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Miners' Nystagmus.

by

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Miners' Nystagmus.

Introductory.

Having been engaged for two years as medical officer to a large colliery in South Yorkshire, I have had considerable opportunity for investigating the affection of the eyes known as Miners' Nystagmus. My attention was specially drawn to this subject by the controversy among medical men as to the causation of the disease.

Symptoms of Miners' Nystagmus.

Nystagmus is a disease of the eyes characterised by convulsive rhythmical movements of the eyeballs. The movements are for the most part lateral, often rotatory, and occasionally vertical.

The patient complains of objects on which he tries to fix his eyes, moving

and jumping before him. He notices this most when at work in the pit, all the lights seem moving and unsteady. The oscillations of the eyeballs vary greatly in character and frequency. They are sometimes very slight but can generally be detected if you get the patient to look steadily in an upward and oblique direction, either to the right or left.

The movements are also exaggerated when the patient raises or lowers his head or moves it quickly from side to side.

When the vision is directed below the horizontal line the movements of the eyeballs will cease. This is noticed even in bad cases and is especially seen in Miners' as distinguished from other forms of Nystagmus.

Ciddiness is a prominent symptom of Minus' Nystagmus and in severe cases may be so bad as to cause the patient to stumble and fall. Associated with this there is often headache, generally frontal in character. Sometimes only a sense of uneasiness in the orbital regions is complained of.

Sickness is often present varying in degree from a feeling of nausea to severe vomiting. The sickness is generally slight and is often the first symptom to disappear when the Nystagmus improves.

I remember however one case in which the vomiting was so violent that it could only be controlled by laying the patient on his back and giving frequent doses of Bromide of Potassium.

The vomiting in this case was suggestive of some cerebral lesion but no such cause could be found. In connection with the movements of the eyeballs I have noticed convulsive twitching and quivering of the eyelids. A frequent concomitant feature of Miners' Nystagmus is night-blindness. This night-blindness, depending as it does on the sluggish action of the retina, seems to me to predispose to Nystagmus. It often occurs, however, apart from any other disorder of the vision.

Myopia and Presbyopia are also common among nystagmic patients.

Causation of Miners' Nystagmus

Miners' Nystagmus was at one time considered to be caused by the noxious

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gases set free in coal pits. This idea is now abandoned and, if it were not, the improved system of ventilation of mines at the present time would explode such a theory.

*¹ British Medical Journal 1888
In his report* on the air in mines Dr^r Naysmith says, "Nowadays the air is generally good; ventilation is efficiently carried out; and the conditions connected with the miners' occupation are as favourable to health as those in the occupation of any other workman."

*² Ophthal. Societ^y's Transactions
One writer, the late Mr^r Oglesby,*² has described Miners' Nystagmus as being epileptiform in character.

Mr^r Jefferson*³ has tried to show that it is associated with a central lesion. I have never been able, in any case of

*³ British Medical Journal
Miners' Nystagmus, per se, to find a lesion either in the brain or

1887. Vol II. page 109. spinal cord. These alleged causes having been discussed there only remain for consideration two other theories viz: - the imperfect illumination of the mine, and the position assumed by the miner at his work.

* Pamphlet by Dr. Court, Staveland. It has been asserted by some writers* that the cause of Miners' Nystagmus lies in the use of safety-lamps in pits. The only explanation that they can give brings in the element of visual strain. But we must remember that in Miners' Nystagmus we have to deal with definite groups of muscles so that the extra visual strain does not altogether account for it.

If the imperfect illumination were the cause of the disorder all the workers in the pit should be equally affected and in the same way all

the ocular muscles should be involved. I will endeavour further on to show that all the workers in a coal pit are not equally liable to Nystagmus, nor does the affection equally involve all the muscles of the eyeball.

The idea of the miners themselves is that their Nystagmus is caused by using safety lamps. I do not think that much importance can be attached to this opinion. Their opinion is founded on the dancing of the lamps in the pit but they seem to forget that the lights above ground move in a similar way. Moreover, miners are not often men of observation or reflection and so are apt to grasp at any cause that is obvious to their senses.

We know that popular opinion often runs contrary to what medical men

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have found to be the truth and I think it is so in this case. It has been argued by those who hold the safety-lamp theory of the cause of Miners' Nystagmus that nystagmic patients improve when they leave a pit where safety-lamps are used and get work in a pit where naked lights are used. It is often found, however, that as well as changing their place of work, the men also change their mode of work.

This is a most important difference as will be shown hereafter.

Personally I have no experience of *British naked lights in pits as safety-lamps Medical were always in use in the pit with journal which I was connected.

July 11th *Dr Snell records a case of a nystagmic patient who, on changing to a naked
1891. page 62.

light pit, recovered from his Nyctagmus but who, on investigation, was found to have changed the kind of work which he did. Snell also gives abundant evidence of the presence of Nyctagmus in miners working by candle light.

