

# James Andrew Craig (1872–1958)

President of the Ulster Medical Society

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## Presidential Opening Address

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### THE RETINA IN CONSTITUTIONAL DISEASE.

BEFORE proceeding with my address I wish to express my appreciation of the high honour you have conferred on me in electing me as your President for the coming year. I have accepted this honour with a natural gratification, tempered by some diffidence as to my fitness to maintain the high standard that has been set by the many eminent men who have in the past held the coveted distinction. I feel that I may be found wanting in many of those qualities which go to make a successful Chairman, and which you have a right to expect to find in your President. There is, however, one qualification to which I will lay claim, and that is an earnest desire for the welfare of the Ulster Medical Society and a determination to do all that lies in my power to further its interests, and to maintain its high traditions during my year of office.

During the past year the Society has suffered the loss by death of three of its Fellows, Dr. J. C. Martin of Portrush, and Drs. William Monypeny and John M'Leish of Belfast.

Dr. Martin was a man of unbounded energy which found its outlet in many activities. Not only did he conduct with conspicuous success an extensive general practice, but as Surgeon to the Portrush and Coleraine Cottage Hospitals, he earned a reputation as a bold and skilful operator, which extended over a wide area. As Coroner for North Antrim he ruled the affairs of his responsible office with dignity and discretion. He occupied a high place in the esteem of his fellow-townsmen, and was for a considerable period Chairman of the Urban Council, while his professional eminence was accorded recognition by his election as President of the North of Ireland Branch of the British Medical Association. His death has removed an outstanding figure from the ranks of the profession in Ulster.

William Monypeny was a member of this Society for thirty years, and was, until his health began to fail, a well-known figure at our meetings. His varied interests extended to all forms of healthy sport; early in life he was a rugby player of some



renown, and since the institution of our annual golf competition he was seldom absent from our yearly meeting. He was a man of quiet and unassuming demeanour, somewhat restrained in speech, but endowed with a singular clarity of thought and soundness of judgment, and with an outlook on life which was shrewd and tolerant. To his patients he was a good and faithful servant, and his strong common sense and kindness of disposition made him that most admirable of all the types of our profession, a general practitioner beloved and trusted by all his patients. I do not think that either in the profession – or out of it – he had any enemies, and to those of us who had the privilege to know him well, his death leaves a gap which will not easily be filled. In spite of a serious illness two years ago, he seemed to have recovered a fair degree of health, and his death, which came with tragic suddenness, overtook him, as I think he would have desired that it should, while he was still at work.

Only last week the flag on the tower of the Queen's University flew at half-mast as a tribute of

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respect to the late Dr. John M'Leish. Dr. M'Leish's career was closely associated with the Belfast Union Infirmary, to the Maternity Department of which he was attached as Visiting Physician. During his twenty-six years of service with that Institution he had seen and shared in the remarkable evolution which, in that period, transformed it from a vast storehouse of rich but inaccessible clinical material, to what it now is – an invaluable adjunct of our Medical School. His enormous experience in obstetrics made it fitting that he should be appointed teacher to the Central Midwives Board, Clinical Lecturer and Examiner in Midwifery, and Teacher in Vaccination to the Queen's University, and Teacher of Vaccination under the Local Government Boards of England and Ireland. Dr. M'Leish was a man of considerable culture, and with a refined taste in music and literature which made him an agreeable and charming companion. He had a philosophic temperament, which enabled him to meet misfortune with fortitude and without repining. Perhaps his strongest characteristic was an engaging simplicity and frankness, which went far to disarm criticism and made him many friends.

The custom of this Society has ordained that the incoming President shall deliver an inaugural address. I suppose that the choice of a suitable subject for this is always a matter of some anxiety. It is especially difficult when an Ophthalmic Surgeon attempts to interest a body of physicians and surgeons in some of the problems of his particular study. Many of these are too technical in their character and too limited in their scope to be of much interest to the members of a Society such as this. I have therefore chosen for my address a subject which is by no means new, but which will, I hope, be of general interest. I shall crave your indulgence if, in my desire to make my statement complete and my meaning clear, I tell you much that you already know.

