nicotinic receptors [4] were substantially reduced in both AD and PD. There were no changes of the equilibrium dissociation constants (K_D).

The exact cellular location of nicotinic cholinergic receptors in the cerebral cortex is not known. The parallel changes in these receptors and CAT activity in AD and PD suggest that they are located pre-synaptically on degenerating cholinergic axons. This view is consistent with the finding that nicotine stimulates the release of acetylcholine from cholinergic terminals in the cortex.[5] The present results point to the potential for stimulation of the remaining nicotinic receptors as a treatment of the cholinergic deficit in AD and PD and provide a rationale for a therapeutic trial of selective nicotinic agonists.

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Industrial exposure to cobalt causing optic atrophy and nerve deafness: a case report

A 48 year old man presented with a seven month history of progressive bilateral deafness with tinnitus and occasional vertigo and a six month history of visual failure. He had been exposed to raw cobalt powder for 20 months, working 50 hours a week. He stopped work in November 1988. In spite of face masks, some of the powder was inhaled. He smoked ten cigarettes a day and drank two pints of lager a week. There was no drug exposure or family history of note. On examination his visual acuity was 6/36 in the right eye and 6/60 in the left eye. The temporal margins of the discs were pale. Hearing was impaired bilaterally. Full haematological investigation, chest radiograph and CT brain scan were normal. CSF showed a raised protein of 70 mgs/100 ml with oligoclonal IgG banding. Syphilis serology was negative. Blood cobalt was 234 μgm/l (normal <2) in February 1989, falling to 14·7 μgm/l by May 1989. Twenty four hour urinary cobalt was 119 μgm/24 hr (normal <51) in February 1989. VERs in February 1989 were right eye 125 ms, left eye 126·5 ms, in May 1989, 118 ms on both sides, and in February 1990, 109 ms on both sides. By January 1990 the visual acuity improved to 6/12 bilaterally.

Audiometry improved from December 1988 to February 1990 as shown. The patient felt his hearing was back to normal by the end of 1989.

Cobalt is a relatively rare metal. Today most of it is produced as a by-product of copper or silver production. Cobalt is widely used in the making of hard metals in industry, for example, drill tips and gas turbine blades. It is also used in medicine. The metal alloy, vitallium, is a strong and corrosion resistant metal used for prostheses in replacement bone surgery, for example, hip and knee joints.[1]

Cobalt has also been used clinically in the treatment of certain types of anaemia; when given to normal and anaemic patients it has produced a reticulocytosis. Medically, it has been used as an antidote for certain types of poisoning, such as cyanide, and as a potentiator of the action of antibiotics or hydrocortisone. Radium has virtually been replaced by Cobalt 60 for radiotherapy.[1]

Many adverse reactions have been reported following its clinical use, although there are remarkably few reports of severe poisoning as a result of industrial exposure. Reactions to cobalt have included anorexia, nausea and vomiting, diarrhoea, precordial pain, cardiomyopathy, skin rashes, flushing, nerve deafness, renal damage, hypothyroidism, asthma and pulmonary fibrosis and possible optic atrophy.[1-5] Despite the long list of adverse reactions, the complications that developed in this case, optic atrophy and nerve deafness, have never been reported to occur together.

Licht, Oliver and Rachmilewitz[4] described the only previous case report of optic atrophy possibly secondary to cobalt chloride. The patient, a 32 year old Jewish man, was found to have a pancytopenia with a hypercellular bone marrow of unknown aetiology. The anaemia responded to courses of cobalt chloride given on four different occasions. On two occasions the drug had to be discontinued because of nausea and vomiting. On the fourth occasion, after a fifteen week course of cobalt chloride, the patient began to complain of deteriorating vision. Ophthalmological findings and fluroscein angiography indicated the presence of optic atrophy and abnormal choroidal perfusion. Their patient had received a total dose of 73 g of cobalt chloride over a period of three years. Following cessation of the drug there was no further deterioration in vision despite the progression of the underlying disease, suggesting that the optic atrophy may have been due to cobalt toxicity.

