Toxic Amblyopia.

1894.

Thesis for the degree of M.D.
by

E. C. Fischer M.B: C.M. 1891.

Royal Ophthalmic Hospital,
Moorfields,
London E.C.

Donors of £10.10.0. are Life Governors.

Royal London Ophthalmic Hospital.

Blomfield Street, Moorfields, E.C.

London, May 26th 1894

I hereby certify that Mr E. C. Fischer was appointed a Clinical Assistant to this Hospital in 1892 November 1st & that he has acted as such since, until he was appointed Assistant Anæsthetist in February of this year.

Robert Brudenell Carter
Secretary

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Royal London Ophthalmic Hospital.

Blomfield Street, Moorfields, E.C.

London, April 27 1894.

Sir,

In forwarding my Thesis a 'Toxic Amblyopia', I beg to submit the enclosed certificate of Hospital attendance, as well as a declaration to the effect that the Thesis is my own work.

I beg to remain,

Yours faithfully,

E. C. Fischer.

T. R. Fraser Esq,
Dean of the Faculty
of Medicine.

Donors of £10.10.0. are Life Governors.

Royal London Ophthalmic Hospital.

Blomfield Street, Moorfields, E.C.

London, April 27 1894.

I hereby declare that my Thesis on 'Toxic Amblyopia' is my own work and has been entirely composed by myself. Where I have quoted from other authors inverted commas have been used, and foot-notes inserted.

L. C. Fischer M.B.

1891.

The term Toxic Amblyopia may be strictly applied to a form of blindness or bluntness of the visual sense (ἀμβλυς = blunt) which is produced by the action of many different poisons on the nervous system. Amongst these the more important are Tobacco, Alcohol, Lead, Bisulphide of Carbon, Quinine, Belladonna and the poison of Diabetes. The term however is generally restricted to that form caused by the abuse of Tobacco and it is this subject which I propose to discuss in the following pages.

I do so more particularly for three reasons:- firstly on account of the large amount of desultory writing on this subject; secondly because of the doubt that still exists as to the true nature of the affection; and thirdly on account of the general importance to the Public, that one should be in a position to at once recognise this form of blindness in its early stages while recovery is possible. This importance is manifest on account of the widespread and ever

increasing consumption of Tobacco. The average amount annually consumed per head of the population in this country amounted in 1821 to eleven and a half ounces, in 1851 to sixteen ounces, in 1881 to twenty two ounces and in 1891 to no less than twenty six ounces.

To understand fully the toxic effects that may be produced by the abuse of Tobacco smoking it is necessary to know the physiological action and physical properties of Tobacco and Tobacco smoke.

Tobacco consists of the dried leaves and petioles of the plant Nicotiana Tabacum, belonging to the order Solanaceae.

The constituents of the dried leaves as found by *Flückiger are as follows:-

Nicotine varied from	1-9 per cent
Albuminoids	15-20 .. ..
Gum	4-6 .. ..
Cellulose	7-8 .. ..
Starch	3-6 .. ..
Resin and Fatty substances	2-6 .. ..
Ash .. .	12-20.

The Ash contains several salts - potash

*Flückiger. Thorpe: Dictionary of Applied Chemistry III, 848.

sodium and Calcium, along with phosphoric and sulphuric acids. The Potash salts are chiefly found in the midribs and assist the combustion so that certain tobaccos eg Birdseye, which contains the cross-sections of the midribs, burn rapidly and are consequently hot to smoke.

The amount of Nicotine varies much in the different varieties – there being less in the milder preparations. [1]Schlösing estimated it at 2-8 per cent. His method was to take 10 grammes of Tobacco and exhaust them in a continuous distillatory apparatus with ammoniacal ether; the ammoniacal gas is expelled by boiling from the nicotine solution. Now decant and evaporate off the Ether, then neutralize by a solution of sulphuric acid of known strength.

Tobacco smoke contains only the faintest trace of Nicotine, if any. Thus Nelsens found 1 decigramme in 16 grammes of Tobacco, whilst [2]Vohl and Eulenberg failed

[1] Schlösing: Ann. Ch. Phys XIX. 230

[2] Vohl. Blyth: Dict.y of Hyg. & Pub. Health 1876. 596.

to find it.

It contains however a number of volatile bodies such as pyridine and its compounds, together with Marsh Gas, Ammonia, Carbonic Acid, Sulphuretted Hydrogen, Hydrocyanic Acid and Sulphocyanic Acid.

The toxic action of tobacco is produced by the volatile alkaloid = Nicotine which is a colourless oily-looking fluid, and volatilises at 250°C. It is probable also that a volatile oil = Nicotianin, and an Empyreumatic oil produced during destructive distillation in burning, take a small share.

It is therefore important to bear in mind that Nicotine exists in such a very minute quantity in the Smoke, so that it cannot be the actual smoke but rather a method of smoking which allows the nicotine to come into contact with the mucous membrane of the mouth – that produces the toxic effects. This, as we shall see is the Pipe, and hence the absence of toxic effects in those who smoke only carefully prepared cigarettes,

eg. the Turks and Egyptians.

Nicotine, when absorbed into the blood, rapidly causes salivation, nausea and vomiting with extreme depression of the nervous system, bringing about a state of collapse. In small doses it causes slight cerebral excitement and a sense of well-being, with stimulation of both sensory and motor nerves; the respiratory and circulatory systems are also stimulated producing a rise in blood pressure from a direct and peripheral action on the Vaso-motor apparatus.

This is another important point for the symptoms of toxic amblyopia have been attributed by some to a spasm of the minute vessels. It seems a possible theory for it is quite conceivable that long continued irritation as is brought about by the continual absorption of nicotine in small doses for a long period may produce a condition of tonic spasm of the small arteries.

Nicotine also acts physiologically on the Eye, causing when introduced into the

conjunctival sac lachrymation, contraction of the pupil and injection of the globe. The same effects may be noticed when nicotine is absorbed by the buccal mucous membrane, but less pronounced and of longer duration. *Benham made experiments on this point. He injected $\frac{1}{250}$ nicotine in two drops of water into the right Conjunctival sac: both pupils contracted but the left only to a small extent and after a lapse of ten minutes. The effects on the pupils, noticed by Benham, were as follows:

		Right (1/6 normal)	Left
In	20 seconds	15	16
	60 "	12·6	16
	10 minutes	11	15
	15 "	12·6	15
	30 "	14	16
	50 "	16·6	16

Thus it will be seen that the maximum contraction occurred after 10 minutes from the injection, and five minutes later dilatation began which reached the normal standard at the end of 50 minutes.

*Benham. Des Amblyopies et des Amaur. toxiques' par Galezowski. Paris 1878. 35.

Passing now from the consideration of the Physical properties and Physiological action of Tobacco we are in a position to start our investigation of the peculiar blindness that has been attributed to its use, and has received the name of Toxic or Central Amblyopia. Graefe called it 'Central' Amblyopia because this was the only part of the Retina that was affected, but as this name is sometimes applied to Amblyopia of central origin it had better not be used in this reference.

Yet the difficulties surrounding such an investigation are numerous not only on account of the many possible fallacies which so often complicate the cases eg alcohol, Syphilis, Sexual Excess, but also from the well-nigh impossibility of obtaining post-mortem specimens from which we might be able to determine a definite lesion.

How too does it happen that so few smokers comparatively become affected when the number of such can be reckoned

by millions? Many reasons might here be put forward as answer but I believe the most important are that there are ~~not~~ many people, comparatively speaking, who smoke to excess and whose habits and surroundings favour the develops. ment of such a disease; but still more important is a certain individual predisposition or idiosyncrasy that renders the person more likely to be attacked by such a poison as tobacco. This is evidenced by the difficulty and in many cases impossibility of becoming acclimatised to the use of tobacco. Thus certain members of a family can smoke with impunity while to others tobacco is a poison, and in the same family we may have several members attacked. *Prout said "it happens with Tobacco as with deliterious articles of diet; the strong and healthy suffer comparatively little while the weak and predisposed to disease fall victims to its poisonous operation."

*Prout: Nature and Treatment of Stomach & Renal disorders. London 1840. 25.

*Mackenzie was the first to point out that certain cases of Amaurosis which came under his observation were due to the poisonous action of Tobacco. He says: "The operation of poisonous substances sometimes produces a sudden attack of amaurosis. Belladonna, Stramonium and some other narcotics in large doses are almost immediately followed by this effect. Other poisonous substances applied to the body in small quantities every day, are probably productive of a similar effect, only that they operate more slowly. Tobacco may be justly signalised as a poison of this sort; but many others and in particular Mercury and Lead, have been accused of an insidious operation on the nervous system, terminating in blindness."

Mackenzie had however no satisfactory and diagnostic symptoms on which to base his conclusions, - all was mere inference. Thus he noticed that certain cases of blindness in smokers got well

*Mackenzie: Diseases of the Eye. 1854. 1066-67.

on stopping smoking. Individual cases, however, prove nothing, and [1] Mackenzie himself says, "it is difficult of course to prove that blindness is due to any one particular cause, when perhaps several causes favourable to its production have for a length of time been acting on the individual."