While many ophthalmic problems, particularly those relating to the optics and surgery of the subject, are very technical in character, the relationship of Ophthalmology to general medicine is nevertheless of the most intimate nature, and failure to link the two sciences must result in loss to both. The importance of the eye symptoms, and especially of the characteristic alterations of the visual fields, in diseases of the pituitary body, is too well known to call for further mention. The diagnostic value of abnormalities of the pupillary reflexes, of alterations of the visual fields, of the light and colour sense, and of the condition of the optic disc as directly observed, is so great, that it is not going too far to say that every

neurologist must possess as part of his equipment a certain degree of skill in the use of the ophthalmoscope and perimeter. The optic nerve has, as you know, certain anatomical peculiarities which render its examination so essential and instructive. It is a direct offshoot from the brain, and the membranes of the latter, the dura, arachnoid, and pia, are continued separately in its sheath, the subarachnoid space being prolonged on the nerve as a lymph space. It is therefore easy to understand why an examination of the disc affords in many cases evidence as to the condition of the nerve centres, which is always valuable and sometimes incontrovertible. One is tempted to pursue this subject further, but it is necessary to proceed to the subject of this address: "The Retina in Constitutional Disease."

In considering the effects produced on the retina by constitutional diseases, it may be stated at the outset, that these are mainly, if not entirely, vascular. And in the examination of the vascular apparatus of the eye, the oculist has one great advantage. The eye is the only organ in the body where the blood vessels can be seen and studied in their natural state, seen moreover with a magnification of fifteen diameters, and studied as often as is necessary without submitting the patient to pain or hardship of any kind. The effects of hyperpæsis, of arterio-sclerosis, of altered condition of the blood in the various anaemias and toxæmias, can be brought under direct observation with an ease and accuracy which make the retina an ideal region in which to study these conditions. And not only are the objective signs so distinctive and so valuable in diagnosis. The effects of derangement of the circulation, whether due to purely local causes, or occurring as part of a general vascular disturbance, will, in the retina, at once give rise to symptoms which are so strikingly obvious to the patient that they cannot be overlooked. In most of the other organs, the results will only become manifest when their repetition has given rise to damage of their respective functions. It is common to find in the post-mortem room evidences of embolism and thrombosis in the spleen, kidney, etc., although no symptoms of vascular obstruction had been observed or recorded during life. The only other organs comparable to the eye in this respect are the heart, the internal ear, and certain parts of the central nervous system.

It is therefore not a matter for surprise that some form of ocular disturbance is often the first indication to the patient that something is seriously

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amiss, or that he seeks advice in the first instance from the oculist rather than from the physician. The question at once arises – how far is the former justified in attempting to arrive at a complete diagnosis, and how much or how little should he tell the patient? The answer is, I think, simple. The latter should in every case be referred back to his medical adviser with a report of his eye condition, and every other method of investigation employed which is likely to throw light on the case. It is a clinical crime to come to a finding by any single method, when other and better methods are available, and it is only by collecting and co-relating the results obtained by these that our knowledge will grow. Might I here enter a plea for a closer co-operation in this respect between the various branches of the profession. It is often difficult, and occasionally impossible, for the oculist to complete the notes of a case, for want of the information which only the physician can supply.

The first abnormal vascular condition to which I would draw your attention is that of hyperpiesis – increased blood pressure in the retinal vessels. This is, in most instances, due to a general arterial hypertension, but may be determined by such factors as a vaso-dilation of the trunk of the retinal artery, which increases the capillary and venous pressure, or by any obstacle to the return of blood situated in the region of the central vein, the eye in this respect behaving like the other organs of the body. It is necessary, however, to emphasise the fact, that while as a broad rule a general rise of arterial blood pressure is immediately followed by a corresponding rise in the local blood pressure of the retinal arteries, this only occurs where the general vascular apparatus is in a comparatively healthy condition. It by no means always follows that a high sphygmometric reading, taken at the brachial artery, implies that the tension of the intraocular vessels is also above normal; in fact, where a general arterio-sclerosis exists, it has been found that the reverse is more often the case. This point will be referred to later.