Gardner[2] studied 17 patients with anaemia and uraemia treated with cobalt chloride.
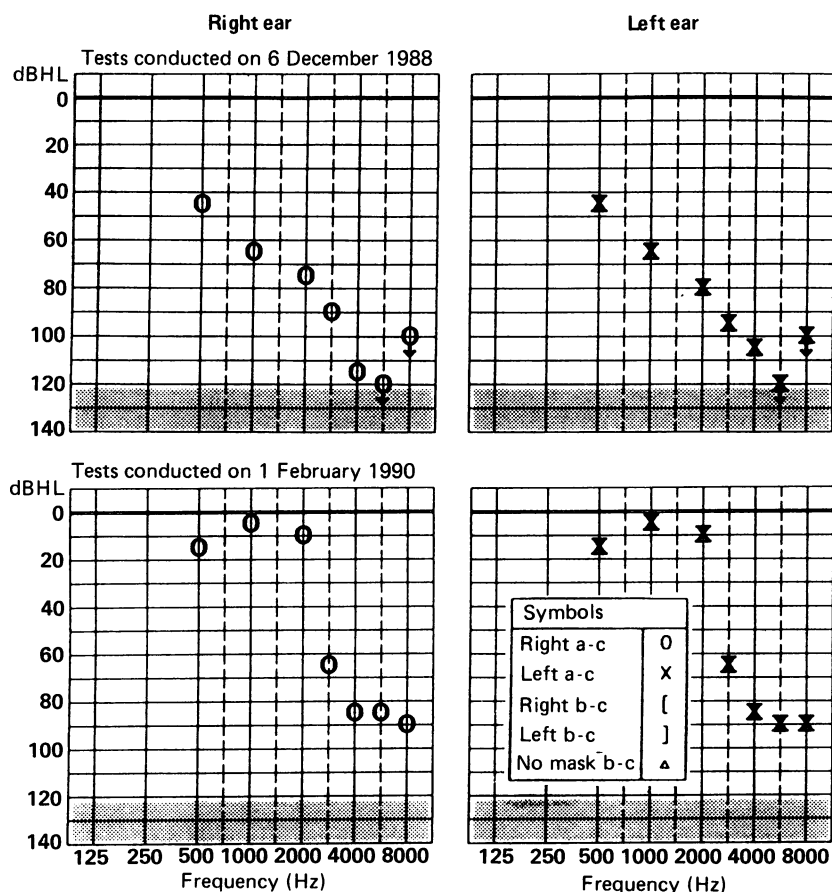

Right ear   **Left ear**

Figure   Audiograms showing improvement of hearing after withdrawal from cobalt exposure.

Four patients noted tinnitus after four to 16 weeks of therapy. One of these four developed nerve deafness after 12 weeks; hearing was absent in a frequency range above 1000 cycles/s. Within 10 weeks of stopping the drug the hearing deficit recovered to the pre-treatment range of hearing. In this patient the nerve deafness recurred on re-starting therapy and recovered again when the drug was again discontinued. Although other side effects in other patients were reported, such as nausea and vomiting, there was no report of optic atrophy.

Schirrmacher[5] reported a case where a 35 year old woman with anaemia and chronic nephritis was treated with 100 mg of cobalt chloride daily for six months, by which time she had developed many adverse effects of treatment including bilateral nerve deafness. Audiometry showed a decrease in sound perception in all frequencies and caloric tests were also abnormal. Five months later, after stopping the drug, her hearing had improved. There was no optic atrophy.

Even though our patient's hearing deficit has improved considerably since his initial presentation, 11 months after stopping work he still has a residual auditory dysfunction. According to the literature cobalt toxicity (as a result of cobalt treatment) results in transient nerve deafness with full recovery. Our patient may have had some hearing impairment before cobalt exposure as he himself feels that his hearing is almost back to normal.

The high blood levels of cobalt and definite improvement in vision and hearing occurring within one month of stopping work, strongly suggests that cobalt toxicity was the cause of the deafness and visual loss. It has been reported to the Health and Safety Executive. No other case has been identified to our knowledge.

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Bilateral perineuritis of the optic nerves

Perineuritis of the optic nerves is a rare inflammatory condition which presents a typical clinical picture of recurrent episodes of visual loss associated with pain and neuroradiological features resembling an optic nerve sheath meningioma. It has become increasingly recognised and is an important differential diagnosis of optic nerve meningioma as it is potentially treatable. We report a case and emphasise the clinical and neuroradiological features that allow its differentiation from other lesions of the optic nerves.

In 1985 a 31 year old Greek woman presented with three stereotyped episodes of reduced vision in the left eye over an eighteen month period. Her right eye was normal and she had no other neurological deficit. Two weeks before each attack she had experienced facial pain. The visual loss occurred over several days and was associated with pain on ocular movements. The attacks were treated with short courses of systemic steroids and each time the vision returned to almost normal over several weeks. We first examined the patient at the third episode. Right visual acuity was 6/5 and left counting fingers. On the left there was colour loss to all Ishihara plates, pain on ocular movement and disc pallor. There was no intraocular inflammation or proptosis. The right field was normal, the left showed only preservation of a rim of peripheral field in the upper nasal quadrant of the left eye.

