CENTRAL SEROUS RETINOPATHY*

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MOST reports on central serous retinopathy are prefaced by a summary of the literature, which has now attained considerable proportions. At the risk of needless repetition it is proposed to recapitulate the salient points of this interesting history, with particular reference to indigenous material.

Although this condition was well described by von Graefe (1866), it was not until after the first world war that coherent observations with multiple cases were forthcoming. With the exception of a few isolated cases described by Batten (1921), Cassidy and Gifford (1922), and Hudson (1926), these originated either in Japan or on the continent of Europe. Thus Kitahara (1936) was able to collect over 150 cases; Horniker of Trieste, who was particularly interested in this condition, reported many cases of his own and analysed those of Kitahara in a series of articles culminating in his classical treatise (Horniker, 1937). In this he drew attention to the functional angioneurotic nature of the disease—formerly it had been considered purely infective.

The first series in the American literature was that of Walsh and Sloan (1936); shortly afterwards Gifford and Marquardt (1939) published a review and six cases of their own, and were able to confirm Horniker's conclusions regarding the angioneurotic diathesis shown by the victims of this disease.

Thereafter came the second world war and with it a spate of articles on this subject in the world literature, particularly from the oculists of the United States Navy (Cordes, 1944; Lucic, 1945; Borley and others, 1945; Harrington, 1946). Why so many cases (over 200) should occur in the U.S. Navy—but only in the Pacific, and not in the other services or in other theatres, nor among combatants of others nations—has greatly perplexed many investigators, and will be further considered at a later stage.

Reports from the U.K., however, remained rare. Loewenstein (1941) described two cases; and Greeves (1941) collected eleven. The former considered tuberculo-allergy, possibly in connexion with an inborn angioneurotic constitution, to be the cause; the latter believed the condition to be a mild central type of choroiditis. Doggart (1945) discussed a number of cases, and later (Doggart, 1949) published a series of seventeen, which he had collected over 5 years. Two cases were mentioned by Philips (1945) and one by Foster (1943). No aetiological conclusions were reached by the last three authors. Davenport (1954) reported a small number of cases, and Buxton (1954) collected 21, some of which however may not have been cases of central serous retinopathy. No adequate analysis was attempted. As fewer than sixty definite cases have been reported

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in these islands, it might therefore be considered to be a condition of some rarity here, thereby justifying this publication of 27 cases collected over 3 years, at an Eye Hospital serving a population of about 300,000.

Definition and Clinical Picture

Confusion with other types of macular oedema (*e.g.* due to radiational or concussion trauma, uveitis, or optic neuritis) and the macular degenerations, and the still-present misgivings on its aetiology delayed the emergence of central serous retinopathy as a well-defined entity and led to its description under a multitude of synonyms; with the possible exception of "disciform degeneration of the macula" these should now be swept away. The text-book descriptions of Duke-Elder (1940), Elwyn (1946), and Savory (1951) can be said to be germane. Typically, the subject is an active, intelligent male aged 20-45. There is occasionally a history of earlier transient attacks of blindness. He complains of defective or distorted central vision, of sudden or indeterminate onset in one or, more rarely, in both eyes (but both not usually commencing simultaneously). Metamorphopsia can always be elicited: this has been used as a diagnostic test for macular oedema (Amsler, 1953; Brückner and Field, 1945; etc.). The subject is more likely to be engaged in work requiring high-grade vision than in a "labouring" occupation. Ophthalmoscopy reveals a dark-reddish appearance of the macula with loss of the normal reflexes and often some retinal elevation. Fine punctate haemorrhages and yellowish-white spots may be observed; the vessels are usually normal, but occasionally constrictions and contiguous haemorrhages or infiltrations may be seen. The rate of appearance and progression of these changes varies widely from case to case. Resolution may ultimately be complete, though the "oedema" persists for 6 or more months, or a residuum of fine pigmented or atrophic areas, drusen-like spots, vesicles, or an actual "hole", may remain indefinitely. It is possible that the elevation, in certain cases, may not subside and may even enlarge further, becoming paler as the overlying tissues atrophy, producing a variety of the condition known as "juvenile" disciform degeneration of the macula (Junius, 1930; Verhoeff and Grossman, 1937; Gifford and Cushman, 1940; Duggan, 1942; Adler and Scarlett, 1944; Lucic, 1945; Bedell, 1950; Klien, 1951, 1953), this condition in turn graduating insensibly with the "senile" form of disciform degeneration.

