THE VISUAL FIELDS IN SPHENOID AND ETHMOID SINUSITIS.

By G. F. C. Wallis, M.D.Edin.,
Late House-Surgeon to the Eye Hospital, Bristol.

Although during the past twenty years numerous cases of disease in the nasal accessory sinuses associated with ocular symptoms have been recorded, it is only recently that any serious attention has been paid to the visual fields in this condition, and even at the present time the statements are very conflicting. With the object, therefore, of determining whether the visual fields are in any way affected in nasal sinusitis, and to note the frequency and character of such if present, I examined the ocular conditions of every patient who came for treatment of that affection to the Bristol Royal Infirmary and the Shrewsbury Eye, Ear and Throat Hospital during periods of eight and three months respectively. Excepting another case seen at the Bristol Eye Hospital, those reported below represent the visual fields in every sphenoid and posterior ethmoid sinusitis seen, and not as in selected cases.

The diagnosis of sphenoid and posterior ethmoid sinusitis is one of difficulty, and in most cases the differential diagnosis is impossible until after operation; therefore I have endeavoured to give briefly with each case the signs and symptoms upon which this was based. As the ethmoid labyrinth, however, is affected usually in conjunction with sphenoid sinusitis, the differential diagnosis is of less importance, particularly as most authorities agree that in operating upon the sphenoid sinus the ethmoid ought in addition to be dealt with, and also because Onodi (1) has demonstrated the many variations in the anatomical relations of the two sinuses to the optic nerves.

Most of these patients were submitted to skiagraphy by an expert radiographer, and according to Kuttner (2) this is of real diagnostic value in the hands of those devoting themselves to that particular subject. While not entirely assenting in this, I think without doubt it serves the purpose of demonstrating the presence or absence and topography of the sinuses under discussion.

The visual fields were examined, excepting where larger tests were necessary, with 5 mm. square white, red and green, and central scotoma by 1 mm. square red and green objects in every patient. The same colours were always used, and as far as possible

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press

the lighting was made approximately the same. An examination was always made before any local nasal treatment was begun, and the subsequent investigations were made some days after any nasal treatment, lest reflex irritation of the nose might cause contraction. Examination was not made in females during menstruation, as Parsons (3) mentions this as a cause of peripheral narrowing of the fields.

Case 1.—Mrs. F. K——, aged twenty-six. Acute bilateral sphenoidal sinusitis. R.V. and L.V. no perception of light, the former with blocked central artery, the latter by intense hæmorrhagic neuro-retinitis; recovery, R.V. $\frac{6}{9}$, L.V. $\frac{6}{12}$.

The right eye had rapidly become blind, temporal vision being affected first, the fundus showing blocked central artery with feeble collateral circulation, shortly followed by a similar attack in the left, but the fundus remained normal until ten days later, when intense hæmorrhagic neuro-retinitis developed, both eyes being blind for two or three weeks, the right commencing to recover first.

Visual Fields.—Three weeks after onset vision had improved to H.M. in the temporal fields—bi-temporal hemianopsia. Eight weeks after onset (10 mm. objects), white bi-temporal contraction 40°, elsewhere only 20°. The arteries are better filled in right, and the neuritis subsiding in left; R.V. $\frac{6}{60}$, L.V. $\frac{1}{60}$. Four months after onset: Bi-temporal contraction 12°. R.V. $\frac{6}{12}$, L.V. $\frac{6}{36}$. One year after onset (5 mm. objects): Right and left—white bi-temporal contraction 20° to 30°, elsewhere 5°; red bi-temporal contraction 30° to 40°, elsewhere 10° to 20°. Green bi-temporal hemianopsia, but contraction elsewhere very marked. R.V. $\frac{6}{9}$, L.V. $\frac{6}{12}$; slight bilateral post-neuritic atrophy; the circulation is restored in the right central artery of the retina.

Treatment during inflammatory stages, mercurial inunctions and diaphoresis.