The method of estimating the blood pressure in the retinal vessels may be of interest. Incidentally it illustrates the value of the eye as the ideal organ in which to study the circulation.

It has been elaborated by Bailliart, who in 1919 submitted to the Ophthalmological Society of Paris a very exhaustive report on his method, and the results and deduction to be drawn from it. The underlying principle is this: The blood normally enters the eyeball at a pressure of 100 m.m. of Hg. and is opposed by the intra-ocular pressure of 20 m.m. Hg. There is thus a continuous flow through the artery,

and no arterial pulsation exists. The intra-ocular tension is now raised by the application of pressure to the eyeball by a dynamometer, the retinal arteries being meanwhile carefully watched until pulsation appears. The intra-ocular pressure is now slightly in excess of the diastolic pressure, the blood only entering the eyeball during systole. By further increasing the pressure on the dynamometer until the artery just ceases to pulsate, the systolic pressure is recorded. It may be at once stated that the application of such a pressure is not without risk to the eye, especially where sclerosis of the vessels exists. The diastolic pressure can, however, be safely and accurately recorded, the eye in fact acting as its own sphygmometer.

The signs of increased tension in the vessels of the retina are so frequently associated with those of retinal arteriosclerosis, that a precise description of them is scarcely possible. Bardsley, however, has attempted this, and summarises his conclusions as follows: "In simple high-tension –

(1) The vessels have an appearance of uniform distension and fullness.

(2) The light streak is broadened out so that it may occupy the whole breadth of the vessel.

(3) The light streak is much brighter than normal – until with very high tension it becomes like bright copper wire.

(4) The tight arteries indent the veins – where they cross each other – either slightly or deeply, according to the tension."

He arrived at these conclusions by selecting a number of healthy patients and artificially raising the blood pressure by hypodermic injections of adrenalin. As a result of these experiments, and from clinical experience, he even claims that it is possible to estimate the actual height of the general blood pressure in m.m. Hg. from observation of the retinal vessels alone, and formulates a series of indications by which this can be done. While I think that very few observers aspire to this degree of observation and deduction, it may safely be asserted that a high arterial tension in the retinal vessels presents an ophthalmoscopic picture which in most cases is distinctive.

Of much greater importance is the evidence furnished by the ophthalmoscope, of the existence of arterio-sclerosis in the retinal vessels. The signs of this condition were described by Marcus Gunn as long ago as 1897, and have since been confirmed by innumerable observers, with but slight modification. They may be summarized as follows: –

(1) An increase in the brightness of the reflex

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from the retinal arteries, giving them a burnished appearance to which the term "copper-wire arteries" has been applied. According to Coats, this is probably due to a thickening of the middle coat of the artery. As, however, this appearance is only an exaggeration of the normal, it must be interpreted with caution, and accepted as evidence only when it is very well marked.

(2) As the arterial wall becomes thickened it becomes more opaque. The wall of the healthy artery is so transparent that where it crosses a vein, the vein is visible right up to the artery on each side. In sclerosis, however, the vein is invisible for some distance to each side of the artery, the thickened and opaque wall hiding it from view.

(3) Obstruction of the blood-flow in veins where they are crossed by the arteries. Where an artery crosses a vein obliquely, the vein alters its course so as to pass under the artery almost at right angles, afterwards resuming its normal direction. In some cases the portion of the vein distal to the crossing is seen to be turgid and over-distended, a phenomenon to which the term "banking" is applied. These appearances may be accepted as evidence of a high degree of sclerosis.

(4) Irregularity of the lumen. The artery when followed along its course shews narrowings, succeeded by a return to its normal calibre. This phenomenon may be repeated several times in the length of the vessel. According to Coats it is due to proliferation of the endothelium.

(5) Tortuosity of the vessels. This occurs frequently as a normal condition, and by itself offers no proof of sclerosis, except when occurring in the small vessels round the macula.

(6) Retinal haemorrhages. These are usually small and superficial, and therefore generally flame-shaped, their shape being determined by their position in the nerve-fibre layer.

