ratios on electro-oculography with normal electroretinography responses. This is the first clinical model of disease known to be isolated to the choriocapillaris and Bruch's membrane causing an electro-oculographic abnormality without any clinically detectable deficit in visual function.

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Mesangiocapillary glomerulonephritis (MCGN) is a not uncommon renal disease which affects young people. It presents as haematuria and proteinuria and may eventually lead to end stage renal failure requiring dialysis or renal transplantation.¹ We have previously described a series of patients with type II MCGN and partial lipodystrophy (PLD) who had a widespread abnormality of the fundus but no ocular symptoms.² The characteristic fundal picture is that of diffuse, bilateral, symmetrical, yellow, drusen-like lesions at the posterior pole with irregular pigmentation. The renal histology is that of electron dense deposits within the glomerular basement membrane, while similar electron dense material is seen in Bruch's membrane and the choriocapillaris throughout the eye.³ We now report the retinal electrophysiology in four patients with biopsy proved type II MCGN and PLD.

Materials and methods

Electrodiagnostic tests were conducted with the Nicolet Compact 4 System and a Nicolet Ganzfeld Stimulator (Nicolet Biomedical Instruments, Madison, Wisconsin, USA). The electro-oculogram (EOG) was conducted for 10 minutes in complete darkness and for 15 minutes with a Ganzfeld background luminance of 68.5 cd/m² (20 fL). Our normal range of Arden ratios extends down to 1.6.

The pattern electroretinogram (PERG) was carried out using a gold leaf electrode with the eyes at 50 cm from a cathode ray tube screen with near 100% contrast rate, white luminance, and with 50' checks, and overall screen angles of 20° vertical and 28° horizontal. Reversals were 8/s (4 Hz) and normal PERG exceed 3 µV. The flash ERG was undertaken in low background light (3.1 cd/m²) existing for at least 5 minutes before the flash, and with single flashes of intensity 2.1 cd/m² (2.5 µV). Normal results exceed 150 µV. Flicker ERG was at 30 Hz with flash intensities of 1.3 cd/m².s. Normal values are greater than 50 µV.

Results

All four patients had had successful renal transplantation for kidney failure and were normotensive on systemic antihypertensive therapy. All patients had normal visual acuity and were asymptomatic (Table 1). Fundus examination showed that two cases had the typical appearance of widespread, multiple, yellow, drusen-like lesions at the posterior pole and mid-peripheral retina with pigment changes (Figs 1, 2). One patient had several discrete drusen-like lesions, while one patient had normal appearing fundi. Two patients (cases 2 and 3) had the characteristic facial features of partial lipodystrophy (Fig 3) which is commonly associated with type II MCGN.¹ Table 2 shows that two patients (cases 2 and 3) had a markedly reduced EOG light peak to dark trough Arden ratio and a third patient had a moderately reduced ratio (case 4), (normal for our laboratory is greater than 1.6). The waveform and amplitudes of the PERG, flash ERG, and the flicker ERG were essentially normal for all four subjects.

Case 1 had an EOG at the lower limit of normal with normal ERG studies.

Discussion

The significance of this paper is not to report a rare condition, but to demonstrate the physiopathological correlation of known chorio-

Royal Liverpool
University Hospital
C O'Brien
J Duvall-Young
M Brown
M Bone

Manchester Royal
Infirmary
C Short

Correspondence to:
Mrs J Duvall-Young, St Paul's
Eye Unit, Royal Liverpool
University Hospital, Prescot
Street, Liverpool L7 8XP.

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Table 1 Clinical details of the four patients (Type II MCGN with partial lipodystrophy)

Case	Age	Sex	RVA	LVA	Fundus examination
1	29	F	6/5	6/5	Normal
2	48	M	6/5	6/5	Diffuse drusen and pigment changes at posterior pole
3	41	M	6/5	6/5	Diffuse drusen and pigment changes at posterior pole
4	33	F	6/5	6/4	Discrete drusen-like lesions

MCGN=mesangiocapillary glomerulonephritis.
RVA=right eye visual acuity.
LVA=left eye visual acuity.

Figure 1 The typical fundal appearance of multiple drusen-like lesions at the posterior pole.

Figure 2 Multiple yellow lesions with minor pigment changes in the mid-peripheral retina.

Table 2 Electrophysiology measurements (μV)

Case	EOG Arden ratio		PERG P50	Flash ERG A-B amp	Flicker ERG
	R	L			
1	1.68	1.60	5.46	263	96
2	1.18	1.35	5.32	181	72
3	1.28	1.27	7.27	234	76
4	1.41	1.48	7.51	223	57

PERG = pattern electroretinogram.

Figure 3 The characteristic gaunt appearance of facial lipodystrophy seen with type II mesangiocapillary glomerulonephritis due to loss of facial fat.

capillaris and Bruch's membrane disease to the currently used electrophysiology tests. The disorder described is unusual in that the patients have a widespread abnormality of the fundus but are asymptomatic. We found that cases 2, 3, and 4 had abnormally low EOG Arden ratios with normal ERG responses. This study helps us to interpret the results of the EOG. Specifically, the deposits in Bruch's membrane and the choriocapillaris, which do not cause any appreciable visual disturbance, cause a reduction in the Arden ratio of the EOG. Miller has suggested that ion changes at the base of the retinal pigment

epithelium (RPE) are responsible for the light peak of the EOG.⁴

In Best's disease the electrophysiology findings are comparable, in that the EOG Arden ratio is low but the ERG is normal.⁵ The site of the lesion in this condition is unknown but lipofuscin accumulation is seen in the RPE as a secondary effect.^{6,7} Previously, the evidence that the EOG detects abnormalities in the RPE has been presumptive on the basis of animal experiments.⁸⁻¹² Our cases show that the Bruch's membrane and choriocapillaris deposits with histologically normal RPE are sufficient to cause a reduction in the Arden ratio. We must then conclude that the deposits in themselves cause a disturbance in RPE function, probably by representing a diffusion barrier from the choriocapillaris. It is surprising that no functional effect on vision is detectable.

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