In July 1863 [2] Wordsworth reported three cases of supposed Tobacco Amblyopia. He selected these as apparently free from such possible fallacies as the abuse of alcohol, syphilis or sexual excesses. These cases occurred in men at ages varying from twenty one to thirty six. They were all heavy smokers, temperate and robust, and had never had syphilis. They all had a history of gradually advancing dimness of sight, extending over a period of some months; the ophthalmoscope revealed in each case whiteness of the optic discs, more marked towards the temporal side. Indeed Wordsworth declared before the

[1] Mackenzie: Diseases of the Eye 1854. 1022.
[2] Wordsworth. Lancet 1863, II, 95-96

Hunterian Society that so characteristic were the ophthalmoscopic appearances that he could pick out smokers from non-smokers in cases of Optic Atrophy. He said "I believe that the earliest changes observed in tobacco cases are those of increased vascularity of part or whole of the optic disc. After an uncertain period the nerve is unequally coloured, part being over-vascular and part anaemic. In more advanced cases the outlines of the disc are undefined, the choroidal margin being blurred and the area of a bluish-gray colour. Lastly the conditions of white atrophy are approached." I quote his description here as these are the generally recognised ophthalmoscopic appearances.

In the same year the attention of *Sichel was drawn to Mackenzie's account of Tobacco Amblyopia, in the existence of which he had not formerly believed. On this subject he read a communication before the Société médico-pratique de Paris and cited cases in which he had found the same ophthalmoscopic appearances as described by

* Sichel: L'Union médicale 1863. 54. 236-240.

Wordsworth. These appearances tallied with those described by him in 1857 as occurring in alcoholic patients.

But it was to [1]Hutchinson that much is due for his efforts in collecting and examining all cases that appeared to be of this description. In 1863 he published an account of forms of Amaurosis precisely resembling those of Wordsworth and Sichel and with a distinct history: the patients were adult males who suddenly noticed that "there was a fog over everything"; cerebral symptoms were absent or slight viz headache, giddiness or sleepiness. The patient was otherwise in good health. One eye was usually attacked before the other, but in a month or two both became affected. [2]Hutchinson collected all these cases of amblyopia which came under his care during 1863 and the four preceding years. These he tabulated dividing them into four groups comprising sixty five cases in all. I give his table as published, as this was the first attempt to classify

[1]Hutchinson: Lond. Hosp. Reports 1864, I, 35.
[2]Hutchinson: Lancet 1863, II, 536.

these amauroses

		Males.	Females.
Series I. Symmetrical and in Adults :			
	a Idiopathic Amaurosis	37	3
	b Secondary "	3	4
Series II Symmetrical and in Children			
	a Idiopathic	3	7
	b Secondary	0	1
Series III Unsymmetrical. All ages		3	4

It is with the Idiopathic cases of the first series that our interest lies.

The great disproportion that exists between the number of males and females affected, is at once obvious viz thirty seven males and only three females out of a total of forty cases.

*Thielsen in 1867 communicated a paper at the International Congress of Ophthalmology (Aug 14) on Tobacco Amblyopia. He illustrated it with an apparently typical case, free from complications, which had been treated by him for six months without avail. At this time Thielsen saw Sichel's article on Tobacco blindness, and on enquiring into his patients history he found that he smoked almost

* Thielsen: Compte-Rendu du Congrès d'Ophthalmologie. 1867. 3. 168.

constantly the strongest tobacco – a fact he had not previously ascertained. Tobacco was at once prohibited and at the end of three months his patient could read J1 and letters rather larger than J24 at 40 feet: at the end of nine months restoration of vision was complete.

Again in 1867 [1]Hutchinson published the results of his investigations in a second series of cases extending from January 1864 to December 1866. This comprised 37 cases – all adults from 21 to 36 years of age. Of these thirty four occurred in men and three only in women – there being thus the same discrepancy between the males and females as in the former list. In twenty seven out of the thirty four cases no other cause, except that of Tobacco, could be assigned.

Yet a third series of cases was collected by [2]Hutchinson between 1867 and 1870. Again was the disproportion between the two sexes marked, for out of a total of twenty nine cases, twenty eight occurred in men and one

[1]Hutchinson: Med. Chir. Transacts. Lond 1867, I, 411.
[2]Hutchinson. Ophth. Hosp. Reports 1871-73 VII 169-185.

only in a woman. The case of this woman was of great interest from the fact that a son of hers had been treated previously by Hutchinson, and a nephew by Hulke, both for "tobacco amaurosis". Were these not rather cases of Leber's disease or Hereditary Optic Atrophy which occurs almost exclusively in young men, and in whom the tobacco acted as the exciting agent on constitutions already predisposed to toxic influence? *Hutchinson suggests a possible idiosyncrasy in these three cases, and thinks it probable that the stoppage of menstruation was the exciting influence in the case of the woman.

Reviewing then these statistics of Hutchinson's the chief thing noticeable is the great discrepancy between the number of males and females attacked by this form of amaurosis. This disproportion could not be due to Intemperance or Venereal disease from the fact that males are not exposed to these factors in sufficient disproportion to females. Neither could it be due to

* Hutchinson. Ophth. Hosp. Reports 1871-73. VII. 169.

immoderate sexual indulgence because in this case young adults would be more liable to suffer, and in the cases under consideration the average age was over forty. Again too there would not be sufficient disproportion in the two sexes.

Neither could the disease be attributed to Occupation on account of the various professions and trades of the patients, so that there practically only remained Tobacco to which to attribute the blindness. Yet although it was almost certain that Tobacco was the cause, no distinctive or diagnostic points had so far been discovered.

*Von Graefe was the first to attach great importance to the systematic examination of the Field of Vision in cases of eye disease. He showed that in certain diseases there were special alterations in the Field which were almost diagnostic, and by this means he was able to divide cases of Amblyopia into certain groups:

1/ Those in which the Field was normal but Visual Acuity was diminished.

2/ Those in which Field was relatively normal

* Graefe: Archives für Ophth II. 2. 258.

but concentrically limited in relation to the diminished central vision.

3 Cases in which the Field was abnormally and irregularly limited.

In Toxic Amblyopia he found that the Field was never contracted unless accompanied by Atrophy of the Optic nerve.

But in addition to examining the Field with a white object, one should also in suspicious cases, examine with colours; for frequently, at an early stage, the colour Field is irregular or contracted, before we can detect any alteration in the white. We then know that the Prognosis is bad as contraction of the periphery will eventually take place.

*Leber was the first to discover the existence of central scotomata in cases described as of Alcoholic Amblyopia. Many of these resembled the simple tobacco cases. Thus he found little change at the disc, — sometimes slight hyperaemia and occasionally small bright white opacities on the disc or its edge which were believed by Graefe to be

* Leber. Archiv. f. Ophthalmolog. XV. 3. 26.

evidence of a retro bulbar neuritis. Along with these symptoms there was diminution of Visual Acuity and central colour scotomata.
From the fact that colour blindness and amblyopia were not associated together of necessity [1]Leber considered it a sufficient reason that the power of recognition of colours should be specially examined in affections of the eyes.
[2]Hirschler confirmed Leber's observations on these scotomata.

A scotoma is a break in the continuity of the Field of Vision, and may be positive or negative. The former is observed by the patient as a black spot in his Field, and is best observed on looking at a large bright surface. It is due to a deficient stimulation of the Retina as in cases where the light rays are intercepted by such things as vitreous opacities, haemorrhages situated on the Retina, Choroiditis etc. In the latter, as in Tobacco cases, the nerve fibres are involved and the scotoma

[1]Leber. Archives f. Ophth. XV. 3. 20
[2]Hirschler. Archives f. Ophth. 1871. 17. 228.

is unobserved by the patient.

By a systematic examination of the Field it was now discovered that all, or almost all, of these supposed Tobacco cases exhibited a central scotoma for colours, without any limitation in the periphery of the Field, and these two facts are the chief diagnostic points of the disease. What has been added since then to our knowledge of the symptoms and diagnosis has mostly been a repetition of former observations.

The frequency of Tobacco Amblyopia is less than one per cent of all cases. Allt met with one hundred and fifty three cases from 1865 to 1876, and Hansen estimated his cases as a half per cent.

The usual history then is as follows:. The patient - usually an adult male from forty to forty five years of age - complains of a gradually advancing mistiness of the sight which has been coming on slowly for the last few months. He cannot see either in the distance or close at hand although he can guide himself in the streets because the peripheral

parts of his fields are unaffected. Both eyes are usually simultaneously affected, though there may be an interval of some days before the second eye is noticed to be dull also. This mistiness or cloud has often a shining appearance and is most noticed in a bright light - particularly in the milder forms of the disease. It is probably due to some early irritation of the nerve fibres either directly by the toxic agent or through the vascular system. Tinted lights and colours are also sometimes noticed and frequently there is difficulty in distinguishing gold and silver coins.

Sight is usually better in a dull than in a bright light, and for this reason Arlt named the disease "Retinitis hyetalopia". But the visual acuteness is not in reality increased in the dark. Nettleship believed that this symptom was due to a dilatation of the pupil.* Fuchs however believed that the veiling of objects being less marked in a dull light, the patient

* Fuchs: Text Book of Ophthalmology 1892. 440.

thought he saw better by contrast. [1]Reymond has attributed the visual disturbance to a torpidity of the Retina. In the latter case a strong stimulus is necessary to produce a given impression. In a bright light vision in central scotoma would be almost equivalent to that of a normal eye in relative darkness, but amblyopes see better in relative darkness so Reymond supposes that these patients would see less circles of diffusion.