Diagnosis.—In the early stages of the affection pituitary enlargements were excluded by her good condition, normal menstruation, absence of change in face, feet and hands. Apart from the ocular signs and headache the nervous system was healthy, which also excluded intra-cranial growth. Nothing could be discovered to cause the symptoms, and owing to a completely negative history of nasal trouble and absence of discharge, sinusitis was not suspected. One year later when examined, definite evidence of sphenoidal sinusitis was found—engorgement of both inferior turbinals anteriorly but no pus; posteriorly, pus upon both middle turbinals and on the pharyngeal wall. Transillumination of frontal sinuses and antra perfect; skiagraphy showed very large sphenoidal sinusitis.

Case 2.[1]—Annie A——, aged twenty-seven. Chronic bilateral sphenoidal sinusitis.

Bilateral choked discs present in right one year, left two years; reduction of R.V. to $\frac{6}{9}$ and L.V. to perception of light; recovery, R.V. $\frac{6}{5}$ L.V. $\frac{6}{9}$.

Visual Fields (before operation).—Right: White (5 mm. object) contracted in the inferior quadrant 50°, but elsewhere 20°; red is contracted similarly but more marked, and green is within the 5° circle (red and green 12·5 mm. objects); there is no central scotoma. Left (for 120·0 mm. white object) is a small square island of vision extending from 30° to 80° in the temporal field.

[1] Fully reported in *Lancet*, 1910. Russ Wood and Wallis.

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press

Both sphenoidal sinuses were opened, a fortnight after which R.V. $\frac{6}{6}$, L.V. $\frac{6}{12}$.

Visual Fields (5 mm. objects three months after operation).—Right: White shows 10° temporal contraction and the loss of a small sector inferiorly; red and green are now slightly more extensive than previously when tested by 12·5 mm., and much more relatively. Left (35·0 mm. white, formerly 120·0 mm.): The field of fixation, extending to 8° circle—within which is a central scotoma for green—is surrounded by a ring scotoma to 30° circle, but the peripheral field confines are almost full. R.V. $\frac{6}{6}$, L.V. $\frac{6}{9}$. Four months after operation—Right: All colours extended 5° to 10° (5 mm. objects). Left: 35·0 mm. white object. The peripheral field has encroached upon the ring scotoma 7°, and the central green scotoma has disappeared.

Diagnosis.—A long history of repeated sudden failures and recoveries of vision associated with frontal headache suggested a possible sinus origin; in the nose pus was only seen above the middle tubinals posteriorly, proving probable source of pus from one of the sinuses of the posterior group; the frontal sinuses and antra illuminated well. The absence of Bright's disease, syphilis, and plumbism, and healthy hæmopoietic and nervous systems, excluded these as possible causes of neuritis, and after pus had been removed from the sphenoidal sinuses by operation all the symptoms rapidly subsided.

Case 3.—Joseph O——, aged twenty-three. Subacute bilateral sphenoidal sinusitis and extreme deflection of nasal septum.

Bilateral gross optic neuritis; marked hippus; R.V. $-3 = \frac{6}{12}$, L.V. $-3 = \frac{6}{9}$.

Visual Fields (before operation, 6·5 mm. objects).—Right: Concentric contraction for white 20°, and red 30°. Left: White and red contracted 45° in temporal fields, but 30° elsewhere. Bilateral absolute central scotoma for red and green.

Submucous resection was performed to permit of sphenoidal sinus operation later.

Visual Fields (fortnight after, 5 mm. objects).—Right: Slight improvement for white and red. Left: White and red extended 15° for 5 mm. objects, but relatively much more. Central scotoma has disappeared in both.

Sore throat and rise of temperature supervening the day after the septal operation with presence of a type of Klebs-Loeffler bacillus rendered operation upon the sinuses at an early date inadvisable. The submucous resection and bleeding, relieving the marked congestion and rhinitis, converted a partially closed to an open sinusitis, with consequent relief of symptoms.