*British Medical Journal, July 11th 1891. Page 63. *See says that the establishment of the existence of the disorder under these circumstances is an argument of the highest importance against the safety-lamp theory, because it will be seen at once that the cause which its supporters allege to be the main one, is absent. It is indeed fatal to such a theory, and those who aver that imperfect illumination is at least as prominent as any other cause, are reduced to the contention that, after all, the light afforded by

the candle is an indifferent one.

This latter view must, however, also in its turn give way in the face of the occurrence of Miners' Nyctagmus under excellent conditions as to light.

A case illustrative of this has been

British published. The patient was a Medical compositor engaged on the staff of a large journal daily paper. He noticed objects moving July 11th up and down and had some giddiness 1891. but no headache nor sickness.

Page 74. The nyctagmus was found to be vertical and the movements were rather jumping: there was quivering of the eyelids. He was carefully examined for any central or other lesion, with negative results.

The room in which he worked was well lighted, and it was found that when he looked up to his "copy,"

instead of raising head and eyes together, he elevated his eyes only.

This explained the occurrence of nystagmus. It is also of interest in illustrating the mode of causation of nystagmus.

It has been found that, notwithstanding great improvement in the illuminating powers of modern protected lights, Miners Nystagmus is still as prevalent as ever.

Imperfect illumination does indeed occupy a secondary place in the causation of the disorder. The worse the light the more will the effects of visual strain be experienced, so that, ceteris paribus, Nystagmus will be more frequent with the less perfect illumination.

* Journal Dr. Dransart* examined men

d' employed in six pits in the North
Oulietique of France. In five of these pits
du Nord naked lights were used and in
de la the sixth, safety-lamps.

France, He found Nyctagmus with greater
August frequency in the safety-lamp pit
1891. but, on the other hand, it existed
without exception in all the other
pits. Having dealt with the question
of illumination and seen that
the prime cause of Miners' Nyctagmus
is not to be found therein we must
look elsewhere for the cause.

I think that the prime cause must
be traced to the conditions under
which the miner performs his work.

* Lambert. In a paper* on the subject Snell says
1875. that "it seems to me that this disease
Vol. II. (Miners' Nyctagmus.) occurs chiefly,
page 81. if not entirely, in those colliers who

are obliged to do their work in the pit whilst lying on one of their sides."

Observation of cases led him to the conclusion that Nystagmus was associated with a particular class of miners performing a particular class of work.

This view was further supported in
 Transactions a later paper. The kind of work which
 of bulks so largely as a cause of Nystagmus
 Ophthal. is called "holing" and will be described
 mological later on.

Society. In all the cases of Nystagmus which I
 1884. have met with among colliers the patients
 Lancet, either had, at some previous time,
 1882, worked at "holing" or were, at the time
 Vol. II. of their indisposition, engaged in
 page 103. "holing".

To see the internal working of a pit I made three different visits into one.

There are several different classes of workers to be seen.

Thus there are men called "datalers" whose work is to look after the roads and airways; and pony-drivers.

The latter are boys who drive the ponies drawing the tubs or ~~rocks~~: they are the prospective colliers. It is not among these two classes that Nystagmus is to be found. I have never seen a case occur in any of them and this experience has been corroborated

* Lancet, 1891, Vol. I. Page 311. South Wales collieries speaks of "the absence of Nystagmus among the labourers and hauliers." Mr. Jeaffreson *² British of Newcastle *² also says, "It is certain Medical that the malady is confined to coal journal, miners, and it is equally certain that 1884, Vol. II. it is amongst this class confined to page 109.

those that hew coal.

To these two rules there is practically no exception."

On reaching the coal seam you find men engaged in getting the coal and others employed in filling the tubs or corves with the broken up coal. The latter are called fillers and may occasionally work at getting the coal while they are waiting for empty tubs to come.

The work of the coal getter is to loosen the coal from the coal seam. In order to do this, he has to put himself into a constrained position where "holing" or undermining the seam before getting it down. He has to sit down and with his legs curled up and almost lying on his side he strikes at the coal with a horizontal swing

of his pick.

The object is to undermine the coal and the miner will in this way clear away the coal to a height of about two feet. When he gets enough coal out to leave room for his body the miner goes under the seam into the hole that he has made and lying on his side continues to undermine the coal. This process is called "holing" and a man may go on "holing" thus for a distance of six or seven feet under the coal seam. As he cuts away the coal from under the seam he sets up wooden props or supports to hold up the coal till he has got far enough under it. Then the props are knocked down and the coal seam, having no support, falls and the coal is filled into the tubs which

are in waiting.