It is probably due to a hypersensitive state of the Retina so that the patient sees better when there is less light stimulation. Occasionally the image of an object is retained for an undue length on the Retina as pointed out by [2]Richardson, and described by Galezowski in cases of so called "Alcoholic Amblyopia" The former noticed this fact so long as the eyes were not fatigued by long work is tobacco produced its primary stimulant effect so long as

[1]Reymond. Wecker and Landolt III. 640.

[2]Richardson: For and against Tobacco. Lond 1865. 4.

the retina was not exhausted. In health the retinal image is absorbed and transmitted to the brain at once, but when nutrition is interfered with the image is retained for a time in the surface as it were.

The light sense too is diminished. This can be proved by testing with a small piece of white paper from ½ to 1 centimetre in diameter: when this is brought into the region of the scotoma it gets duller. It is however rather a difficult point to bring out. This diminution in the light sense bears no relation to the loss of visual acuteness, but is definitely related to the size of the scotoma.

Apart from these symptoms the patient is usually in good health – cerebral symptoms are absent. He gives a history of having smoked for a considerable number of years. About half an ounce per day of 'Shag' tobacco is the average quantity smoked.

Ophthalmoscopically the Fundus appears healthy, or the optic disc may be slightly congested with a little blurring of its

outline: the larger arteries and veins are of normal size. At a later date the temporal half of the disc becomes pale, and still later, if the disease progresses to such a stage, the whole disc may become white with diminution of the calibre of the vessels.

Testing with the Perimeter the Field of Vision is found to be intact at the periphery, but towards the centre a scotoma for colours, especially for red and green, is found. Red in the scotoma appears of a dark grey while green appears light grey and violet-blue.

As we have seen the scotoma is negative it is not perceived by the patient.

A Central negative colour scotoma, together with intact periphery of the Field, and diminished Visual Acuity may be always said to be of toxic origin; on the other hand toxic cases have been recorded without scotomata and *Treitel has found scotomata in healthy eyes

*Treitel. Archives f. Ophth. XXV. II. 98.

The Scotoma is almost invariably of a definite shape namely an oval lying horizontally and corresponding in projection to that part of the Retina between the disc and the macula. The centre is not exactly in the point of fixation but rather outside it i.e. between it and the blind spot.

When no scotoma has been found it is probably because the coloured test-object has not been small enough, so that its colour has been recognised by a healthy part of the retina. Our test object should therefore be not larger than five to ten millimetres. In severe cases however the scotoma may extend to the whole Field for green and red.

In testing for scotomata the patient should be made to fix a white spot in the centre of a black field and a black pointer should be used tipped with a coloured test-object. It is better to have another colour on the reverse side of the pointer, so that one colour can be rapidly substituted for another eg red or

one side and green on the other.

Colour-blindness must of course be excluded before testing and this may be rapidly done by means of Holmgren's wools. We must remember too the normal limits of the Field for colours - green being the smallest, then red, then blue, - the periphery of the Field being colour-blind.

The colour of the test-object too should not be too bright. Another point to be careful about is to stand facing the patient, and make sure that he is looking steadily at the white spot, or otherwise the test-object will be recognised by a healthy and more peripheral part of the Retina.

Should the patient be congenitally colour-blind for red and green, then blue and yellow test-objects should be employed.

*Berry suggests a rapid method of diagnosis by which "the patient is made to fix a white spot on a large surface of red paper, on which is painted a green spot of a hue exactly complementary to the red, and of as nearly as possible the

*Berry. Diseases of the Eye 1893. 442.

same shade; he is then quite unconscious of the green and considers the surface to be uniformly red, when the spot falls within the area of the scotoma, while he immediately sees it in its proper colours if it be held so as to cause the spot to fall on a healthy portion of the Retina."

*Macé and Nicati found that central colour scotomata were rendered much more apparent by the interposition of a coloured glass. Thus instead of testing in the ordinary way they interposed red, green and blue glasses before the eye, which was made to look at a white square test-object. This had the same effect as reducing the illumination. The disappearance of the test-object as it entered the area of the scotoma was thus readily recognised.

In the toxic cases the scotoma for colour may be absolute, but for form it is never so; its density too does not hold

*Macé and Nicati. Archives f. Ophth. 1881. 506.

a definite ratio to the Visual acuity. It is surrounded by an area in which the scotoma is relatively - especially for red and green.

Although the symptoms and signs as given above are typical of Tobacco Amblyopia, there are many slight variations and exceptions from these.

As regards the age at which the disease begins, the average is about forty years but many juvenile cases have been recorded. The youngest case seen by Berry was in a lad of twenty and Nettleship had a case at twenty one, while Morton had one of twenty two.

As to the onset *Hutchinson. junr records a case in which one eye was not affected till six months after the other: G. W. aet 42 was an outpatient at Moorfields in April 1884. R.V $\frac{20}{70}$. L.V $\frac{20}{20}$ and J1. In the following September the Left failed also. In January 1885 R.V. = $\frac{20}{100}$ and J19 at seven inches. L.V. $\frac{20}{200}$ and J16 at seven inches. Central scotoma for red and green but field was intact at periphery.

* Hutchinson: Moorfields Hosp. Reports 1886

Recovery was perfect.

Galezowski[1] had a case of monocular toxic Amblyopia of left eye, but I believe this was more of the nature of Neuritis.

The onset tho' though usually gradual may be sudden as in a case recorded by Nettleship of a man who had only smoked for a year and in whom the symptoms rapidly developed.

As to the scotoma - the size and exact situation of the central defect probably correspond to variations in the arrangement of the nerve bundles or to variations in the exact position of the inflammation. The usual colour scotomata are for green and red, but a yellow scotoma has been found fairly commonly and Hutchinson jun.[2], Norton and Frost have met with blue scotomata. Again the scotoma may be absent at any rate for a time; Frost has seen five cases of Amblyopia without central scotomata, and it has been

[1] Galezowski. Rec. d' Ophthal. 1877. IV. 2.

[2] Hutchinson. Transacts. Ophth. Soc. VII. 65

asserted by *Stoeber that the scotoma is never stationary, and may disappear after rest in a dark room.

When recovery occurs it starts from the periphery and from the nasal side, so that the remains of the scotoma should be sought for paracentrally and between 3° laterally and the blind spot (Sachs) for otherwise the patient may appear to be cured having $V = \frac{6}{6}$ and normal colour perception. Morton had a case in which the scotoma persisted for two months after Vision was $\frac{6}{6}$.

At what point does the Scotoma begin? Leber, Battelship and Treitel believed that it was at the fixation point, extending thence to the blind spot, but this is probably not the case. If this view held good the patient's central vision would become bad much earlier and would be denser than at the blind spot - which is not the case. Sometimes too the scotoma does not reach the point of fixation and Krenchel has found

* Stoeber. Archives d'Opht. 1883. 256.

a central scotoma without diminished Visual Acuity. The manner in which the scotoma passes off would suggest that the scotoma begins at the blind spot. As Sachs has shown (see above) the scotoma passes off beginning at the nasal side: this corresponds to the yellow spot side which exhibits the least dense and narrowest end of the scotoma.

Under what circumstances does Tobacco produce this toxic effect on Vision?

First let us examine the results of investigations made in countries where tobacco is used to a much greater extent than in our own.

Amongst the Egyptians and Turks, who are the greatest smokers in the world, amaurosis is not common.* Farquhar a surgeon for many years to the British Consulate at Alexandria, had met with

* Farquhar. Zander on the Ophthalmoscope p 219.

very few cases of this affection. [1]Dickson a physician to Her Majesty's Embassy at Constantinople gave evidence to the effect that amaurosis was not common in Turkey generally, although the usual amount of Tobacco consumed by a single person per month was estimated at an oke, or about $2\frac{5}{7}$ lbs avoirdupois. [2]Hübsch's testimony is still more emphatic. He wrote "as to the action of Tobacco upon the eyes, it is very problematical; here every body smokes from evening to morning and from morning to evening; men smoke a great deal, women a little less than men, and children smoke from the age of seven or eight. I have never been able to attribute amaurosis to the abuse of Tobacco; the number of smokers is great, the number of cases of amaurosis is few. . . . . So much for the action of Tobacco." [3]Van Millingen's evidence too is altogether negative. He had never seen a case of Tobacco Amblyopia

[1]Dickson. Zander on the Ophthalmoscope 219.

[2]Hübsch. Zander on the Ophthalmoscope 220.

[3]Van Millingen. Transacts. Opth. Soc. 1888. VIII. 240.

in a Turkish man or woman, although he had spent fifteen years in Turkey, and the quantity of Tobacco disposed of annually amounted to the huge total of one hundred and sixty million pounds.

In the face of such evidence as this, there must be other factors at work in the production of amaurosis.

Shag which is the Tobacco that usually is smoked by the patients in this country, contains, according to* Van Millingen, 6·87 per cent of nicotine. Turkish Tobacco is much milder only containing from 3 to 4 per cent of nicotine, but there a vastly larger quantity is smoked. The smallest amount of Shag which has caused amaurosis is half an ounce per week producing two parts of Nicotine, and the smallest amount of Turkish Tobacco smoked is half an ounce a day or equal to between three and four grammes of Nicotine. Thus the Turks should suffer far more from the toxic effects of Tobacco than the people in this country.