Aetiology

This is not yet known with certainty. There are two main factions, and some compromisers who combine elements of both schools.

(a) The protagonists of an infective theory. These formerly favoured a bacterial lesion (tubercular, syphilitic, coccal) but now rely on either an allergic or toxic process (Loewenstein, 1941; Brückner and Field, 1945; Bettman, 1945; Bothman, 1946; Scuderi, 1948; Rosen, 1949; Carlberg and Gausland, 1953; Buxton, 1954), or virus (Borley and others, 1945), or toxoplasmosis (Rieger, 1952) infection.

(b) Those who indict a primarily functional neurovascular lesion. Led by Horniker (1937), Bailliant (1938), and Gifford and Marquardt (1939), their position has been greatly strengthened by the work of Duggan (1942), Cordes (1944), Lucic (1945), Harrington (1946), Nicholls (1952), and Klien (1951, 1953) in the U.S.A., and also in general by the great awakening of interest in the effects of stress on the organism acting through the nervous and endocrine systems. Rightly or wrongly most diseases of obscure origin (*e.g.* essential hypertension, goitre, peptic ulcer, colitis, angina, asthma and bronchitis, peripheral vascular occlusion, Ménière's syndrome, acute rheumatism, various dermatoses, migraine, glaucoma) have lately been given a psychosomatic interpretation. Thus Zeligs (1947) showed that some men under fire in the front line showed reactions of fear; if these men also developed central serous retinopathy, it proved that fear was the cause of the condition. But what of the thousands who did not acquire central serous retin-

opathy but were afraid? Others (*e.g.* Alvarez, 1947; von Storch, 1947; Weiss and English, 1949; Campbell, 1951, 1952) adduced evidence to establish the neuro-endocrine nature of migraine, in some ways a related condition, with rather more conviction. We might add that although some cases of central serous retinopathy show evidence of ex- or endogenous mental complexes, and others give a history of other allergic conditions, or vasospastic diseases (such as peptic ulceration, chilblains, angina), this is by no means always the case. Again, stress, neurosis, and allergy are the lot of so many of mankind to-day that their presence in association with disease may often be merely coincidental and of no aetiological significance.

It is probably, at this stage, best to steer a middle course, and while admitting that certain individuals—call them allergic, neurotic, endocrinopathic, vasculo-spastic, or what you will—are peculiarly susceptible to an attack, we should not rule out an immediate essential cause, possibly infective. The effect of mental states and hormone therapy on the body's defence and reparative mechanisms against all kinds of insult and injury is now only just beginning to be understood. The mentally distressed or maladjusted can probably produce a variety of responses, all of which equally well betoken his state of disharmony. He may show the primitive neurovascular reaction, well described by Cannon (1929), of spasm of smooth muscle; some neuro-endocrinal or metabolic abnormality; or some neuro-immunological deviation manifested by allergy or by infection. The particular one chosen depends on the interplay of constitutional hereditary factors and chance circumstances.

Pathology

The clinical picture, and the few eyes that have reached the pathologist (Verhoeff and Grossman, 1937; Verhoeff, 1938; Terry, 1938; Lucic, 1945; Maumenee and Kornbluth, 1948; Laval, 1948; Klien, 1953) bespeak a non-specific lesion, initially functional and exudative with possible vasospasm and haemorrhages, followed by varying degrees of absorption and resolution, rarely with a mild degree of organization. Elsewhere in the body such a lesion would be considered trivial and would probably pass unnoticed, but the retina, with its considerable energy requirements and neural nature, responds badly to any trauma. The exact location of the lesion is in some doubt; it is probable that both retina and choroid are involved in most cases.

Clinico-pathological problems still unanswered are these:

- (1) Why is the macula selected ?
- (2) Why is the condition usually uniocular ?
- (3) What is the relationship of central serous retinopathy to migraine ?
- (4) What is the true incidence of the disease ?

(1) It is sometimes denied, especially by the Japanese, that the macula is always involved. As the sub-macular choriocapillaris is no different from the rest (Wybar, 1954) and the retina here possesses an excellent vascular network, we cannot incriminate a special anatomical reason. Radiational trauma, here maximal, is the probable factor with localizing significance (Horniker, 1937; Gifford and Marquardt, 1939; Cordes, 1944). Fuchs (1920, quoted by Cordes) believed that a cataract protects the macula from senile degeneration. This may also explain the frequency of central serous retinopathy in sailors, and in the South Pacific.