This method of "holing" is called "bottom-holing" but there are other two varieties. "Middle-holing" as it is called is carried on about the middle of a seam or wherever a band of stone or shale or loose coal may occur.

In "top-holing" the coal is worked from the top of the seam, that is, between the seam and whatever forms the roof.

In these three modes of getting coal the collier has often to get his body into the hole that he has made and has to work there lying on his side.

After being holed the coal if it does not fall on removal of the props, is blown down by means of gunpowder.

Some men called headers work at cutting or driving the headings.

These men open up the seams and make roads for the colliers coming after them. They work either standing or kneeling and use the pick in a vertical direction. This class of men when at work keep their heads quite straight with their eyes directed straight forward and are not very liable to Nystagmus.

Proportion of miners engaged in "holing"

In most coal pits about one third of all the men employed underground are engaged in "holing". Mr. A. H. Stokes, M.P. & Mr. Inspector of Mines in the Midland District says, "The number, in a large measure, depends upon the nature of the coal, and the amount of "holing" required to get the coal. In some mines every yard of coal is holed; in others, little if any "holing" is done."

Relation of "holing" to Nyctalopia.

It is almost without exception among these "holers" that Nyctalopia occurs.

This will be readily understood when you take into account the conditions under which they work.

While lying on one side a miner's head is placed on the lower shoulder and his eyes are looking obliquely upward so that he may get a view of the place where his pick strikes.

A man may work in this position day after day for about three hours at a stretch. Add to this the comparatively poor light with which miners have to work and you have a set of conditions capable of throwing the greatest strain on the eyes.

The association of Nyctalopia with this particular class of workers has

been demonstrated by several writers.

*¹ Annales Thus Dransart *¹, alluding to the men
d' at work lying on their sides, says,
Oculistique "We ought to note this fact, that all
1877. our workmen attacked by Nystagmus
Vol. II. work in the inclined seams."

page 121, Zieminski, *² who has made a special
Foot-note study of Nystagmus in England,

*² Analyse attributes the malady to the constrained
in attitude of the work of the miners, their
Rec. d' look being forced to direct itself
Ophthal. obliquely above either to the right or
1889. left.

Page 634. Nieden, in a discussion on a paper *³

*³ Trans- read before the Ophthalmological
actions of Society, says, "In all my papers about
Ophthal. Nystagmus I stated as the first
Soc. 1884 prime cause of this affection the
Lancet particular kind of work the hewers
1882, Vol. II. had to do in "holing" the coal in a
Page 103.

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stretched position of the body, head,
and eyes."

Pathology of Miners' Nystagmus.

Miners' Nystagmus is a local disorder. From the strain on the eyes in an unnatural position a state of chronic fatigue in the ocular muscles is caused; atony of these muscles follows, and oscillation of the eyeballs is the result. So long as the eyes are at rest they seem quite normal but, whenever you put into action the muscles involved, the movements are apparent.

This kind of Nystagmus is a
* British myopathic disease caused by
Medical muscular disability as a result of
Journal, overwork and is analogous in its
1887, pathology to writers' cramp.
Vol. II. Dr. Taylor* speaking of the similarity
Page 483.

between Miners' Nyctagmus, writers' cramp, and other conditions, says, "It is analogous to that rare condition of the muscles of articulation known as auctioneers' spasm, or to writers, pianists, and telegraphists' cramp, or to a similar affection of the gastrocnemius muscles occasionally observed in ballet dancers, who run and pirouette on tip-toe until they are attacked by cramp, spasm, and uncontrollable motions, whenever they attempt to dance at all."

*Annales d'Ophtalmologie, 1877, Vol. II. The association of Nyctagmus with spasmodic movements and tremors of the muscles of the eyelids and face seems to point to a common cause.

Vol. II. D'ansart's* opinion was that the disorder was due to a constant upward movement of the eyes.
 page 128. and
 1882, Vol. II. page 150.

He says, "The myopathy will have its principal seat in the superior rectus and inferior oblique muscles; it occasions merely a weakness in these organs.

The pair of elevators having an acquired feebleness cannot overcome its antagonist by a single effort; it is obliged to attempt it several times by means of a series of little successive and rapid contractions. It then produces Nystagmus or rather gives occasion to the vertical oscillations.

To explain the horizontal oscillations which are noticed in Miners'

Nystagmus we have recourse to the spasm of the internal recti and the accommodation.

The weakness of the internal recti can suffice to explain the horizontal

oscillations; they are produced by the same mechanism as the vertical ones.

But the accomodation contributes to increase the muscular disorder by virtue of the relations which exist between convergence and accomodation, or in other words, between the ciliary muscles and the internal rectus."

* Rec.
d'
Ophth.
May 1891.