* Van Millingen. Transacts. Ophth. Soc. VIII. 240

But, as we have just seen, they are nearly exempt from amblyopia, so that the factors Quality and Quantity of Tobacco should be excluded. The cause then must lie chiefly in the Manner, aided no doubt by other minor factors which I shall consider presently.

The manner in which Tobacco is smoked is quite different in Turkey and England. The Turks always smoke cigarettes which are carefully prepared so that the Tobacco does not come into contact with the lips, but only the cigarette paper: the smoke is inhaled into the lungs with single deep inspirations, the cigarette not being retained between the lips. In this way the Nicotine cannot come into contact with, and be absorbed by, the buccal mucous membrane. The pipe on the other hand is held continuously between the teeth and the nicotine is sucked up with the inspirations and makes its way through the stem into the mouth where it is readily absorbed by the mucous membrane.

It seems certain then that the method of smoking has far more to do with the toxic effects than the Quality or Quantity of the Tobacco., for it must be the absorption of the nicotine by the mucous membrane of the mouth and not the actual smoke that is injurious. Chewing tobacco too has the same effect in producing Amblyopia.

But there are other factors besides these which play an important part in the production of this blindness. We have seen that Toxic Amblyopia is almost exclusively confined to the adult male working classes, that is to say by far the largest proportion of cases that occur is in this class. They usually smoke a pipe, smoke shag tobacco and very frequently smoke on an empty stomach. Rising early the men often go to work for several hours before they get any breakfast and smoke continuously during this time. We only three cases recorded by Berry as occurring in women smoked on an empty stomach. Other depressing causes are alcoholism, dyspepsia, mental worry and anxiety, grief and sleeplessness,

these being usually accompanied or lightened by a pipe. Again these people often get inferior or insufficient food, and have not the same hygienic surroundings as the better classes,- their homes are badly ventilated, and there is much crowding and breathing of vitiated atmosphere. Further the poor smoke the cheaper forms of Tobacco, and, as we have seen, these cheaper kinds contain the most nicotine.

All these factors tend to produce a general lowering of the system and proneness to suffer from disease or other noxious influence.

The actual occupation, apart from hygienic considerations, does not appear to have much influence, for we find the followers of all trades affected. I have however myself noticed a decided frequency amongst painters and attribute this not so much to the effects of the lead with which they work as to the belief common amongst them that tobacco is beneficial in preventing lead poisoning. The profuse salivation caused by the tobacco "brings the lead off

the chest" as one patient remarked.

As to the effects of alcohol, – no doubt taken to excess it tends to bring about a state of malnutrition of the body and in this way is distinctly harmful, but taken in moderation it has the opposite effect. It is a well known fact that one can smoke a greater quantity of Tobacco without feeling any ill effects when one drinks in moderation than when without this the same quantity of Tobacco would cause headache, nausea and malaise. *Richardson in 1865 pointed out the antagonistic properties of Alcohol and Tobacco. "Alcohol tends to create fermentative changes in the stomach and alimentary system, and to give rise to those acid modifications of the blood on which the more serious organic affections of the heart mainly rest, while the tendency of tobacco is to stop those changes." Again Alcohol dilates peripheral vessels whilst we have seen that Tobacco contracts them and it is for this reason that alcohol has been used in the treatment

* Richardson. For and against Tobacco 1865. 28.

of Tobacco Amblyopia.

Marcus Gunn believes that total abstainers as well as excessive drinkers are especially liable to Tobacco poisoning, whereas moderate drinkers can smoke with comparative impunity from the ordinary acute effects of Tobacco poisoning.

There has been much discussion as to whether alcohol alone causes Amblyopia. English ophthalmologists do not recognise such a form, but on the Continent and especially in France, there is a firm belief in it. As early as 1837 [1]Sichel published a paper on this subject, and amongst other Continental authorities Van Millingen gives the percentage of all cases of Amaurosis at Berlin as 4·37 and at Paris as 1. [2]Galezowski and Guélliot amongst others were advocates of this type. The former found central scotoma very rare in such cases, the onset rapid and the course irregular: along with this there was confusion of colours

[1]Sichel: D'amaurose symptomatique du Delirium Tremens. 1837.

[2]Galezowski: Des Amblyopies et des Amauroses Toxiques. Paris 1878. 12.

especially of composite colours eg yellow-green and blue-green confounding these with the predominant colour or with grey. [1] Galezowski also found colour impressions lasted longer on the retina, so that on looking at a second colour it appears like the first. This had already been described by Richardson as occurring in Tobacco cases, and has been previously mentioned. [2] Guélliot described four distinguishing features by which Tobacco and Alcoholic Amblyopia might be distinguished:

(1) Atrophy results more quickly to Tobacco.

(2) There is never confusion of colours in Tobacco.

(3) Patients see less well in the evening in Tobacco.

(4) No mist is seen in alcoholic cases.

[3] Nuel however admits that the typical Amblyopia may result from Tobacco.

Nettleship has seen no cases of purely alcoholic amblyopia where tobacco could be excluded altogether, and he has often met

[1] Galezowski: Du Diagnostic des maladies des yeux par la chromatoscopie rétinienne. Paris 1868. 218.

[2] Guélliot: Amauroses nicotinique. Le progrès médicale 427.

[3] Nuel. Traité d'Ophth de Wecker et Landolt 1887

with cases of recovery from amblyopia on stopping the Tobacco without stopping the Alcohol. Many other English ophthalmologists bear evidence to the same effect.

Diabetes is another predisposing cause and probably there is not a separate form of diabetic Amblyopia. Undoubtedly many cases precisely resembling those of Tobacco occur in diabetic patients but in no case recorded in this country could tobacco be excluded. *Samuel however has seen cases in Diabetic patients who did not smoke. As to whether these amauroses in Diabetics disappear on stopping the Tobacco, we have no evidence.

Lastly amongst the predisposing causes is a personal idiosyncrasy on the part of the patient which renders him more susceptible to noxious influence. This will be further discussed in connection with the Juvenile cases of Tobacco Amblyopia, described under the diagnosis of this affection.

* Samuel. Centralbl. f. praktische Augenheilkunde 1882. 202.

thology. Much discussion has arisen as to the Pathology of these affections of the Optic Nerve, which are characterised by central scotomata. This has arisen from the great difficulty of obtaining Post-mortem specimens for examination. ~~Different opinions~~. Different opinions having been expressed as to the nature of the affection, some maintaining that there is a definite lesion of certain fibres of the optic nerve either of the nature of an inflammation or degeneration, others believing in the retinal origin of central scotoma in toxic amblyopia, I propose to give a short account of the views most generally held.

Leber believed that the disease was due to a partial atrophy of the optic nerve, on account of the whiteness of half of the disc, and he suggested that the nerve fibres which ended in the macula and between it and the papilla must lie in the outer half of the disc - a theory which was subsequently proved to be correct by Samelsohn.

[1]Schön believed in the retinal origin of central scotoma owing to the almost constant form of the defect and its tendency to retrogression. In long standing cases, however, he thought that changes might occur at the macula which would result in ascending atrophy of the optic nerve. Sachs, commenting on this theory, disproved it from the fact that discoloration of the temporal half of the optic nerve remains although there is continuous improvement of the patients vision, and because the relation of the scotoma to the vertical line is not symmetrical as it would be if a result of functional disturbance at the macula: as a matter of fact the scotoma extends towards the blind spot, little of it being in the middle.

[2]Soeberg Wells also though recognising the occurrence of tobacco amblyopia did not believe that there was a peculiar and characteristic atrophy of the optic nerve, but that the

[1] Schön. Graefe-Saemisch Band VII. S. 418.

[2] Soeberg Wells. Lancet 1871. 39.

symptoms were attributable to a diminution in the retinal sensibility whereby it could not act with its normal acuteness on the stimulus of light.

[1]O. Bär suggested that the scotoma was due to spasm of the vessels, which, owing to the peculiar blood supply of the part, would be most felt at the macula and between it and the disc: this would account for the form of the scotoma and its tendency to retrogression.

[2]Berry thinks it probable "either that the poisonous effect is exerted on some part of the brain which includes a part of the papillo-macular fibres, or that some limited Vaso-motor change affects these fibres in some part of their course" - thus agreeing with O. Bär.

But how could one get such a very limited Vaso motor change, and why does the disc remain persistently pale on recovery when one would have expected the local spasm to have passed off?

[1]O. Bär. Volkmannsche Vorträge No 246. S. 29.

[2]Berry. Diseases of the Eye 1893. 444.

It is more than probable that Toxic Amblyopia is a form of retro-bulbar neuritis, for although the clinical symptoms differ considerably, as pointed out by Berry, from ordinary cases of retro-bulbar neuritis, yet these symptoms may be explained by the fact that the inflammation may affect different points of the nerve behind the eye, and involve different fibres. From the fact that the arrangement of the bundles of nerve-fibres supplying the same parts of the retina differs at different distances along the nerve, this would account for the inconstancy of the symptoms as Nettleship suggested. The arrangement of the papillo-macular fibres in the optic nerve was discovered by [1]Samelsohn, followed by [2]Nettleship and Uhthoff.