(2) This fact rather rules out any anatomical explanation and weakens the radiational theory. The migrainous affliction is also usually a unilateral one, and this tends to support the idea of a relationship between central serous retinopathy and migraine.

(3) If central serous retinopathy is a vaso-spastic psychosomatic condition, then we should anticipate some connexion with migraine, in which, as we have noted, there is strong evidence suggestive of this aetiology. Unfortunately, the cross-reference is not convincing. Whereas migraine shows a predilection for women (two to four females to every male affected—von Storch, 1947; Duke-Elder, 1949), the reverse holds for central serous retinopathy. If we review the published cases in the U.S.A. and Europe according to sex from 1936 to 1955, we find a ratio of seven males to each female. Again, central serous retinopathy has never been reported as a complication of migraine (Walsh, 1947; von Storch, 1947; Brain, 1947; Donahue, 1949; Duke-Elder, 1949; Campbell, 1951, 1952), and when retinal vascular changes occur (and this is a rare event—Sédan and Jayle, 1936; Graveson, 1949; Duke-Elder, 1949) these take the form of occlusion of the central retinal artery or one of its major branches, and occur usually in females. While it is possible that the scintillating scotoma may be retinal in origin (see Walsh, 1947), the absence of a symptom so startling and unforgettable, and indeed the reported rarity of any typical migrainous attacks in patients suffering from central serous retinopathy makes us doubt whether there exists any firm aetiological relationship between the two diseases. Similarly, retinal arterial spasm is only rarely associated with Raynaud's disease (Anderson and Gray, 1937).

(4) Various authors, commencing with Batten (1921), have repeatedly stressed that central serous retinopathy is probably much commoner in most countries than is generally believed, and as common in Europe as in Japan. Cases with mild transient obscurations (amaurosis fugax, "black-outs") often do not reach the oculist, or show no abnormality when they do. Many attacks, if not bilateral and not too severe, may pass unnoticed by the subject, or may be considered of no consequence, unless the subject is engaged on work requiring fine macular vision (*e.g.* map or vernier reading or draughtsmanship) and/or is a rather intelligent, introspective type of person. It is well known that minor, and even at times major, visual loss excites little immediate response on the part of the victim; he usually waits a few days at least to "see if it gets better" before seeking advice.

Therapy

The treatment recommended depends largely on the oculist's conception of the disease. Thus it may vary from the exhibition of vasodilators, diuretics, and sedatives and even psycho-analysis, to the mass-elimination of septic foci and antibiotic therapy. The true value of these, and of cortisone, which theoretically (Fritz, 1951) should be efficacious, is difficult to assess owing to the rarity of the condition in the experience of most authors, and the frequently noted tendency for full spontaneous recovery. Thus, while Greeves' cases mostly recovered fully, Duggart advised a rather cautious prognosis. Ridley (1954) even finds a place for cervical sympathectomy in stubborn cases.

Present Series

The author's cases number 27; 22 of these conform to the typical clinical picture of central serous retinopathy, and the remaining five differ only by

virtue of the permanent and, to some extent, progressive nature of the retinal elevation combined with an excess of degenerative changes. We will therefore in some particulars consider these two groups separately, although many investigators claim no essential differentiation in the aetiology, the basic lesion in disciform degeneration of the macula being a rupture of Bruch's membrane with transudation of plasma or blood (Ashton and Sorsby, 1951; Frayer, 1955).

(1) *Age and Sex Analysis.*—This is shown in Table I.