(7) Exudates in the retinal tissue in the form of small white dots, with well defined sharp edges. The development of these exudates denotes that a form of retinitis – arterio-sclerotic retinitis – has supervened, and denotes a late stage in the disease. It is often unilateral, differing in this respect from the retinitis of renal disease, which is always bilateral.

But – it may be asked – why go to all this trouble of making a minute observation of the retinal vessels? Is a detailed ophthalmoscopic examination necessary in order to arrive at a diagnosis of arterio-sclerosis? Can this not be made from the patient's symptoms, his pulse tension, his sphygmometer readings, etc.? While making no

attempt to minimize the value of these methods, it may, however, be pointed out, that while as a rule arterio-sclerosis affects the general arterial system, in many cases its manifestations are local. Pathologists have frequently found sclerosis of the arteries of the brain where the general systemic vessels have remained healthy, and conversely, that in a fairly generalised arterio-sclerosis the arteries of the brain have been normal. Again, it is in arteries of the size of those of the retina that the fibrosis begins and its manifestations are first discovered, and this discovery is often made in a patient who is conscious of no disability whatever, who will assert emphatically that his health is perfect, and who would never have thought of consulting his medical adviser. His only complaint perhaps is of presbyopia, and it is during the routine examination for the correction of this that the evidence of sclerosis becomes manifest. Most important of all, however, is the prognostic value, the guide afforded by the condition of the retinal arteries to that of the cerebral. Owing to the similarity in their histological characters, and in their method of development, it might reasonably be assumed that both sets of vessels would be affected similarly and to an approximately equal degree, and this has been found to be the case. This matter has been investigated by Foster Moore and independently by Adams. The conclusions arrived at by the former are so striking as to justify their quotation in full. He investigated the question from two opposite aspects. On the one hand he followed up the subsequent history of sixty-six patients who attended the Moorfields Eye Hospital for symptoms which were found to be dependent on arteriosclerosis. The condition of fifty-two of these was ascertained at the end of seven years. Thirty-eight were known to be dead, and in thirty-seven the cause of death was discovered. In seventeen it was either a cerebral haemorrhage or thrombosis, and out of the fourteen still living, there was satisfactory evidence such as hemiplegia or monoplegia that six had developed vascular lesions of the brain. Thus out of fifty-two patients, forty-four per cent. had in seven years suffered from gross vascular cerebral lesion, which in seventeen instances was fatal.

The second investigation dealt with the condition of the retinal arteries of forty-four patients who were admitted to the wards of St. Bart's Hospital, suffering from a gross vascular lesion of the brain. Of these thirty per cent. showed no evidence of arterio-sclerosis, twenty-seven per cent. showed evidence of mild or moderately severe sclerosis, and forty-three per cent. showed evidence of a high

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degree of sclerosis, i.e., seventy per cent. of the total number exhibited evidence of disease of the retinal arteries.

The results of Adams' investigations, although not quite so striking, are of great value. They relate to the after-history of 159 cases of vascular disease of the retina, excluding cases of true albuminuric retinitis. These he divided into five groups according to age. In group I – patients under fifty – he found that the duration of life depended greatly on the presence or absence of albumen in the urine. In group II – between fifty and sixty – the difference in prognosis of those with or without albumen was not so marked. In group III – sixty to seventy – the prognosis as regards life seemed to improve considerably; and in group IV – seventy to eighty – it was better still. As a result of his investigations Adams came to the rather surprising conclusion that the older the patient the less important, from the point of view of prognosis, to life, are the vascular diseases of the retina. He also found that retinal lesions are considerably more common in women than in men, and this without reference to child-bearing, as a large percentage of his cases were unmarried.

As regards my own observations on this point, I have been struck by the fact that a comparatively large number of cases in which I have observed definite signs of retinal sclerosis continue to live and enjoy at least a moderate degree of health. The prognosis must be based, not on the ophthalmoscopic appearance of the vessels, but on the condition of the heart and kidneys; its estimation lies with the physician and not with the oculist.