[1]Samelsohn made a Post-Mortem examination, in 1880, of a patient who had suffered from central scotoma for red and green

[1]Samelsohn. Zur Anatomie und Pathologie der Retro bulbären Neuritis. Graefe's Archives f. Ophth. XXVIII I.1. (1882).

[2]Nettleship. Transacts. Ophth. Soc. 1880-81. 124.

but in whom there was no evidence of the abuse of tobacco or alcohol. His Visual Acuity was only $\frac{15}{200}$ and before death the scotomata were absolute for white as well as for colours. The periphery of his Field however remained normal.

On section he found that the optic nerves showed a definite change. In the optic canal the centre of the nerve showed an increase of the connective tissue with proliferation of nuclei and atrophied fibrils, while peripherally the nerve was healthy. Anterior to the canal there was descending degeneration of the fibres as a result of being cut off by the inflammation higher up in the canal. These fibres corresponded to the scotoma. Posterior to the optic canal there were no changes visible. The condition then that *Samelsohn found was a central axial neuritis, commencing at the optic foramen and followed by a descending degeneration of the nerve fibres. In the optic canal the fibres were circular and held an axial

*Samelsohn. Archiv. f. Ophthalmolog. XXVIII. I. 40.

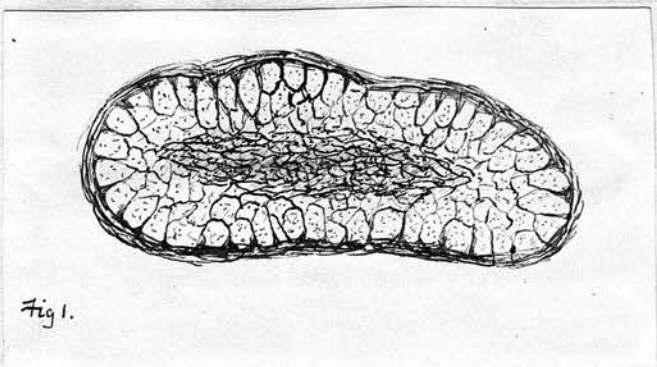


Fig 1.

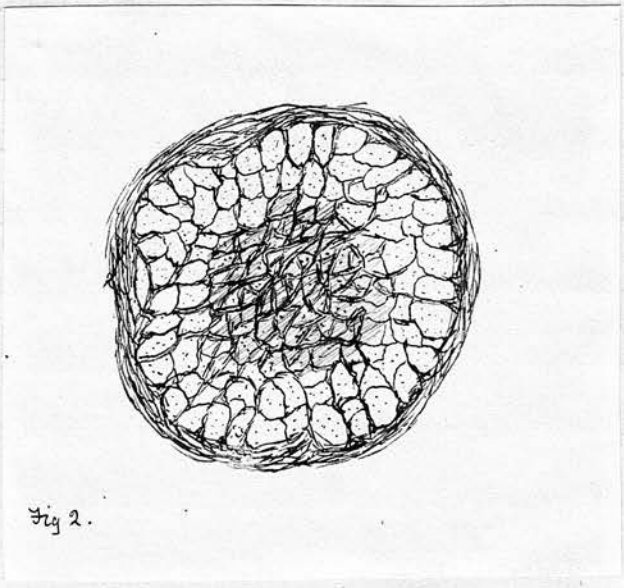


Fig 2.

Fig 1. Section in the region of the optic canal. The peripheral part of the nerve is normal while in the centre it is atrophied.

Fig 2. Section in the neighbourhood of the canal, where the nerve has become round. Thickening of the central septa, with atrophy of fibrils.

Fig 3. Section after entrance of central vessels. The degenerated portion is now lateral.

Fig 4. Longitudinal section through the right Papilla.

position, while at the entrance of the central vessels and down to the optic disc they had a wedge-shape on section - the apex of the wedge pointing towards the vessels.

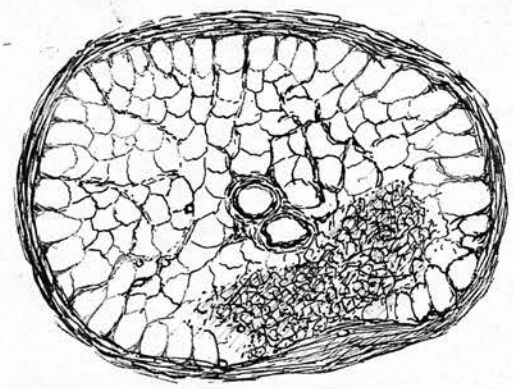


Fig 3.

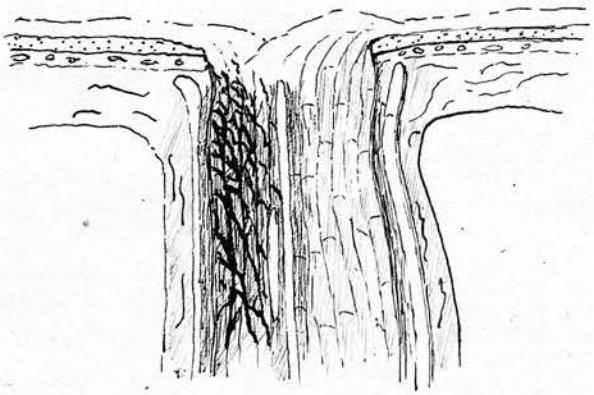
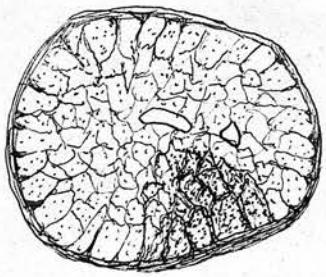


Fig 4.

These diagrams are copied from *Samelsohn, and illustrate well the pathological changes.

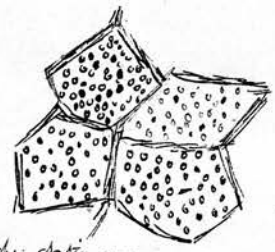
*Samelsohn: Archives f. Opht. Bd 28. 1882. Pp 40 and 110.

Fig 1. 

Transverse section of optic nerve a little in front of point of entrance of central artery & vein.

× 20

Fig 1. Showing "increase of nuclei both in the fibrous septa which separate the bundles of nerve-fibres, and in those bundles themselves. The inner sheath at the same part is thicker than at any other part".

Fig 2. 

× 84

Fig 2. Healthy optic nerve

Fig 3 

× 84

Fib. sept. much thicker than in health. Increase of fib. tiss. round minute vessels (V. V.)

Figures illustrating the changes found by Hetteships and Edmunds.

*Hetteships and Edmunds. Transacts. Opth. Soc. 1880-81. 124.

[1]Nettleship and Edmunds found the same changes as Samelsohn viz atrophy of nerve fibres, increase of nuclei and thickening of connective tissue septa. In the more posterior sections the affected part was almost in the centre of the nerve, but further forwards viz about the entrance of the central artery and vein it approached the surface having a wedge-shaped appearance on section.

Uhthoff has examined seven cases which exhibit well marked changes of a similar nature. He found a degeneration of the temporal half of the optic nerve, wedge-shaped, with apex turned towards the central vessels. Six millimetres behind the globe the degenerated area is half-moon shaped and rather further back this becomes oval, while at the optic foramen it is central. The degeneration consisted in a great increase of nuclei, with much thickening of the fibrous septa between the nerve bundles.

[1]Nettleship and Edmunds. Transacts. Ophth. Soc. 1880-81. 124.

[2]Uhthoff. Archiv. f. Ophth. XXXII. 4. 95.

*Sachs followed with a case in 1884. He found the appearances described by Samelsohn and Hettlestrip but believed that they were not due to an inflammatory process. Although there was increase in the fibrous septa, he thought this was due to the coming together of normal septa, with atrophy and degeneration of the nerve fibres between them, while there was well marked congestion in the degenerated area. The groups of degenerated bundles supplied a part of the retina which corresponded to the scotoma. These bundles passing from the optic canal to the papilla were situated eccentrically at the lower and outer part of the nerve, while the bundles in the axis of the nerve were normal. "The disease probably commences in these eccentric bundles and also persists after the conduction in the bundles running in the axis has been re-established, so that Samelsohn's hypothesis, in which the axial position of

*Sachs. Archives of Ophth. 1889. XVIII. 135.

(Translation by MacCauley)

the macular fibres in the canalis opticus is offered as the sole explanation of their isolated implication, is not in accordance with the actual existing conditions."
Sachs thus differed from Samelsohn in demonstrating the eccentric position of the atrophied bundles, and in believing that the process was one of degeneration rather than of inflammation. At the same time he found that the most marked degeneration of nerve elements was in the optic canal and for this reason he agreed with Samelsohn in placing the initial lesion in this situation.
*Aldren Turner, working under Virchow, also confirmed the existence of these changes. Unfortunately the clinical data of his case are not complete.

Here is then a definite lesion in retrobulbar neuritis, and the bulk of evidence goes to show that toxic amblyopia is a form of this disease. Although there was no evidence of the excessive use of Tobacco

* Turner. Journal of Anat. and Physiolog. 1889-90. 307.

in Samelsohn's case, yet it precisely resembled Tobacco in the central scotoma for red and green, uncontracted Field of Vision and diminished visual acuity.