TABLE I
AGE AND SEX DISTRIBUTION

Age Group (yrs)		...	...	15-24	25-34	35-44	45-54	55-64	65+	Total
Central Serous Retinopathy	Male			2	8	3	1	4	—	18
	Female			1	—	1	1	1	—	4
	Total ...			3	8	4	2	5	—	22
Disciform Degeneration of the Macula	Male			—	—	—	1	1	1	3
	Female			—	—	—	—	1	1	2
	Total			—	—	—	1	2	2	5
Grand Totals		...	...	3	8	4	3	7	2	27

The usual preponderance of males obtains, here attaining a ratio of 4·5 to every female for the central serous retinopathy cases, or 3·5 : 1 for all cases. Only three series in the literature show an excess of females—those of Stenström (1943) with four females out of five, Doggart (1949) with fourteen out of seventeen, and Buxton (1954) with fifteen out of twenty-one. Whilst Stenström admits his ratio is probably fortuitous, the English authors offer no explanation. Chance can be ruled out in all three instances ($P < 0\cdot01$). The age groups show a fairly even distribution, but the disciform degenerations are confined, as might be expected, to the older groups. Under age 45 we have fifteen cases (55·5 per cent.), and twelve cases (44·5 per cent.) are aged 45 or over, counting disciform degenerations.

The proportion of people aged 15-44 living in England and Wales in 1953 is 53 per cent. of the total population over 15 years of age; for males only, the corresponding figure is 56 per cent. (Central Statistical Office, 1954). These proportions do not differ at all significantly from ours ($P > 0\cdot95$). Even if we exclude the disciform degenerations, thereby having 68 per cent. of cases younger than 45 years, the difference still does not attain significance. We may therefore conclude that though the condition shows a preference for males, it is liable to affect those in all adult age-groups fairly equally.

(2) *Occupational Analysis.*—Table II (overleaf) shows the occupational status of our patients. Twelve of the eighteen males with central serous retinopathy required a high degree of visual discrimination for their work, not counting the three salesmen; of the remaining three individuals, two had severe bilateral affections, and the third had a severe unilateral attack whilst resident in a sanatorium. One of the four women required good acuity for her work (teacher), another had severe bilateral disease, and the other two had severe attacks in one eye. Seventeen of the 22 central serous retinopathy patients performed work which could be said to carry a fair degree of responsibility; of the five others, three had severe bilateral and two had severe unilateral involvement. If we consider the

TABLE II
OCCUPATIONAL ANALYSIS

Condition	Sex	Occupation	No. of Cases
Central Serous Retinopathy (22)	Male (18)	Seaman	2 (one bilateral)
		Draughtsman	3 (two bilateral)
		Fitter	4
		Salesman	3
		Inspector	1
		Accountant (student)	1
		Labourer	1 (bilateral)
		Kitchen worker	1 (bilateral)
		Unemployed	1
		Pharmacist (student)	1 (bilateral)
	Female (4)	Housewife	2 (one bilateral)
Teacher and housewife		1	
Hairdresser and housewife		1 (one attack bilateral, one unilateral)	
Disciform Degeneration of the Macula (5)	Male (3)	Fitter	2 (one bilateral)
		Retired labourer	1
	Female (2)	Housewife	2

disciform degeneration cases, the two still working both required good foveal vision; all five however had suffered visual loss in both eyes, from simple macular degeneration if not from disciform degeneration. It is not easy to conclude from all this whether the condition shows a predilection for persons engaged in responsible, worrying work or whether these are the people most likely to discern an attack and seek advice, especially if only one eye is affected, and that to a mild degree. This might explain the high ratio of males to females and the prevalence in the U.S. Navy (two of the author's cases were seamen) where a high visual standard is not only required but is actively pursued; but it does not account for its rarity in the air forces, and in the other navies of the world to-day and in the past. The author can however recall seeing two cases of macular scarring when examining British naval pensioners in 1945; though then ascribed to shell-flash burns, on retrospection a more likely diagnosis would have been old central serous retinopathy, as the history of exposure in both cases was rather vague and unsubstantiated. Perhaps "shell-shock" would have been a more succinct description of the condition.

(3) *Laterality*.—Table III (opposite) indicates the site of involvement. Cases bilateral at one attack and unilateral on another are counted as "bilateral".

The present series exemplifies the well-known tendency for only one eye to be affected; the 2 : 1 ratio is probably higher in fact, as many unilateral cases do not seek or require advice. There was a tendency for older patients to have more bilateral affections than younger patients; the proportional difference is not significant however ($\chi^2=0.82$, $n=1$, $P>0.3$). Where bilateral, both eyes were affected simultaneously in all but one.

(4) *Duration*.—The duration of "activity" may be taken as the time required for the retinal oedema to subside, haemorrhages to cease to be formed, and vision no longer to improve. Atrophic and pigmentary changes are then apparent in some cases. In disciform degeneration, the elevation is capped by pale atrophic tissue and has reached its maximal elevation. Table IV (opposite) shows duration according to age at onset and final visual acuity. Previous attacks had occurred in only three cases (once in each).