Diagnosis.—The history of severe frontal headache, prolonged nasal obstruction with formation of crusts, which were also seen together with pus on the roof of the post-nasal space, suggested sinusitis of the posterior group.

Submucous resection, relieving the congestion, was followed by great increase of pus above the middle turbinals posteriorly. Skiagraphy showed moderately large sphenoidal sinuses. Optic neuritis of nervous and toxic origin was excluded.

Case 4.—Joseph H——, aged twenty-two. Probable bilateral chronic sphenoidal and posterior ethmoidal sinusitis; duration two years.

R.V. and L.V. $\frac{6}{36}$; bilateral central guttate choroiditis.

Visual Fields.—In both eyes the corresponding colours are equally and symmetrically affected—white contracted 5° in temporal and 45° in superior quadrants; red contracted superiorly 40° and inferiorly 45°; green is entirely within the 20° circles, but more contracted superiorly and inferiorly. Large relative scotomata in each eye for red and green.

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press

No operative treatment was permitted and patient lost sight of.

Diagnosis.—The long history of nasal obstruction and post-nasal discharge, together with pale engorged middle turbinals, and pus in the right olfactory cleft, and also upon the middle turbinals posteriorly—which rapidly reappeared after removal by Fränkel's syringe—suggested involvement of ethmoid labyrinth as well as of sphenoidal sinuses.

Failing vision dated shortly after onset of nasal symptoms; syphilis was excluded, and no other cause could be found for the choroiditis.

Case 5.—Elsie B——, aged nineteen. Chronic bilateral sphenoidal sinusitis and probable ethmoiditis; duration three years.

Considerable bilateral primary optic atrophy. R.V. and L.V. $\frac{6}{12}$.

Visual Fields (before operation).—Right and left: White, red and green show temporal contraction of 55°, but elsewhere 25° to 35°.

The symptoms were relieved by drainage and prolonged after-treatment of the sphenoidal sinuses in this and Case 6, but no cessation of suppuration followed, and the visual fields (three months after) had not improved in either patient.

Diagnosis.—A history of bilateral nasal discharge with severe frontal headache, which became worse when the discharge lessened, and objectively much pus in the middle and superior meatus anteriorly on both sides and upon the middle turbinals and roof of post-nasal space made the diagnosis of sinusitis probable. Pus and polypi were curetted from the sphenoidal sinuses, but suppuration continued, evidently from the ethmoid labyrinth, as the frontal sinuses and antra were repeatedly washed out with negative results. Skiagraphy showed very large sphenoidal and healthy frontal sinuses.

No other cause could be discovered to cause partial atrophy in this or Case 6.

Case 6.—William J——, aged twenty-two. Chronic left and probable right sphenoidal sinusitis; four years' duration.

Slight bilateral primary optic atrophy. R.V. and L.V. $\frac{6}{5}$.

Visual Fields (before operation).—Bilateral symmetrical and almost concentric contraction for all colours: White 20°, red and green 25° to 30°, slightly more marked in temporal fields.

Diagnosis.—There had been left-sided nasal discharge and obstruction for many years. Anteriorly pus was present in the left superior and middle meatus, and posteriorly crusts, and pus, which rapidly re-formed, after removal, upon both middle turbinals. The left sphenoidal sinus was opened, and pus was syringed out through the opening for months afterwards. The antra were washed out with negative results. Skiagraphy of the sinuses showed the frontal healthy, posterior ethmoid large, and sphenoid moderate in size.

Case 7.—Mary P——, aged eighteen. Subacute right sphenoidal sinusitis; duration nine months.

Asthenopia; R.V. and L.V. $\frac{6}{6}$; bilateral, fine hazy neuritis.

Visual Fields (before operation).—Right: White, red, and green show temporal contraction of 25°, 35°, and 40° respectively; elsewhere white 15°, red and green 25°. Left: White, red, and green contracted 50° in temporal quadrants; elsewhere 20° to 30°.