Thus in the first stage of a Tobacco case we find slight congestion of the disc with impairment in the conduction power of the nerve fibres. There seems no reason why a slight Neuritis should not completely recover just as the more common forms of Neuritis often do; but if the irritant were continued for a long period atrophic changes and permanent impairment of function would result – such as we find in the most severe cases of Tobacco Amblyopia.

As to why the Tobacco poison picks out the optic nerve, and sets up changes therein, we do not know: we must simply take for granted that it does so, just as lead causes a special form of paralysis of the extensor muscles of the arm from affecting a special portion of the musculo-spiral nerve, and as alcohol a peripheral neuritis with inflammation and proliferation of

connective tissues in internal organs, more especially the brain and liver. In this connection *Samelsohn points out that there may be some connection between the optic nerves and the liver from the fact that metastatic deposits are found in the liver after the removal of choroidal and orbital sarcomata. I think, however, this does not follow: the liver is one of the earliest internal organs affected in recurrent malignant disease - wherever the primary lesion be situated.

The anatomical relations of the nerve in the optic canal would be liable to interfere with the free circulation, and as the vessels enter the nerve from the periphery and form a plexus in its centre, it would be this part of the nerve which would most readily show inflammatory changes.

As to why the optic nerve remains persistently pale after recovery, is more difficult to explain. If the pallor were

*Samelsohn. Archives. f. Ophth. 28. I. 1.

due to a Vaso Motor contraction of the small vessels in the nerve, as has been suggested by some authorities, then, on stoppage of the toxic agent, the spasm should pass off and the nerve resume its normal colour. It is probably then due to a slight increase of the connective tissue between the bundles and obliteration of a few minute vessels, but not sufficient to interfere with the function of the nerve and so prevent the conduction to the brain of the retinal images.

It is this change which has been described by Samelsohn, Nettleship, Uhthoff and others.

nosis.

As we have seen the diagnostic points of Tobacco Amblyopia form a Tripod viz central negative scotoma, diminution of the Visual Acuity, and uncontracted Field of Vision. Central negative scotomata have however, been described in other retro-bulbar affections of the optic nerve, by [1]Von Graefe, [2]Leber and [3]Förster.
The Tobacco scotomata are always of most regular shape as was first pointed out by Förster and Schön, followed by Sachs and [4]Berry in 1882. [5]Sach's observations, taken from Schnabel's clinic showed that the average extent of the scotoma was: 'Outwards 18°, Inwards 5°, Upwards 7° and Downwards 6°' it's typical form was an oval lying horizontally - the blunt end being central and the pointed end corresponding to the blind spot.

[1] Von Graefe. Klin. Monatsbl. Bd III. S. 209.
[2] Leber. Archiv. f. Opthlt. Bd XV, Ab. 3, S. 65.
[3] Förster. Graefe-Saemisch Bd VII., S. 201.
[4] Berry. Edinb. Med. Journal 1882. 673.
[5] Sachs. Archives of Opthlt. 1889. XVIII. 135.

On the other hand the absence of central scotoma in Tobacco Amblyopia has been noted by Leber,[1] Vossius and others.

That these forms of Retro bulbar neuritis are one and the same disease, with slight modifications, depending probably on the exact localization of the inflammatory mischief, Berry does not admit.[3] He has pointed out several clinical distinctions between the true form of retrobulbar neuritis and Toxic Amblyopia. In retro bulbar neuritis he asserts that the central scotoma is not of such regular shape as is found in the true toxic cases, and often extends a little towards the inner side of the point of fixation. The Field of Vision is also somewhat contracted in the first case, and the ultimate prognosis is not so good, for although some recover, in others the central scotoma becomes absolute, whilst

[1] Leber. Lancet 1871. 39.

[2] Vossius. Bull. d'oeul. XIII. 291-292.

[3] Berry: Diseases of the Eye 1893. 235.

others progress. The disease too is as common in women as in men, the onset is sudden, and one eye only is usually affected.

In addition to this true retro bulbar heuritis there are other forms which show a central scotoma and which are not genuine toxic cases. I quote from *Berry who gives Jensen's description of them: the latter classified these atypical cases, which were taken from Hansen Grut's clinic as follows:-

(1). Stationary Scotomatous Optic Atrophy.
(2). Progressive Scotomatous Optic Atrophy.
(3). Bilateral Optic heuritis with Central Scotoma.
(4). Unilateral Amblyopia, heuritis or Atrophy with central scotoma.
(5). Glaucoma simplex.

To the first group belonged 7-8% of the cases of central scotoma. Jensen described this group as follows: "It occurs exclusively in young men under the age of thirty four, usually between twenty and twenty five

*Berry: Diseases of the Eye 1893. 444-445.

years; occasionally showing an hereditary tendency, sometimes apparently caused by want of sleep, and other weakening factors; often without any demonstrable cause. The affection begins with considerable Amblyopia which occurs either suddenly or reaches a maximum in the course of a short time, without being accompanied by disturbances of general health; it develops usually simultaneously in both eyes.

"On examination of the Field of Vision a central scotoma is found of about the same size and form as in amblyopia centralis, but much more complete — white objects presenting a visual angle of 1° to 2°, disappearing either entirely or becoming very indistinct within its area. Corresponding to this fixation is uncertain or excentric. During its course the density of the scotoma and consequently the central amblyopia remains as a rule unchanged.

"The periphery of the Field of Vision may present slight anomalies in the colour sense; rarely

complete or permanent red-green blindness. Further transitory defects of the peripheral vision for white objects may arise. As a rule the periphery remains normal during the whole course.

"Ophthalmoscopically there is found to be complete atrophy of the papillae, and this sometimes very early; as a rule it is decided before the lapse of a year. Occasionally there may be a suspicion of a neuritic origin; on the other hand a decided intra-ocular neuritis is never found to precede the atrophy. The prognosis of this affection is bad quoad restitutionem, but absolutely good quoad vocitatem."

This description resembles in many particulars that of Leber's disease or Hereditary Optic Atrophy.

In Jensen's second group he found a central colour scotoma of the same form as in Amblyopia centralis with unaffected periphery of the Field of Vision. At a later stage the Field for white and for colours becomes diminished. This is followed

by complete atrophy.

Next to the atypical cases of Jensen may be placed those in which the Field of Vision is impaired at the periphery, though the other symptoms resemble Tobacco cases in all particulars. *Lawford amongst others has recorded such cases eg that of a man, a smoker, in whom the disease had become stationary without stopping the use of Tobacco, and whose Field was distinctly contracted.

All these variations in the types of retro-bulbar neuritis can I think be explained by the particular localization of the inflammation. Thus in ordinary cases in which we have central scotoma without contraction of the Field of Vision, there is a limited axial inflammation which eventually recovers and the conduction of the nerve fibres is restored. In severer forms in which recovery does not take place the axial inflammation has brought about an atrophic degeneration

*Lawford. Transacts. Ophth. Soc. III. 163.

permanently impairing their conductivity. In those cases in which the Field of Vision is also contracted, the focus of the inflammation has spread from its original seat towards the periphery of the nerve, and so involved fibres which supply the periphery of the Field.

There is evidently some connection between Toxic Amblyopia and Hereditary Optic Atrophy or Leber's disease. The chief features of both affections bear a close resemblance. Thus *Leber found that Hereditary Optic Atrophy occurred chiefly amongst males at ages varying from eighteen to forty five, but the average amongst females only amounted to ten per cent of these cases. The patients are usually of neurotic temperament. The onset is often sudden but may be slow being a progressive dimness of sight: both eyes are usually affected, but often one before the other, and the degree of dimness may vary. There is a complete

* Leber. Archiv. f. Ophth. XVII. 1871. 249-291.

central scotoma, but no contraction of the periphery of the field. The patients see as well in bright as in dull light. The ophthalmoscopic changes are the same as in the toxic cases, namely, primary congestion of the disc followed by pallor which, commencing at the temporal side, spreads to the whole area. As a rule the vision does not now get any worse and although the central vision is never completely recovered, there may be an improvement.

*Habersohn collected together many cases of this nature. They were seventy five in number occurring in seventeen families, sixty two being males and thirteen females. In both males and females the onset was at puberty in the majority but a few at about the fortieth year. The most noticeable features resembled those of Leber's namely the period of onset -usually puberty, central amblyopia

*Habersohn: Hereditär. Opt. Atroph. Graefe und Saemisch 1877. 824.
Transacts. Ophth. Soc. VIII. 212.

central scotomata for colours, no contraction of the Field of Vision, and bad prognosis. There was a history of smoking in many of these cases before the onset of the symptoms. *Habershon in discussing these cases quoted the case of Juvenile Tobacco Amblyopia of Nettleships. In this the sight had failed gradually for three months. There were no other symptoms. He smoked only an ounce of Birdseye per week. There was no history of Syphilis or sexual excess and he drank alcohol in strict moderation. There was no hereditary history of blindness or failure of vision. A central scotoma was especially noticeable to the outer side of the fixation point. *Habershon, calling attention to two other recorded cases of Juvenile Amblyopia, said: "It seems to me that the occurrence of the Juvenile Tobacco cases among several members of a family forms a connecting link between the isolated cases recorded and the undoubted

* Habershon. Transacts. Ophth. Soc. VIII 212

examples of Leber's disease in whom there is no tobacco history..... The last connecting link is supplied by cases of central amblyopia occurring in several members of a family, in which some are smokers and some non-smokers."