In a later paper * he modifies his opinion and speaks of "the raised and oblique position of the gaze".
The fact of the oscillations of the eyeballs in Nystagmus being lateral or horizontal points to the cause lying as much in the oblique as in the upward direction of the eyes. The oblique muscles have a greater part in causing Nystagmus than Dransart's original views would seem to

show. If this were not so the oscillations would be more vertical in character.

* Carpenter's The physiology* of the movements of the Physiology, ocular muscles throws light on this point.

Page 896. If we incline the head to one side or other, by turning it on its antero-posterior axis, rotation of both eyes on their antero-posterior axes also takes place probably through the instrumentality of the oblique muscles.

It is of importance to remember this in connection with the attitude of a miner while engaged in "holing". Thus, a miner at work lying on his left side will use in the right eye, the superior rectus, inferior oblique and external rectus, and in the left eye, the superior rectus, inferior oblique, and internal rectus. If he works on his right side the arrangement will be reversed.

The to- and- fro or horizontal movements, seen in Nystagmus, may be accounted for by the atony of the external and internal recti muscles, the rotatory movements by the inferior oblique, while the weakness of the superior recti acts in causing the vertical oscillations.

Some colliers are unable to work long on one side; they have to change to the other side in order to alter the direction of their eyes.

Transaction In this connection the late Mr Oglesby of the Ophthalmological Society, mentions an interesting case. It is peculiarly in the case is that the man is left handed, and when getting coal the head and neck are flexed on the left shoulder. At present he has much difficulty in getting coal when in that position, but, by flexing

1882.
Page 249.

the head and neck on the right shoulder, he can still do a fair amount of work."

Torticollis and conditions allied to
Miners' Nystagmus.

I have never met with spasmodic movements of the muscles of the neck amounting to torticollis though muscular tremors and quivering of the eyelids were tolerably common in cases of Nystagmus.

Dr Landolt in a paper on Ocular

* Le Torticollis* records two cases in which
Bulletin the torticollis was alleged to be the
Medical. result of the tilting of the head
1890, consequent on efforts to avoid the double
Page 573. images associated with paralysis of
the superior oblique muscle on one
side. These cases are interesting
when viewed in the light of the cause

of Nystagmus being in the position assumed by the men at work.

Prognosis.

The prognosis of Miners' Nystagmus is distinctly favourable. If the patient can be removed from his injurious surroundings recovery will generally follow.

Treatment.

The most important matter in the treatment is cessation from, or alteration of the kind of the patient's work.

Complete rest from work at least for a time, is generally necessary.

When the Nystagmus improves a little the patient may be allowed to work above ground either on the pit bank or at other employment. It is not always necessary to leave the pit but

any occupation causing a constrained position must be discontinued.

The giddiness accompanying severe cases of Nystagmus is best treated by making the patient keep the recumbent posture with his eyes closed.

The Bromide of Potassium in doses of $\text{gr} \text{ss}$ repeated every 3 or 4 hours is of great benefit. It seems to act by diminishing the reflex excitability of the brain and spinal cord and aids in lessening the convulsive movements of the eyeballs.

By its sedative action it also allays the sickness and vomiting in severe cases of Nystagmus. Tonics such as Iron are of service as there is frequently constitutional weakness in these cases.

Prevention of Nystagmus.

How to meet and overcome the injurious influences which have been mentioned as causes of this disorder is perhaps more a question for the mining expert than the medical man.

The points to be considered are the mode of work and the lighting of mines.

The kind of work done by the miner and especially the variety called "holing" having been mentioned as injurious to many, it becomes important to know if any means can be adopted to render such work either unnecessary or less frequently required.

Coal-cutting machines have been invented to take the place of manual labour. These machines are not much

need yet; their disadvantage being their great cost. They are really more economical because, by their use there is a distinct saving of labour and the coal which they get out is of better shape and size.

Probably through time they will be more extensively used when their advantages become more apparent to coal owners.

The use of explosives in coal-mines is another means of mitigating the labour of the collier. Modern progress has made the use of these much less dangerous. Some compounds of nitro-glycerine are practically flameless and can be used with safety in all, unless very fiery mines. In the lighting of coal-mines there is room for great improvement.

The lighting though better than formerly does not come up to what it should be and things are indicating further improvements before long. New safety lamps are being devised in which the increased lighting power is secondary only to their safety. Much is to be expected from the use of electricity for lighting purposes. The principal disadvantage is the inconvenience or even danger attending injury to the conducting wires. Its great advantage lies in its safety, as no communication with the external air is necessary. Professor Sylvanus Thompson at the British Association Meeting in 1891. gave it as his opinion that it will be by means of electricity that the better

lighting of coal-mines in the future will be effected.

Some improvement in lighting may be looked for now that legislators are bestirring themselves in the cause.

The improvements in the light-giving power of some of the modern safety-lamps can be traced to the work of the Royal Commission on Accidents in Mines, in 1886.