It is apparent that in nineteen (59 per cent.) of the central serous retinopathy attacks activity did not last more than 3 months. Thirteen (68 per cent.) occurred in the

TABLE III
LATERALITY (ALL CASES)

Side	...	...	...	...	...	Unilateral		Bilateral	
Sex	...	...	...	...	...	Male	Female	Male	Female
Central Serous Retinopathy						12	2	6	2
Disciform Degeneration of the Macula						2	2	1	—
Total						14	4	7	2
Ratio						18		9 = 2 : 1	
Age (yrs)					Under 45	11		4 (27 per cent.)	
					Over 45	3		4 (57 per cent.)	

younger subjects. Likewise thirteen (65 per cent.) of the eyes attacked in the under-45 age group cleared in 3 months, whereas the figure for those aged over 45 is six (50 per cent.). The differences are not significant ($P>0.05$).

(5) *Prognosis*.—Table IV shows that fourteen (74 per cent.) central serous retinopathy attacks lasting less than 3 months left a visual acuity of 6/9 or better, whilst only five (38 per cent.) of those of longer duration did so. Though suggestive, these

TABLE IV
DURATION OF “ACTIVITY”, PER EYE, PER ATTACK

Duration of Activity (mths)...				Up to 1	1 to 3	3 to 6	6 to 12	More than 12	Total
Disease	Central Serous Retinopathy			13	6	7	4	2	32
	Disciform Degeneration of the Macula			—	—	—	4	2	6
Age (yrs)	Under 45			11	2	5	2	—	20
	Over 45	Central Serous Retinopathy...		2	4	2	2	2	12
		Disciform Degeneration of the Macula		—	—	—	4	2	6
Visual End-Results	6/9 or better			11	3	4	1	—	19
	Less than 6/9	Central Serous Retinopathy...		2	3	3	3	2	13
		Disciform Degeneration of the Macula		—	—	—	4	2	6

(Details of one attack unknown)

proportions are not of statistical significance ($\chi^2=2.6$, $n=1$, $P>0.1$). The prognosis in disciform degeneration is clearly poor, the duration being long and the best visual end-result obtained being 6/24. In addition, the opposite eye always showed a macular lesion.

Prognosis according to age is shown in Table V. In persons under the age of 45, sixteen attacks left a visual acuity of 6/9 or more, and four (20 per cent.) had a worse result, while over the age of 44 the corresponding figures are three and fifteen (83 per cent.) These differences are significant ($\chi^2=12.76$, $n=1$, $P<0.01$).

TABLE V
VISUAL END-RESULT BY AGE, PER ATTACK, PER EYE (ALL EYES)

Age Group (yrs)	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	Totals
Visual Acuity	6/5 or better 6/9, 6/6	3 2	6 1	2 2	— 2	1 —	12 7 } 50 per cent.
	6/12, 6/18 6/24, 6/36	— —	1 —	— —	2 3	— 1	3 4 } 18 per cent.
	6/36, 6/60 Less than 6/60	2 —	— —	1 2	4 1	— 1	7 5 } 32 per cent.
	Total Eyes ...	7	9	4	5	11	2 38

(6) *Season of Onset.*—The month of onset is shown in Table VI. Sixteen (55 per cent.) attacks occurred during the colder months, but this proportion is not significant ($P>0.05$).

TABLE VI
MONTH OF ONSET*

Disease	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Central Serous Retinopathy	3	—	3	4	2	1	3	2	—	2	2	2
Disciform Degeneration of the Macula	—	1	2	—	—	—	—	—	1	1	—	—
All ...	2	1	5	4	1	1	3	2	1	3	2	2

*(Uncertain in two attacks).

(7) *Investigations.*—The following positive findings were noted:

Symptoms	No. of Cases
No abnormality	...
Recent head injury (3 days before onset)	...
Conjunctivitis or keratitis co-existing at onset	6
1 also had chilblains, bursitis, hay fever, coryza, chronic bronchitis, and epistaxis (Case X).	
1 also had chilblains.	
1 also had migraine.	
1 also had hyperpiesis.	
1 later developed posterior uveitis and periphlebitis retinae.	