Still more confirmatory evidence may be taken from [1]Hutchinson's case previously mentioned, and from Nettleship's cases. In the former, which was the case of a woman who was affected with amblyopia precisely similar to the toxic form, the woman's son had been treated by Hutchinson, and her nephew by Hulke, - both for tobacco amblyopia. In [2]Nettleship's cases - in the one Tobacco Amblyopia occurred in father and son, while in the other Tobacco Amblyopia occurred in the father and Tabes Dorsalis with progressive optic atrophy in the son.

Thus it will be seen that we have

[1]Hutchinson. Ophth. Hosp. Reports VII. 169-185.

[2]Nettleship. Transacts. Ophth. Soc VII. 43.

very similar symptoms to those of Toxic Amblyopia, which usually occurs at or about forty years of age, in:-

1/ Isolated Juvenile Smokers

2 In several juvenile smokers in the same family.

3/ In different members of a family of whom some are smokers and others non-smokers.

4 In different sexes of the same family.

5/ In Leber's disease which is undoubtedly hereditary.

All this tends to prove the existence of a peculiar neurotic diathesis in those patients who suffer from this disease.

The tobacco appears to be the exciting agent which acts on a nervous system readily susceptible to noxious influence; thus we often find two or more members of the same family affected.

But Tobacco is not the only poison that produces a Toxic effect on Vision, for we have very similar symptoms produced by Quinine, Bisulphide of Carbon, probably Diabetes, Belladonna,

Lead and other drugs.

The sexual system too plays an important part at different periods of life particularly at puberty, and at the close of the climacteric period in women. There are frequently sexual irregularities and excesses about the age of puberty, but also the whole bodily system is undergoing a change at that time: it is no wonder then that at this period such a drug as Tobacco should exert a harmful effect. The case of the woman also recorded by Hutchinson and mentioned above would also seem to point to the influence of the sexual system. *Hutchinson commenting on the above case said "when Tobacco causes blindness it does so in virtue of an idiosyncrasy, and it is by no means improbable that such idiosyncrasy will be found occasionally in several members of a family, and it may manifest itself in response

* Hutchinson. Ophth. Hosp. Reports. VII. 170.

to more than one kind of exciting influence. Thus in the young smokers Tobacco is the cause, while in the case of the woman aged forty three it is the disturbance due to the declin[illegible] of the menstrual functi[illegible]."

Prognosis

The Prognosis in simple uncomplicated cases of Tobacco Amblyopia, that is when there is no contraction of the Field of Vision is very good. In the majority perfect vision is restored both for near and distant objects, and the central scotoma passes off. The scotoma however may persist for a considerable length of time after apparently perfect recovery. There is usually a lapse of a month or six weeks - sometimes more - before an improvement can be noticed, and the patient begins to see objects more distinctly. Meantime all tobacco must be rigorously stopped or at all events very much diminished. No case of complete recovery has been recorded without at least diminishing the amount of Tobacco smoked. Some cases however remain stationary, without any reduction, as for instance a case of Lawford's* which remained in statu quo for seven years. If vision is reduced to $\frac{20}{200}$ and

* Lawford. Transacts. Ophth. Soc. III. 163.

the scotoma has reached the inner side of the fixation point., [1]Berry asserts there will be no recovery.

When the Field is contracted and the scotoma is absolute little restoration of vision occurs, although some slight improvement may take place after the lapse of many months. As a rule these cases remain stationary.

Very few cases have been known to go on to complete atrophy but this occasionally does take place as seen by [2]Hutchinson. Under these circumstances the inflammation has spread from its original site towards the periphery, invading the whole thickness of the nerve, and leading to complete atrophy and degeneration of the nerve fibres.

These cases however are rare when of purely toxic origin, thus differing from the more ordinary forms of retrobulbar neuritis eg that arising from

[1]Berry: Diseases of the Eye 1893.

[2]Hutchinson. Med. Times and Gazette 1869. II. 279.

a sudden chill, in which the tendency is for the inflammation to spread from the centre towards the periphery of the nerve.

Relapses are occasionally met with - for instance a case recorded by Hettleship.

Treatment

The essential point in the treatment of Toxic Amblyopia is to entirely prohibit the use of Tobacco. Without doing so no drug is of any avail.

*Loureiro, regarding the use of Tobacco as a public evil, suggested its regulation by the State, and a trial was made in Paris in 1866 to diminish the amount of Nicotine, but the plan failed owing to the complaints of customers who found that the aroma and pleasant properties were impaired.

If the case is seen early and Tobacco is entirely suspended a recovery of complete vision will occur without the aid of any drugs; but medicines and particularly tonics, with a good dietary, will undoubtedly hasten matters.

Strychnine was first recommended by Nagel in the treatment of diseases of the optic nerve, and this drug is almost looked upon as a specific in this country. It possesses a stimulant

*Loureiro. Compte-Rendu du Congrès d'Ophth. 1867. 3. 174.

action on the optic nerve and slightly increases the visual acuity even in normal eyes.

The cases that came under my observation at Moorfields were accordingly treated with Strychnine, and with marked success. How far, however, this drug acts as a true specific is uncertain, but it certainly has a beneficial effect whether by acting directly on the optic nerve, or indirectly by improving the general bodily tone and increasing the appetite.

It may be given either hypodermically or by the mouth: Huel adopted the former plan and found it of special service in advanced cases.

Samelsohn recommended Iodide of Potash in increasing doses commencing with five to ten grains daily and gradually increasing to sixty or seventy grains: this treatment be continued for several months.

In very acute cases the injection of Mercury has been tried with success, but I have no experience of this drug.

and it could have little effect in the ordinary toxic cases.

Courserant found the subcutaneous injections of chlorohydrate of Pilocarpine most beneficial in the combined nicotine and alcoholic cases. He made an injection every other day beginning with one Centigramme, and increasing by half a Centigramme each day. He records three cases cured by this means in thirteen, twenty five and twenty eight days respectively [p.153] A few minutes after each injection the sight considerably improved. Thus in Case I:-

Before the 1st Injection	R.V. $\frac{6}{24}$	L.V. $\frac{6}{36}$
After 1st ..	$\frac{6}{18}$	$\frac{6}{24}$
Before 2nd ..	$\frac{6}{18}$	$\frac{6}{24}$
After 2nd ..	$\frac{6}{12}$	$\frac{6}{18}$
Before 3rd ..	$\frac{6}{12}$	$\frac{6}{12}$
After 3rd ..	$\frac{6}{6}$	$\frac{6}{12}$

He also believed that this drug was

*Courserant: 'Du traitement et du Diagnostic des Amblyopies toxiques alcoolo-nicotiennes par les injections sous-cutanées de chlorohyd. de Pilocarpine.' Gaz. des Hôpitaux. Paris 1885. 58. 154.

a diagnostic means for distinguishing between cases of toxic origin with commencing atrophy and purely toxic cases, for in the former injections never improve the vision which remains the same before and after each injection, while on the contrary, if the pallor of the discs was due to a general intoxication the visual acuity increases.

In addition to the drugs already mentioned Nitrite of Amyl has been tried and found of service. Its effects however seem to be temporary and are probably to be explained by the dilatation of the minute vessels. This fact would seem to favour the theory that the Pathology of the affection is due to a Vaso motor Spasm as Berry amongst others has suggested.

Apart from drugs recovery is the rule if the case is not advanced. Some Surgeons even deny the efficacy of Strychnine, for instance twenty cases, with a central scotoma in each,

were recorded by [1]Hartridge: in these Strychnine was of no use. [2]Shears, too, got little benefit from strychnine in forty cases treated with this drug.

Amongst local measures depletion has been tried, but this method can have little effect owing to the chronic nature of the inflammation. In the rare acute cases it might prove of service.

Apart from drugs the patient should attend to his general health as much as circumstances will permit, by taking good food and getting as much fresh air and moderate exercise as possible. It is not necessary to stop the alcohol if taken in strict moderation, for this rather acts as a bitter tonic, and as an antagonist to Tobacco.

[1]Hartridge. Brit. Med. Jl 1884. 1199.

[2]Shears. Brit. Med. Jl 1886. 200.

Cases

that have come under my observation at Moorfields from October 1893 to February 1894.

Case I. W. G. male, aet 53. Painter, was admitted on the 15th May 1893. Sight failing for last two weeks. Smokes half an ounce of Shag daily. Moderate drinker. Central colour scotoma for ~~Green~~ and Red. Uncontracted Field.

R. V. $\frac{6}{0}$ and J16 at 10".

L. V $\frac{6}{0}$ and J16 at 10".

Fundus appeared healthy. Presbyopic.

On 26th of July Vision had improved considerably, - Had been taking Pairine.

R. V. $\frac{6}{18}$ and J8; L V $\frac{6}{60}$ and J12.

23/8/94 R. V $\frac{6}{12}$; L. V $\frac{6}{24}$. Scotoma for green.

18/10/93. R. V $\frac{6}{6}$; L. V. $\frac{6}{18}$.