After the sphenoidal sinuses were opened the intense headache and all ocular and nasal symptoms subsided. R.V. and L.V. $\frac{6}{5}$.

Visual Fields (three weeks later) were extended 10° to 20° in each eye.

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press

Diagnosis.—This patient had suffered severe constant right temporal and frontal headache for one year, unrelieved by the removal of the teeth and medicinal treatment. Because of the severe post-ocular pain, bilateral fine hazy optic neuritis, and the presence of œdematous inferior turbinals, the sphenoidal sinuses were explored and found to contain a little mucoid material. The diagnosis was practically confirmed by the rapidity of subsidence of neuritis, improvement in visual acuity and fields. Pain had not recurred when the patient was seen two months later. Skiagraphy of the sinuses shows very small sphenoid and frontal healthy.

Case 8.—Mrs. M. D——, aged forty-two. Chronic bilateral sphenoidal and ethmoidal sinusitis; duration several years.

Syphilitic choroido-retinitis present in both eyes, which entirely modified the visual fields.

Case 9.—Thurza S——, aged twenty-eight. Chronic bilateral sphenoidal sinusitis; eight years' duration.

R.V. and L.V. $\frac{6}{6}$; fundi healthy.

Visual Fields (before operation).—Right: White concentrically contracted 15°, red 45°. Left: Almost concentric contraction for white 20° and red 30°, but slightly more marked in the temporal quadrants.

Opening the affected sinuses and very prolonged after-treatment cured the nasal suppuration and symptoms.

Visual fields examined on several occasions became progressively more limited, and five months after operation were much more contracted than before treatment for all colours, probably due to retinal fatigue resulting from mitral incompetence and severe post-operative debility. R.V. and L.V. $\frac{6}{5}$.

Diagnosis.—The history of post-ocular pain with severe frontal headache, complete nasal obstruction and discharge during eight years suggested a probable sinus origin. Anteriorly on both sides much pus and polypi with œdema of middle turbinals, and posteriorly pus upon and above both middle turbinals; some œdema of forehead. Skiagraphy indefinite. The antral and frontal sinuses were explored and found healthy; both sphenoidal sinuses were opened and polypi removed, which confirmed the diagnosis.

Case 10.—Mrs. Alice S——, aged thirty-three. Chronic bilateral sphenoidal and posterior ethmoidal sinusitis; ten years' duration. R.V. and L.V. $\frac{6}{5}$; fundi healthy; hyperphoria 10° prism.

Visual Fields (before operation).—Right and left: White concentric contraction 5° to 10°, green 35° to 40°.

A fortnight after curettage of affected sinuses the headache, nasal suppuration, and symptoms were all relieved.

Visual Fields (a fortnight and a month after operation).—Right and left: White full and green, only contracted 5° to 15°. Hyperphoria is still present.

Diagnosis.—Severe post-ocular pain and frontal headache during ten years. Anteriorly, considerable atrophy of mucosa, but no pus or crusts, but, posteriorly, blood-stained pus upon pharyngeal wall and roof of post-nasal space. Frontal and antral sinuses illuminate well. Skiagraphy shows healthy frontal and very large sphenoidal sinuses. Pus and polypi were curetted from sphenoidal and ethmoidal cells.

Case 11.—Mary R——, aged twenty-nine. Probable chronic bilateral sphenoidal and ethmoidal sinusitis three years' duration.

R.V. and L.V. $\frac{6}{6}$; asthenopia; fundi healthy.

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press

Visual Fields (before treatment).—White normal in both; green contracted in right and left temporal portions 30°, but elsewhere 10°.

After six weeks' administration of small doses of potassium iodide and antimony the headache and nasal discharge were greatly alleviated, though not cured. R.V. and L.V. $\frac{6}{5}$; asthenopia cured; patient lost sight of.