Flash VERs showed normal responses in the right eye but delay and low amplitude with an abnormal wave form in the left eye. Responses to pattern reversal were absent in the left eye but showed normal latency and slightly reduced amplitude in the right. A diagnosis of left optic neuritis was made.

The patient returned home when her vision was back to normal but following another attack a few months later there was no visual recovery in her left eye. Soon after this she had an attack in the right eye. Over the next 18 months she had three further episodes in the right eye each preceded by bilateral frontal headache and pain in the face two weeks before. She had no pain on ocular movement or on retropulsion of the globe and although her vision improved after each of these episodes, it never recovered to its previous level.

On review in 1987 the right visual acuity was 6/12 with reduced colour perception, the left eye had no perception of light. There was left optic atrophy and temporal pallor of the right disc. Perimetry showed a superior temporal defect in the right eye and a diagnosis of a chiasmal lesion was made. General and neurological examination was normal apart from a previous valvotomy for mitral stenosis. Routine haematology including haemoglobin electrophoresis, biochemistry, protein electrophoresis, autoantibody screen (ANA + ve 1:10), serum angiotensin con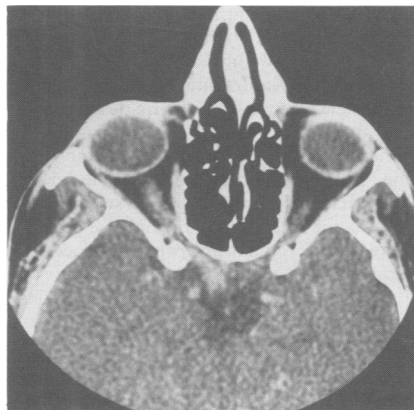verting enzyme, chest, sinus and skull radio-graphs were all normal. Circulating immune complexes were raised (PEG method 7·8 mg IgG/dl, normal < 4·9). Ear, nose and throat consultation was unremarkable. A lumbar puncture showed normal cells, protein and no oligoclonal band. CT scan (fig 1) showed bilateral thickening and ragged outlines of the optic nerves with enlargement of the chiasm. MRI confirmed these findings. A diagnosis of an intrinsic inflammatory lesion of the optic nerves and chiasm of unknown aetiology was made and she was started on oral prednisolone, 60 mg daily which was tailed off and discontinued over six months. At this time the neuro-ophthalmic signs were unchanged but CT scan appearances had improved.

She remained well without steroids for another seven months but then had a relapse in the right eye. An exploratory craniotomy was performed to obtain a tissue diagnosis. At surgery the right optic nerve appeared normal, the left grey and atrophic. There were no adhesions or evidence of tumour. The left optic nerve was excised for histology. This showed an optic nerve largely replaced by collagenous fibrous tissue. In places this was infiltrated with small numbers of lymphocytes and plasma cells (fig 2). In one area a few nerve fibres remained. Some of these were myelinated, others had lost their myelin sheaths. The patient was restarted on systemic steroids and two years later the vision remained stable with no further relapses.

The history of relapsing visual loss, associated with ipsilateral headache, pain on ocular movement and retropulsion of the globe, initially suggested demyelinating disease; later neuroradiological evidence of thickening of the optic nerves and sheaths was more typical of optic nerve sheath meningioma.[1] The prominent history of steroid responsiveness and pain associated with the attacks, however, made an inflammatory lesion likely.

The features of an "inflammatory" optic nerve lesion and neuroradiological changes similar to optic nerve sheath meningioma, together with the pathological appearances of the optic nerve[4] are compatible with perineuritis of the optic nerves. Dutton reported four patients with this condition[1] and there have been a number of other case reports which emphasise the difficulties of differential diagnosis from optic neuritis or optic nerve sheath meningioma.[2-7] Eight out of nine of these cases were female and ages ranged from 22–68 years at presentation, although most patients presented in the 40–55 age range. Pain was a noticeable feature in all except two cases. Visual loss has been reported to be

Figure 1   CT scan (axial scan) showing bilateral thickening of both optic nerves with ragged outlines.
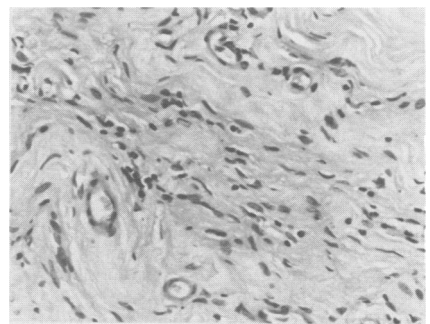

Figure 2   Section of left optic nerve showing extensive fibrosis and a sparse infiltrate of lymphocytes and plasma cells (H + E × 400).