A study of the local effects produced on the retina by sclerosis of its vessels should be of interest even to the physician. It is safe to assume that a parallel effect obtains in other organs such as the heart and kidney, and particularly in the brain.

The first result in sclerosis is an increased resistance to the blood-flow, partly due to the loss of elasticity of the vessel wall, and partly due to the narrowing of the lumen. The next result, which is secondary to the first and compensatory in character, is an increased force of the heart-beat leading to hypertrophy of the ventricles, and a general rise of blood-pressure. In order to maintain the proper nutrition of the tissues, this pressure must increase in direct proportion to the degree of sclerosis. Now, it has been proved that the pressure in the retinal vessels in sclerosis is actually less than normal. I have already referred to Braillairt's method of measuring the tension of the retinal arteries. By this it is found that the amount of pressure necessary to produce

arterial pulsation is less than in the normal eye. Again, it has been proved that a constant relationship exists between the tension of the vessels of the eye and the intra-ocular tension. Now, the latter can be easily and accurately measured by the use of the tonometer. A low tonometer reading is, however, the rule, even when a sphygmometer reading taken at the brachial artery is high, so that it is safe to infer that a high general blood pressure does not imply a high vascular tension in the retina when retinal sclerosis exists. The retinal tissues are in fact being underfed, even when the general blood pressure is considerably raised. If, under these conditions, a sudden general lowering of blood pressure occurs, the results are often striking, and sometimes disastrous. They manifest themselves in two degrees, the milder being the production of a temporary loss of vision – amaurosis fugax – the more severe being the formation of a clot in the central artery of the retina or one of the branches, the so-called embolism of the vessel, resulting in permanent total or partial blindness. The former has its cerebral parallel in the transient pareses and aphasia, the latter in the grave vascular cerebral lesions, thrombosis and haemorrhage.

In the condition known as amaurosis fugax the patient experiences repeated attacks of sudden failure of sight, complete or partial, generally in one eye. These attacks last from a few minutes to several hours, and obscure a portion or the whole of the field of vision, and then pass off, leaving no trace. They are sometimes accompanied by giddiness, syncope, and vomiting. While there is evidence to show that they are in some cases due to spasm of the artery, it is generally held that they are due to a general lowering of blood pressure in a patient suffering from retinal sclerosis. If the pressure is soon restored to its original figure the attack passes off; if the lowering persists too long thrombosis occurs, with the production of permanent total or partial blindness.

The question at once arises: In how far is it safe to lower by depletory measures the general blood pressure, where arterio-sclerosis is present in the vessels of the retina and presumably of the brain? Whether is a high blood pressure or a low blood pressure the more dangerous? The evidence in the retina would go to prove that the proceeding is attended with considerable risk to that structure. May it not be presumed that it is attended with an equal risk of inducing a cerebral thrombosis or haemorrhage?

The development of haemorrhages in the retina is by no means always due to an obvious arterio-sclerosis. What may be termed their casual

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discovery is a common experience during the routine examination of the eye, and this often in patients who are in apparently good health. How are they to be regarded? Are they of purely local significance, or are they to be taken as evidence of general disease, or disease of some remote organ?

There is, I think, strong evidence to show that they do occasionally occur as an isolated clinical manifestation. In some cases they are obviously due to trauma, as occurs in direct violence to the eyeball, in head injuries such as fracture of the base of the skull, and in the retina of the new-born child. We may also include in this category retinal haemorrhages due to the severe strain thrown on the vessels by violent vomiting, coughing, etc., which find their parallel in the conjunctival haemorrhages similarly produced. In many cases, however, no history of trauma is obtainable, and no evidence of organic disease can be discovered elsewhere in the body. Perhaps the most striking instance of this is the occurrence of copious intra-ocular haemorrhages in young and apparently healthy individuals, generally of the male sex, and with a strong tendency to recurrence. This condition, which was first described by Eales of Birmingham, and now generally known as Eales' disease, has been a subject of discussion and controversy for years. In Eales' original description, a trace of albumen in the urine is described as being always present, but subsequent records by other observers have shown that this is by no means constant. I may say that I have failed to find albumen in the urine of many cases that have come under my observation. Axenfeldt, who has devoted considerable attention to this affection, has come to the conclusion that it is due to tubercular disease of the retinal vessels.