<i>Coryza or influenza at onset</i>	4
1 was Case X above.	
1 also had calcified cervical glands, allergic dermatosis, chronic bronchitis, and rheumatic carditis.	
1 also had migraine, hay fever, colitis, and inactive pulmonary tuberculosis.	
1 also suffered nephrectomy for hypernephroma 2 years before.	
<i>Urticaria co-existing</i>	2
<i>Active pulmonary tuberculosis</i>	1
<i>Septic arm at onset (also suffered chilblains)</i>	1
<i>Active duodenal ulcer</i>	3
<i>Active rheumatoid arthritis</i>	1
<i>Chilblains co-existing</i>	4 (3 male, 1 female)
<i>Hyperpiesis</i>	3
<i>Gross dental sepsis (also had arteriosclerosis)</i>	1
<i>Migraine all adult life</i>	5
1 also had active duodenal ulcer.	
1 also had angina, polyuria, fibrositis.	
1 also had effort syndrome, hyperidrosis, fibrositis, "rage reactions".	
<i>Anaemia (chronic) associated with active duodenal ulcer, and menorrhagia (treated by hysterectomy)</i>	1
<i>Arteriosclerosis</i>	5
1 associated with high blood pressure.	

It is clear that a fair number of our cases suffered from what have been called "stress" diseases, and some had multiple afflictions. Only twelve were free from this "taint": four of these had marked arteriosclerosis, two others had keratitis, one other had coryza and had suffered nephrectomy for tumour, one had active pulmonary tuberculosis, one had suffered a head injury, one had a septic arm and chilblains, one had recurrent chilblains. Only four possessed what could be called "septic foci".

Wherever possible an assessment was made of the patient's mental state and the presence or otherwise of stress factors (Table VII).

TABLE VII
PSYCHOLOGICAL FEATURES (CENTRAL SEROUS RETINOPATHY)

Symptoms	Male		Female		Total
	No.	Per cent.	No.	Per cent.	
Tense obsessional or inadequate personality ...	11	61	3	75	14
Worry or over-work ...	6	33	2	50	8
Nil of note, or unknown ...	4	22	1	25	5 (23 per cent.)

Thus only four (22 per cent.) of the males, and one (25 per cent.) of the females did not either give a history of undue worry and overwork over a protracted period, or possess an inadequate, obsessional, tense type of personality.

The female was aged 56, and showed no abnormality.

Of the four males: one aged 26 had a preceding keratitis.
one aged 59 had dental sepsis and arteriosclerosis.
one aged 34 had suffered a head injury.
one aged 26 had a septic arm.

Typical of the stress situations were the following:

Two students taking finals; a civil servant doing his chief's work as well as his own for 4 months; a hairdresser running her business single-handed in addition to housework; a teacher obliged to return to work in order to pay for her son's medical school fees; a business man suffering an operation for cancer; a man in a sanatorium with severe tuberculosis; a commercial traveller partly crippled with rheumatoid arthritis.

We might consider especially the association with migraine and peptic ulceration. The former is said to affect about 7 per cent. of the population of the U.S.A. and perhaps more in the U.K. (Atkins, 1955), but males only one-third as frequently as females, *i.e.* about 5 per cent. of men suffer from it.

A survey was undertaken to ascertain the incidence of migraine in the local population. 37 successive patients attending hospital with foreign bodies in their eyes were questioned accordingly. Six were women and 31 men, *i.e.* rather similar proportions to those with central serous retinopathy, and five (one woman, four men; 13·5 per cent.) suffered from migraine (13 per cent. of males). These percentages do not differ significantly from those given by the central serous retinopathy cases ($P>0.05$).

It is not easy to assess the true incidence of peptic ulceration in England and Wales. Though the Minister of Health (1953) gives a figure of 1 per cent., Jones (1951) states that 5·8 per cent. of males and 1·7 per cent. of females (3 per cent. of the total population) aged 15-64 have at some time suffered this disease, and in any one year some 600,000 males (3 per cent. of those aged 15 years and over) have active ulceration. Porritt (1952) offers an even higher figure; he claims that at least 5 per cent. of the total population has this condition. If we take three as the percentage of the adult population at any time suffering peptic ulceration and compare it with the incidence of 12 per cent. in our central serous retinopathy cases, we find that the difference is without significance ($P>0.05$). We may note, however, that all our cases were of duodenal ulceration (and one was in a woman) which is considered more of a stress lesion than its gastric counterpart. Duodenal ulceration, it should be noted, is said to occur frequently in migrainous subjects (Brain, 1947). Thus the associations with these two conditions, though suggestive, are not of proven significance.