Visual Fields (after treatment).—Right and left: White are full, green are extended 10° in the right temporal fields, and 5° elsewhere.

Diagnosis.—Constant frontal headache, without tenderness, nasal discharge, and frequent pain in the right ear during three years. Tenderness on palpating the globes; anteriorly both middle and inferior turbinals œdematous, and pus far back in the superior meatus; naso-pharynx full of pus, which, after removal, rapidly re-formed above the middle turbinals, indicating probable ethmoiditis in addition to sphenoidal sinusitis. Frontal and antral sinuses illuminate well.

Laurens (4), in 1895, in a collective article of all the ocular signs and symptoms in accessory sinus disease, stated that affections of the visual fields have been observed, but are rare. Onodi, in his exhaustive work on the accessory sinuses, states that "Hinkel treated twenty cases of sphenoidal suppuration without finding anything abnormal in the visual fields. . . . Contrary to the findings of Grünwald, Ziem, Bryan, Kuhnt and Berger, Henrici and Häffner in thirty-six cases of accessory sinus disease found a normal visual field. These facts are to be explained, . . . by the varying relation of accessory sinuses and optic nerves. . . . There are two factors that help in the limitation of accessory sinus disease, and prevent it from spreading to the optic nerves: the nerves may come into no relation with the sphenoidal sinuses or ethmoid cells, and the wall of the sphenoid may be very thick." Whilst agreeing with Onodi that the varying relations of accessory sinuses to the nerves and the thickness of the sinus walls are factors to be considered in the production of field affections, I cannot concur in his anatomical explanation as the cause of these conflicting statements. It seems scarcely within the bounds of possibility that certain anatomical relations of the posterior sinuses should always occur in the patients of those observers who have recorded field affections, and that certain other anatomical relations should always occur in the patients of those who have not found the fields affected. I believe the chief explanation is to be found in the character of the sinus inflammation, as will be pointed out later.

Birch-Herschfeld (5) observed central scotoma in three cases of sphenoidal sinus suppuration, and believes that the papillo-macular bundle is always involved firstly and that peripheral field contractions are secondary; Berger (6), on the other hand, lays stress on the concentric contraction of the visual field as a sign of impli-

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press

cation of the optic nerves. In these eleven cases, excluding Case 8, in which there is syphilitic choroido-retinitis, central scotoma occurred twice, and peripheral contraction in every case.

Contraction, either general (*i. e.* of the whole field but not necessarily concentric) or concentric, was present in every patient, that for red and green being more marked than white, and green being by far the most affected (excepting in Cases 5 and 7, where the contractions for all colours were proportional). This greater contraction for green is the more remarkable, because when the visual fields of normal individuals were tested with these same coloured objects, that for green was as extensive as that for red, owing to the green being tinged with yellow: therefore white and green accentuate field affections and give the best comparison. In Case 11 the fields for white were full but those for green showed extreme contraction; in Case 6 there was partial reversal of colours in a young healthy boy without any hysterical stigmata, and appeared to be due to colour perception defect; I have noted both of these signs in anterior sinusitis.

In addition to general, eight of these cases showed marked temporal contraction, five of which were bi-temporal and one a bi-temporal hemianopsia; this latter symptom is evidently not common, for I have only seen two cases reported as occurring in sphenoidal sinusitis—one by Jameson Evans (7), and the other by Redlich (8). Glegg and Hay (9) have reported a case with pronounced bi-temporal contraction.

In two of the cases considerable altitudinal contraction was present both in the superior and inferior fields. This form of contraction appears to occur as frequently in the anterior group of sinuses as the posterior. Marked temporal and particularly bi-temporal contraction is common in the posterior group, but I have only seen one example of this in the anterior, that being a very extensive frontal sinusitis.

Island vision and ring scotoma occurred in Case 2, a severe papillœdema, which during the worst stage of visual defect showed only an island of vision in the temporal field, but during recovery developed into a complete ring scotoma.