It has been pointed out by Hawthorne that haemorrhages, apart from violence, and unaccompanied by appreciable organic change, occur in almost all parts of the body. Thus epistaxis without nasal lesion is exceedingly common; haematemeses does not always mean ulceration of the gastric or duodenal mucous membrane. There are cases of haematuria, not infrequently recurrent, in which no structural alteration can be found in the urinary passages, and even haemoptysis sometimes stands in a similar enigmatic position. Thus retinal haemorrhages occurring as an isolated clinical event, have their parallels if not their explanation. He offers as an hypothesis the presence of some substance in the blood calculated to damage the vessel walls, and points out that these poisons have each its special or selected area of mischief. Thus in typhus we get

haemorrhages in the skin; in scurvy, in the gums; in Henock's purpura, in the intestinal wall; in influenza, epistaxis, and in cantharides poisoning, haematuria. Evidently in each of these instances the blood vessels of a particular area have been damaged by a poison that has, to the affected vessels, a specific pathological relationship. He offers the ingenious suggestion "that in similar fashion the retinal blood vessels in some persons may be damaged by modifications of the blood quality that are at present beyond our power of detection or recognition."

In the great majority of cases, however, it maybe assumed that the existence of haemorrhages in the retina is one of serious general import to the patient, not only to his sight, but to his expectation of life, and that in every case it calls for a complete clinical examination. The cause must be looked for either in an altered condition of the blood or in a diseased condition of the vessel wall. Occurring in a patient with obvious ill-health, its diagnostic value may be of great or even supreme importance. Take for example the case of a patient with prolonged pyrexia, but without physical signs, where the diagnosis may be tuberculosis, typhoid or para-typhoid fever, acute rheumatism, or general septicaemia. The discovery of retinal haemorrhages in such a case will lead to a diagnosis of general septicaemia, in which they are of a comparatively frequent occurrence, whereas in the other conditions they are rare. Again, their presence in a case of severe anaemia is almost proof that this is of the pernicious type, in which they are seldom absent, whereas in the secondary anaemics they are either absent or few in number, and then only in advanced cases.

I have collected from my own records the notes of fifty consecutive cases where retinal haemorrhages were discovered during an examination of the eyes, made in patients who came to me complaining of eye symptoms. The great majority of these were due either to injury, or to sclerotic, albuminuric, or diabetic retinitis, the finding being confirmed by a general examination of the patient. Of those occurring without history of injury or evidence of retinitis, the list includes two cases due to purpura and one to leukaemia. The only discoverable casual factor was in three cases amenorrhoea or suppressed menstruation – in one constipation, in one phosphaturia, and in one haemophilia. In four a complete and exhaustive examination of the patient failed to discover any likely cause, and in eleven, which I think you will agree is too large a proportion, I was unable to obtain any information as to the result of the general

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examination.

It has been shown that in nearly every case of advanced arterio-sclerosis of the retina, due to whatever cause, a certain degree of retinitis results, the chief evidence of this being the development of whitish exudates in the retina. Since in a great many of these cases a similar sclerotic condition obtains in the blood vessels of the kidney, it follows that there is a frequent association of retinitis with disordered renal function. There is, however, a well defined and characteristic group of changes which occur in the retina as a direct result of renal mischief, to which the term renal retinitis is applied.

In this condition the retinal vessels may indeed show no evidence of disease, or if such exists it is probably secondary, and due to the same cause as the retinitis itself – the presence of toxins circulating in the blood.

The ophthalmoscopic appearances in renal retinitis are very distinctive and almost pathognomonic. They are four in number: (1) Oedema of the retina; (2) haemorrhages; (3) exudates; and (4) papilloedema.

Oedema of the retina is probably of very common occurrence, but as it is not easy of detection with the ophthalmoscope, so it is not a valuable sign.