We may finally note that none of the disciform degeneration cases suffered from an excess of anxiety or from any special personality deviation; the only evidence of "stress" found was hyperpiesis in two cases. On the other hand, all five showed signs of arteriosclerosis (which the author has not classed as a stress disease).

(8) *Therapeutic Results.*—As already noted, it is difficult if not impossible to make an appraisal of therapy from the literature. While it is rational to prescribe vasodilators, cortisone, and physical and mental rest, and to treat any infection specifically, we still do not know the part, if any, that these measures play in the alleviation of the disease. We can only summarize our experiences, and draw what few conclusions are feasible therefrom (Table VIII).

TABLE VIII

Treatment	Visual Acuity	Central Serous						
		Subjects under age 45						
		1	2	3	4	5	6	7
None	Lowest recorded	6/18p	6/18	6/9	6/9	6/6 and 6/6p	6/4	—
	Final vision	6/4	6/4	6/9	6/4	6/6 and 6/6p	6/4	6/4, 6/4
Vasodilator Therapy: <i>Oral:</i> "Ronicol" (β pyridyl carbinol), "Prisol" (benzyl imidazoline hydrochloride), or Nicotinic Acid; <i>Retrobulbar:</i> "Prisol"	Lowest recorded	2/60	2/60	6/60	6/18	6/9	6/6p	—
	Final vision	2/60	6/5	6/6	6/4	6/5	6/5	—
Oral Cortisone and Vasodilators	Lowest recorded	3/60	6/18	6/5	—	6/36, 3/36	—	—
	Final vision	6/12	6/5	6/5	—	6/36, 6/36	—	—

Total
All seven full or subtotal recovery (two from 6/18)

Four full, one subtotal, and one none

Two full, one partial, one none

It is impossible to judge whether any of these courses of treatment had any effect either in reducing the maximal visual loss or in aiding its restoration. The course in some cases was erratic and irregular, the disease showing one or more recrudescences before finally settling down. Solution of the stress situation is essential to prevent relapses and later attacks; by honourably becoming unable to work or fight on account of blindness, the patient often solves them himself, if only temporarily. It is worthy of note that in some cases visual acuity continued to fail for a time after the institution of energetic therapeutic measures.

Conclusions

Central serous retinopathy, and the related if not identical condition, disciform degeneration of the macula, is a not uncommon condition in the South of England. It shows the usual predilection for males, but no special adult age group is affected; disciform degeneration tends to develop in the older subjects. People engaged in responsible positions requiring high visual acuity tend to present themselves at hospital more frequently than others, especially if the affliction is unilateral. Bilaterality is not very common, and its presence shows no relationship with age. Duration of attack increases (but not significantly) with age; visual prognosis however, deteriorates significantly as age rises and is distinctly bad in disciform degeneration. Attacks occur at any time of the year. The incidence of stress diseases, a tense obsessional mental "make-up", and a history of stress-producing life situations, were high in the subjects affected. Peptic ulceration and migraine showed a rather high but not significant frequency of association. The value of vasodilator and cortisone therapy remains unproven, but there may be a place for some kind of psychotherapy.

Summary

The findings in 27 cases of central serous retinopathy are analysed against

Retinopathy					Disciform Degeneration of the Macula			
Subjects over age 45					1	2	3	Total
1	2	3	4	Total				
6/24	6/18, 6/24	—	—	Two no improvement	H.M.	6/36	6/36	Two slight, one none
6/24	6/18, 6/24	—	—		2/60	6/36	6/24	
2/60, 6/36	6/60, 6/60	6/4, 6/24	6/9	One subtotal, two partial, one slight recovery	1/60	6/60, 1/60	—	Two no improvement
2/60, 6/9	6/36, 6/60	6/4, 6/12	6/9		1/60	6/60, 1/60	—	
6/60	—	—	—	One none	—	—	—	—
6/60	—	—	—		—	—	—	

a background of present-day conceptions of this disease. Though it is related in some way to conditions of stress, the exact aetiology and elective therapy still await clear definition.

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