Central scotoma occurred four times, which in Cases 4 and 8 was due to the associated choroidal condition, but in Cases 2 and 3 it was caused by involvement of the papillo-macular bundle. In Case 2 (chronic sphenoidal sinusitis) it was a passing phase in the ring scotoma, and was to be expected with so serious involvement of the nerve, but in Case 3 it was due to acute sinusitis.

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press

Therefore, in chronic sinusitis of the posterior group temporal contraction is the characteristic symptom, whereas in acute posterior sinusitis the characteristic feature would appear to be central scotoma.

Ætiology of Field Affections.—Ophthalmoscopic changes are a far more common symptom in posterior sinusitis than in the anterior, as is to be expected from the close proximity of the nerve to these cavities. Cases 9, 10 and 11 were chronic sinus suppurations showing no changes in the fundi, but marked contraction in the temporal portion of the visual fields. This is explained by the assumption that the optic nerves are directly involved by a toxic substance which has soaked through into the optic canal and orbit from the sinuses. In chronic sinus suppuration the walls are thin or dehiscent and the mucosa atrophied, consequently its power of preventing the passage of toxic substances is greatly diminished. It should be remembered that the nasal aspects of the optic nerves are in contact with practically the whole length of the lateral walls of the posterior sinuses, and therefore it is obvious that if the optic nerves be involved the temporal field will be the first affected. The papillo-macular bundle, being central in position, is protected by the outer fibres, and hence scotoma is not seen in chronic cases.

In a series of anterior sinusitis cases which I investigated marked temporal limitation was the exception, and more or less concentric contraction the rule. This may be accounted for on the above hypothesis by assuming that further forward in the orbit (opposite the anterior group of sinuses) the toxic substance becomes more diffused, and hence the circumferential fibres of the nerves are equally affected.

Whilst making these investigations it was suggested that the nature of the field affections observed, in cases without ophthalmoscopic signs, was reflex from nasal irritation. Considering the numerous reflex ocular symptoms that result in nasal disease this appeared very probable; but I could not detect any field affection in mucoceles of the frontal and anterior ethmoidal sinuses, a chronic antral sinusitis (in a young girl), nor in several cases of rhinitis, and of deflected nasal septa. This is probably due to the fact that mucoceles are sterile and presumably free from toxic substances; the antra in children have very thick walls which would hinder the passage of such materials, and in rhinitis very free drainage is secured, yet in these cases there was of necessity severe nasal irritation. Hence, the field contractions described in this paper could not be reflex in origin, but are due to direct

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press

poisoning of the nerve-fibres. Where the diseased sinuses are unilateral but both fields affected, *e. g.* Case 7, the explanation is to be found in the sinus being in relation to both optic nerves (Onodi). There can be little doubt that a considerable quantity of toxic muco-pus is produced within the suppurating sinuses, and, on account of their anatomical formations, it tends to accumulate.

Peripheral contraction also occurs when neuritis has resulted from sinus disease, and the latter was present in Cases 1 and 3 as neuro-retinitis, Case 2 as papillœdema, and Case 7 as "fine" or "hazy" neuritis. In the first two groups field contraction probably resulted from pressure upon the nerve within the optic canal by inflammatory œdema set up by the poisonous substances. In the "fine" neuritis the ophthalmoscopic appearance suggested to Mr. Richardson Cross, who kindly examined the patient with me, a condition of hydrops vaginæ nervi optici, which probably resulted from irritation of the nerve-sheath endothelium by the toxic substance, causing pressure upon the nerve-fibres with consequent field contraction. This condition of hydrops is presumably an early stage in the more severe forms of neuritis. It is likely that the two cases—Cases 5 and 6—showing slight primary atrophy (primary so far as the ophthalmoscopic appearance) had resulted from a previous hazy neuritis from the same cause.