Haemorrhages are of common occurrence. They are as a rule small and superficial, and confined to the nerve-fibre layer, an anatomical fact which determines their flame-shaped appearance.

Exudates: These are due to infiltration of the retinal layers with a fine fibrinous network. They occur mainly in two forms (1) Rounded whitish areas with an indeterminate edge, which obscure the retinal vessels, and from their soft woolly appearance are generally referred to as cotton-wool patches. They occur with particular frequency in retinitis due to a toxic origin, such as acute parenchymatous nephritis and the nephritis of pregnancy; (2) A fan-like or stellate arrangement occurring round the macula. To this the term 'star figure' is applied. It occurs more frequently in renal retinitis than in any other form, but is not pathognomonic.

Papilloedema. This occurs in nearly every case of severe retinitis. It sometimes, however, occurs as an isolated manifestation.

In many cases of retinitis the patient complains of visual phenomena such as seeing floral patterns, etc., before the eyes. He may also complain that everything appears coloured. It is necessary, however, to emphasise strongly the point that even a high degree of renal retinitis may co-exist with good vision, so that the condition of the patient's sight

gives no reliable indication of the state of the retina.

While it scarcely comes within the scope of this paper, it is interesting to note that Barker and Hanes, two American observers, have called attention to the occurrence of exophthalmos in chronic nephritis, and have described as present in their cases, the signs usually associated with exophthalmic goitre – Graefe's sign, Stellwag's sign, and Moebius's sign. In thirty-three consecutive cases seen in the John Hopkin's Hospital, exophthalmos was present in forty-eight per cent. Compared with observations as recorded in this country, these figures would seem unduly high.

The haemorrhages, exudates, etc., found in renal retinitis undergo a process of absorption and would gradually disappear, but for the fact that new manifestations occur to maintain the ophthalmoscopic picture. In the end, however, subsidence occurs, the veins become less enlarged, the arteries shrink, the disc becomes atrophic, and pigmentary deposits replace the exudates in the retina. It is a curious fact that recurrence is rare. It would seem that any antecedent disease of the fundus, due to whatever cause, protects the eye against the development of a renal retinitis.

As regards the general incidence of retinitis in renal disease it may be stated that if we exclude pregnancy cases, and possibly trench nephritis, the condition does not occur in acute nephritis. It is comparatively uncommon in chronic parenchymatous nephritis, but is nearly always present in small white kidney. It is very frequent in chronic interstitial nephritis, where it occurs in about fifty per cent. of all cases, and it may be asserted that probably no patient dies of uraemia without fundus changes. The retinitis of pregnancy requires special mention. This may occur at the first pregnancy, but is much more likely to arise after the fourth or fifth. In it the retinal changes are severe, but in spite of this the prognosis is relatively very good both as regards the preservation of good sight and the expectation of life. It is almost certainly toxic in origin, coming on with great suddenness and clearing up with equal rapidity. In accordance with the rule already mentioned, it does not recur with succeeding pregnancies. Visual disturbances, without fundus changes, occur also in eclampsia. They manifest themselves chiefly in two forms, hemianopsia and amaurosis. The rapidity of their onset and their almost equally rapid disappearance preclude the possibility of an organic lesion. They were formerly attributed to uraemia, but are now generally held to be due to exhaustion of the cerebral visual centres. Vaquez has drawn attention to

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the similiarity which exists between the symptoms of eclampsia and those of acute lead poisoning. In the latter condition sudden blindness, due to constriction of the vessels of the disc and retina, is followed in a severe case by aphasia and cerebral amaurosis due to spasm of the cerebral vessels, the general blood pressure meanwhile being enormously raised. It would be interesting to note whether in eclampsia there is any obvious blanching of the fundus during the attack, and the point is one which would repay investigation.

The prognostic significance of renal retinitis is very great. It is, however, most important that the condition should be differentiated from arterio-sclerotic retinitis, in which the prognosis is much less grave. Ellis and Marrack at the London Hospital have conducted an investigation of the renal function in patients with retinitis and high blood pressure. Their nineteen cases of chronic interstitial nephritis, they divided into two groups.