1/11/93. R. V $\frac{6}{6}$ and J1. L. V $\frac{6}{12}$ and J2.

Case II. ~~H.H.~~ aet 47. Boot-maker. ~~Has~~ noticed his sight getting dim during the last four months and could not distinguish copper from silver coins. At this time he was in 'bad health'. Has been temperate for the last seventeen years but smokes four or six strong cigars daily.

R. V $\frac{6}{36}$ and J10 } not improved by
L. V $\frac{6}{60}$ and J15 } glasses.

Fundus normal. Oval scotoma for red and green.

On 13/9/93. Vision had improved to

R.V $\frac{6}{18}$ and L.V $\frac{6}{60}$.

On 1/11/93. R.V. $\frac{6}{9}$ and J2. L.V $\frac{6}{36}$ and J10.

Case III. Mr. G. aet 65. Coppersmith. Married. Sight has been failing for the last six months. Smokes half an ounce of shag daily. Health good. Has been a heavy smoker for the last fifty years.

R.V. Fingers at 4 feet and J16.

L.V. Fingers at 2½ feet – No J.

There was a large central scotoma for green and red. Fields full. Both discs pale and vessels small. Knee-jerks present. No ataxic symptoms.

On July 1893 – six weeks after admission as an outpatient

R.V = $\frac{6}{60}$ and J15.

L.V = Fingers at 4 feet.

The disc in this case looked decidedly atrophic, although the Fields were full.

Case IV. J. H. aet 33. Painter; admitted on the 11th October 1893. Had never had Syphilis. Moderate as regards alcohol. Sight had been failing for the last eighteen months. Was a heavy smoker and had suffered from lead colic four years previously.

R.V = $\frac{6}{60}$ and J10. L.V $\frac{6}{60}$ and J12.

The usual central scotoma for red and green were present. Field uncontracted. Discs a little pale at temporal sides.

On Oct 25th sight had considerably improved: R.V $\frac{6}{12}$ and J2 L.V $\frac{6}{12}$ and J4.

Case V. T.C. aet 39. Hawker. Married. Seen first on Nov 2nd 1893.

Sight had been failing for six or seven months and he was unable to distinguish gold and silver coins.

R.V. $\frac{6}{60}$ and J18 at 19 inches.

L.V $\frac{6}{60}$ and J18 at 19 inches.

Discs were pale, the upper margins being blurred. Central colour scotomata

but Field of Vision full.
Smokes half an ounce of Shag daily and drinks six or seven pints of ale.
Was not in bad health at time of attack.

On ~~Dec~~ 23rd R.V $\frac{6}{60}$ and J18.
L.V. $\frac{3}{60}$ and J19

On Dec^{r} 18 R.V = $\frac{6}{36}$ and J14 at 12".
L.V = $\frac{6}{60}$ and J15 at 12".

During the three weeks after the treatment first began, patient had been smoking one and a half ounces of Birdseye per week. This was sufficient to account for his Vision rather deteriorating than improving after treatment had commenced.

Case VI. A.M. aet 37. Porter. Unmarried.
Never had Syphilis but has suffered from Gonorrhoea. Takes beer and spirits occasionally. Has smoked about five ounces of Tobacco a week.
Sight failed about four months before

patient came to Hospital on July 21st 1893.

R.V $\frac{6}{60}$ and J14 at 10"

L.V $\frac{6}{60}$ and J14 at 10".

Central scotoma for red and green in each eye. Both Fields full.

Discs slightly hyperaemic.

On 17th Oct R.V = $\frac{6}{18}$ and J8

L.V = $\frac{6}{18}$ partly and J8

On 8th Dec R.V = $\frac{6}{6}$ partly and J6

L.V = $\frac{6}{9}$ and J6.

There remained a small central scotoma in each eye - for green.

Case VII. A. Raet 64. Gardner. Married and has a large family. Began to smoke at age of 40 and now smokes an ounce daily. Drinks ale moderately. Sight began to fail a month ago.

Admitted on 10th October 1893.

R.V $\frac{3}{60}$ and J20. } not improved by + glasses.

L.V $\frac{3}{60}$ and J19. }

Central scotoma for red and green. Fields uncontracted.

Was ordered Strychnine.

On 24th of Oct. Vision had improved to:

R.V $\frac{6}{60}$ and J18.

L.V $\frac{6}{60}$ and J18.

On the 7th of Nov. Vision had further improved:

R V & L.V = $\frac{6}{18}$ and J4 ~ +4·5 Dph.

On 21st Nov. R & L = $\frac{6}{12}$ and J2.

On 5th Dec. R.V $\frac{6}{12}$ and J2

L.V $\frac{6}{6}$ and J1.

Case VIII. J.T. 61. Labourer. Married.

Has smoked pretty heavily for the last thirteen years, but left off his Tobacco a month ago. Sight has been failing for the last four months.

R.V $\frac{1}{60}$ and J19 at 4"

L.V. $\frac{6}{60}$ and J16.

Central scotoma for red and green.

Uncontracted Field.

Margin of each disc hazy at the outer side.

Five weeks later there was a noticeable improvement in vision

R.V = $\frac{3}{60}$ and J19

L.V = $\frac{6}{36}$. and J8.

Case IX. J. G. aet 35. Royal Navy. Admitted on the 11th January 1894. Unmarried.

Sight began to fail seven months ago – this was attributed to the glare of the sun in Bermuda.

Used to smoke half a pound of ship's tobacco per week until two months ago, since which time he has only smoked three ounces. Has not had Syphilis.

R.V = $\frac{4}{60}$ and J19 at 9 inches.

L.V = $\frac{1}{60}$ and fingers at 18 inches.

Has +0.50 manifest Hypermetropia.

Central scotoma for red and green. Blue doubtful with left eye.

Fields normal at the periphery.

The discs were rather pale at the temporal sides.

Improvement noticed in a fortnight after treatment with Strychnine.

On 25th Jan.y 1894

R.V $\frac{6}{36}$ and J16 at 12"

L.V $\frac{4}{60}$ and J19 at 12"

Case X. T. L. aet 43. Clerk. Seen for the first time on the 1st December 1893.

Vision had been good till three months ago, and it had failing much since then. For many years he had smoked one ounce a day till the last three months: since that time he had been smoking two ounces per week.

It was after his sight began to fail that it occurred to him that Tobacco might be the cause, so on the advice of his friends he came to Hospital.

Married. Never had syphilis.

R.V $\frac{6}{24}$ and J10 not improved.

L.V $\frac{6}{24}$ and J10 not improved.

Central scotoma for red and green in each eye. Fields full.

Both discs pale.

A month later there was considerable improvement, and on 2nd Feb. 1894:-

R.V $\frac{6}{12}$ and J8

L.V $\frac{6}{12}$ and J6

Case XI. M. S. aet 54. Sailor. Unmarried.
Complains of not being able to see to read or write. His glasses which are plus with cylinders do not suit and they have been changed four times since sight began to fail nine months ago. Hm +2 D.
Smokes half an ounce of "Ships Tobacco" or cut cavendish daily, if the former is not obtainable. Drinks about a quart of beer and two or three glasses of spirits per diem. Has had both Gonorrhoea and Syphilis – the latter in 1866.
Seen first on Dec 14th 1893.
R.V $\frac{6}{18}$ not improved, and J10
L.V $\frac{6}{60}$ not improved. J14.
Central scotoma for red and green in both eyes. Fields normal.
Fundus – temporal half of each disc was pale – otherwise normal.
28/12/93. R. & L. Visn the same.
11/1/94. R.V $\frac{6}{12}$ and J6
L.V $\frac{6}{24}$ and J10.

Case XII. J. B. aet 33. Painter. Had been an outpatient since December 1892. His sight had failed three months previously and was getting worse. +·05 Hm. Never had Syphilis but smoked a great deal to hide the smell of the paint, and to produce expectoration.

R.V $\frac{1}{60}$ and J19

L.V $\frac{4}{60}$ and J18

Large central scotoma for red and green. Fields intact.

Outer half of each disc pale and vessels rather small.

April 1893. R.V Counts fingers at 4 feet. Field contracted. L.V $\frac{1}{60}$. Field full.

Jan 1894. R.V Counts fingers at 1 foot.

L.V Counts fingers at 4 feet.

The Left Field was now much contracted, and both discs were atrophic.

It was now ascertained that one of his sisters aet 33 had noticed a great deterioration of vision last July, and two uncles on the mother's side also suffered from failure of vision – both at about 35 yrs of age. Unfortunately

patient was unable to give further particulars.

Up to January this case had been treated as one of ordinary Tobacco Amblyopia but it was now diagnosed as one of Leber's disease. He had been treated with Strychnine without avail, and his sight had continued to get worse, the discs became atrophic and the fields contracted. From the family history too, though very imperfect, it was pretty evident that the patient was suffering from Hereditary Optic Atrophy; and the Tobacco, smoked in excess, had acted as the exciting agent in bringing about the disease.

In conclusion I may add that in each case the refraction was taken and the patient examined with suitable correcting lenses.

In addition to total prohibition of Tobacco, Strychnine was ordered - taken by the mouth - and a regime advised.

I regret that many of the notes of the cases are somewhat imperfect, and that I was prevented from watching them further in the out-patient Department.

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