Therefore it is evident that posterior sinusitis causes visual field contractions without fundus changes, with fine forms of neuritis and with gross forms of neuritis; these three are probably merely degrees of the same pathological change, and an indication of the amount of toxic material passing through the bony wall.

In this series "gross" forms of optic neuritis only occurred in acute and subacute sinus suppurations, and the "fine neuritis" in chronic sinusitis. Assuming that in acute cases the toxins are carried by the blood-stream, and by permeation in chronic cases, then in the former much larger doses would continually reach the optic nerve and surrounding tissues with resulting inflammatory œdema than in the latter. Such an hypothesis for acute suppuration is supported by the often rapid onset of neuritis and central scotoma, together with their quick disappearance when the cause is effectually treated. The ethmoid veins freely communicate between the sinus mucosa and the orbits; probably also vessels connect the mucous membrane of the posterior sinuses with the periosteum of the optic canal, particularly when the bone is dehiscent, as so frequently occurs. The mucous membrane in acute cases, being hyperæmic, further assists in this process.

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press

Acute sinus suppuration is probably characterised by central scotoma, due to papillo-macular involvement, and it has frequently been observed in such cases. It only occurs in the one acute sinusitis of this series; and in chronic sinus affections of the anterior group I have never noted it. Onodi and Birch-Hirschfeld (10) state that central scotoma results from pressure upon the optic nerve causing damage to the most delicate fibres—the axial bundle. This was evidently the cause in Case 3, and is also well illustrated in a case of sphenoidal sinusitis, quoted by Fuchs (11), in which he detected a minute central scotoma, although the peripheral field was normal. Pressure alone does not always cause central scotoma, for in Case 2 the patient's right optic nerve was affected by severe papillœdema, but central scotoma was not present. It is therefore possible that a local toxæmia is, in part, the cause of that condition.

Thus, if central scotoma only occurs in acute cases, it may be readily overlooked, unless the patients be seen early and the central vision be carefully tested, because the vision in these cases is often rapidly and completely lost. I have demonstrated that chronic cases show peripheral contraction, acute cases central scotoma, and cannot help thinking that the divergent views held by various writers as to the presence or absence of field affections are due to the perimetric observations being made in undifferentiated (*i. e.* acute and chronic) cases. This seems to me a more reasonable explanation than that of the anatomical variations of the sinuses to the nerves invoked by Onodi.

Ring Scotoma and Island Field of Vision.—I have not found any reference to sphenoidal sinusitis as a cause of these conditions, though from the conversion of the island field of vision in Case 2 to a ring scotoma *pari passu* with the recovery of the patient there can be no doubt as to their causal relation.

Effect of Treatment and Prognosis.—In acute and subacute sinusitis, and particularly where active nerve changes are present, the effect of appropriate treatment has markedly beneficial results upon the visual fields. On the other hand, in chronic cases, which usually show no fundal changes, the visual fields do not greatly improve. We can assume with great probability that in chronic suppurations the poisoning has been going on for a long time, causing permanent damage to the nerve, and in acute sinusitis sufficient time does not elapse for this to take place. Only two patients, however, in this series have developed signs of primary atrophy.

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press

The fields may be, and frequently are, further narrowed after operation upon the sinuses, but this only lasts a few days, and quickly passes off, being evidently due to passive œdema causing pressure upon the nerve.

Conclusions.—Peripheral field contraction was present in every case, and marked temporal and particularly bi-temporal contraction and bi-temporal hemianopsia is characteristic of chronic sinusitis of the posterior group. This is due, in the absence of ophthalmoscopic changes, to the direct action of toxins upon the nerve by contact, and is not of reflex origin.

Peripheral contraction in the presence of gross neuritis is due to pressure from inflammatory œdema within the optic canal, and in "fine" neuritis to pressure from hydrops vaginæ nervi optici, both resulting from the action of toxins.