I. Those in which the renal disease was the primary condition, the high blood pressure being secondary. In these death rapidly resulted from uraemia.

II. Those in which high blood pressure is primary and the renal condition secondary. In these life was relatively prolonged, and death when it occurred was from cerebral haemorrhage or heart failure.

It is generally accepted that, leaving out arterio-sclerotic, pregnancy, and trench nephritis cases, the mournful formula that patients do not outlive a period of two years from the development of renal retinitis, still holds good. The prognosis is no less grave in children than in adults.

The retinal changes, retinitis and retinal haemorrhages, which occur in patients suffering from glycosuria, have been the subject of a good deal of discussion and some controversy, and an exact explanation of their cause has still to be found. To the hospital physician they appear of minor importance, occurring as they do but rarely in the cases that he is called on to treat. These are generally cases of diabetes, occurring in young subjects, in which the patient is suffering from a serious and generally fatal disease, and where a defect of vision is a comparatively small matter. The oculist on the other hand is likely to form an exaggerated estimate of the incidence of these changes in glycosuria. He finds them with comparative frequency in elderly patients whose chief complaint is of failing vision and who show none of the characteristic symptoms, thirst, polyuria, etc., which characterise the condition

known as diabetes. In these the glycosuria is found – generally for the first time – in the quest of an explanation of the fundus condition. It is interesting to note that the fundus changes may persist for a very long time after the urine has become sugar free, and under these circumstances present a very difficult problem in the investigation of their cause.

The most striking difference between the retinitis of nephritis and that occurring with glycosuria is in the age incidence of the two affections. Whereas in nephritis this occurs irrespective of the age of the patient, in glycosuria it affects older patients only, and may be said never to occur under thirty-five. Most of these patients suffer also from high blood pressure and albuminuria, and even when albumen is absent from the urine it may be argued that this does not exclude the possibility of a certain degree of renal insufficiency. It is quite certain that the retinitis cannot be directly due to the presence in the blood of glucose, acetone, etc., as the condition does not occur in the acute diabetes of the young subject where hyperglycaemia and hyperacetonemia are most marked, but is most common in the milder forms occurring in the middle-aged and elderly subject. This would naturally lead to doubt as to whether a retinitis due to diabetes alone ever occurs, or whether it is not merely secondary to cardio-vascular changes. There is, nevertheless, a certain amount of evidence that diabetic retinitis does exist as a separate entity. Most observers are agreed that the ophthalmoscopic picture is distinctive, and some claim to be able with the ophthalmoscope alone to decide whether a retinitis is diabetic or renal. It resembles albuminuric retinitis in the presence of haemorrhages and exudates. The former are, however, more deeply seated in the retina, and are therefore rounded in shape, being in diabetes derived from capillary aneurisms, and not from rupture of the larger vessels in the nerve-fibre layer. The ophthalmoscopic signs of disease of the vessel walls are in fact usually absent, and papilloedema is rare. The exudates take the form of irregular-shaped masses rather than of round patches or dots, and the typical star figure at the macula is not often found.

Again, the immediate cause of death in patients who have suffered from diabetic retinitis is often coma or gangrene. Nettleship found this termination in fifteen out of twenty-four cases. A number of cases of diabetic retinitis have been recorded in which the patients have had persistently normal blood pressure and no albumen. Lastly, the prognosis is much less grave than in renal cases, and less so than in



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arterio-sclerotic cases. Nettleship found that of forty-eight patients sixty per cent. lived longer than two years after retinitis was known to be present.

It will be noted that in discussing this subject the term diabetes has been used without reference to the fundamental nature of the disease, whether pancreatic, renal, or otherwise. There is, I think, a promising field of investigation waiting to be explored in the incidence of retinitis in the various types of the disease. So far, we have been content to study the conditions merely in its relation to one symptom – glycosuria. It would be more scientific to consider it with reference not to what is excreted, but to what is retained. It is only by collaboration between the physician, the biochemist, and the oculist that our knowledge of the significance of fundus changes, not only in diabetes but in renal disease, will advance.