Peripheral field contractions without fundal changes with "fine" neuritis and with gross neuritis in sinus affections are but degrees of the same pathological process, and indicate the amount of poison which has reached the nerve.

Central scotoma probably only occurs in acute sinusitis, and results from pressure, and possibly partly from the local action of toxins.

The differences in the ocular symptoms of acute and chronic sinusitis depend upon the amounts of toxin reaching the nerve; in the latter it soaks through the sinus walls slowly in small quantities; in the former carried more rapidly, and in larger measure by the vessels.

The result of treatment of the diseased sinuses on the contracted fields is most beneficial when the suppurations are acute, and when optic neuritis is present.

Operative treatment of the sinuses may cause temporary diminution of the visual fields.

Ring scotoma may result from sphenoidal sinusitis.

The perimeter should always be used in suspected sinusitis. Field changes help to confirm, and their absence to negative, the diagnosis; the presence of central scotoma calls for more active treatment.

White and green are the best test objects, the field for green being generally much more contracted than the field for white.

My best thanks are due to Mr. F. R. Cross, Dr. P. Watson Williams, and Mr. Russ Wood for permission to publish these cases, as well as for their kind criticism.

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press

REFERENCES.

(1) ONODI.—"Accessory Sinuses and Optic Nerve," 1910; translated by Lüchhoff.

(2) KUTTNER.—Abstract, *Brit. Med. Journ.*, 1910. ("Die entzündlichen Nebenhöhlenerkrankungen der Nase im Röntgenenbild," Berlin, 1910.)

(3) PARSONS.—"Pathology of the Eye," vol. iv, 1907.

(4) LAURENS.—*Gaz. des Hópitaux*, 1895.

(5) BIRCH-HERSCHFELD.—Quoted by Parsons, *op. cit.*

(6) BERGER.—Quoted by Parsons, *op. cit.*

(7) EVANS, JAMESON.—*Ophthalmoscope*, 1908.

(8) REDLICH.—Quoted by Fish, *Journ. of Laryngol., Rhinol., and Otol.*, 1908.

(9) GLEGG and HAY.—*Lancet*, 1905.

(10) BIRCH-HERSCHFELD.—Quoted by Onodi, *op. cit.*, and abstract in *Ophthalmoscope*, April, 1908. ("Beitrag zur Kenntniss der Sehnerven Erkrankungen bei Erkrankungen der hinteren Nebenhöhlen der Nase," von Graefe's *Arch. f. Ophth.*, May 14, 1907.)

(11) FUCHS.—"Text-book of Ophthalmology," 1908.

REPORT OF A CASE OF THROMBOSIS OF THE LATERAL SINUS EXHIBITING SYMPTOMS OF CEREBELLAR ABSCESS; OPERATION; RECOVERY.

BY J. WALKER WOOD, L.R.C.P.&S.EDIN.,
Formerly House-Surgeon, Central London Throat and Ear Hospital.

J. P——, male, aged fifteen. This patient was sent by Dr. Alston to the Central London Throat and Ear Hospital on January 21, 1910, to be placed under the care of Dr. Abercrombie. The following history of his illness was obtained. Fourteen days previously he complained of a sudden pain in his left ear. The onset of the pain was accompanied by shivering and nausea, but no vomiting. Between Saturday, January 8, and Thursday, January 13, he had six rigors. Ear discharge was denied, but his mother stated that he had suffered from giddiness and headache for over six months.

On Admission.—He looked very ill. The temperature was 98° F., the pulse 94, and the respirations 22. The bowels were constipated; headache was complained of, severe and constant, and referred to the vertex and the occiput, more especially on the left side of the head.

The pain was occipital. There was marked tenderness over the site of the mastoid emissary vein, but no swelling or redness. The pain radiated down the left side of the neck, and he had slight tenderness along the line of the internal jugular vein.

Giddiness.—He had extreme giddiness of the rotatory type,

https://doi.org/10.1017/S1755146300186354 Published online by Cambridge University Press