Oculomotor Nerve Palsy in Diabetes

Dr Livia Teo, MBBS, Medical Officer, National Neuroscience Institute, Tan Tock Seng Hospital Campus

Case Study: 60-year-old Chinese male, poorly controlled diabetic with a HbA1c of 10.3%, complicated by diabetic retinopathy and nephropathy. Other comobidities include hypertension, hyperlipidemia, ex-smoker, previous old cerebrovascular accident, hepatitis B carrier and alpha thalassemia trait. He presented with a two-day history of sudden onset of right sided ptosis and a squint - the right eye was noted by family members to be "down and out".

The third nerve provides a crucial nervous supply to the numerous structures in the orbit and eye. It has a relatively long intracranial and intraorbital course that is susceptible to damage at any point. Injury to the nerve commonly occurs in the setting of diabetes as a result of ischaemia to the nerve. However, there are several other life and sight threatening causes which we should exclude before attributing the palsy to diabetes alone.

Notice the right ptosis (lid droop) and the eyeball in a "down and out" position as a result of an oculomotor nerve palsy.

Spontaneous recovery of the nerve palsy occurred two months later.

Photographs courtesy of SNEC. We also thank this patient for consenting to these educational photographs

The following table illustrates the structures innervated by the oculomotor nerve and the common symptoms and signs that a patient can present with.

Innervated structure	Symptoms	Signs
Levator palpebrae superioris	"Droopy" / Asymmetrical eyelids. Complete obscuration of vision in one eye	Partial or complete ptosis
Extraocular muscles - 0 superior rectus - 1 inferior rectus - 2 inferior oblique - 3 medial rectus	Diplopia, giddiness	"Down and out" position of the eye due to pull by spared superior oblique (IV) and lateral rectus (VI). Limitation of eye movements on nine positions of gaze
Parasympathetic supply to eye	Blurring of vision	Pupil dilatation. Impaired accommodation

The lesion of the oculomotor nerve can broadly be divided into complete and partial. In complete palsy, all of the above signs should be present whereas in a partial palsy, the lesion may involve the pupil or be pupil sparing. In pupillary involvement, it is usually associated with a compressive lesion of the third nerve as the parasympathetic nerve fibres, which innervate the ciliary muscles and iris sphincters, are found on the periphery of the nerve. Whereas in ischaemia, it is usually pupil sparing as the nerve fibres in the core of the nerve are the first to be affected.

By detecting the associated signs, we are able to locate the level at which nerve injury had occurred and hence postulate a mechanism for the nerve palsy. Those which are life threatening emergencies have been highlighted in bold in the following table:

Course of the nerve	Important association	Important causes
Nucleus in the midbrain	Partial ptosis and impaired elevation of the contralateral eye	Infarct, **haemorrhage**, neoplasm, abscess
Fascicular intraparenchymal midbrain - passes through red nucleus - medial aspect of cerebral peduncle	Benedikt syndrome: flapping tremor of the contralateral hand Weber syndrome: dense contralat hemiplegia or hemiparesis	Infarct, **haemorrhage**, neoplasm, abscess
Fasciculus subarachnoid portion - PCOM/ ICA junction	Dilated pupil, headache, other cranial nerves involved	**Subarachnoid haemorrhage, intracranial aneurysm, meningitis, meningeal infiltration**
Fascicular cavernous sinus - lateral wall of cavernous sinus	IV and V nerve palsies	Tumour, **aneurysm, cavernous sinus thrombosis**, carotico cavernous fistula
Fascicular orbital portion - superior division - inferior division	Orbital signs: proptosis, chemosis, lid swelling.	Inflammation, tumour

In short, making the diagnosis of a third nerve palsy and identifying the life threatening causes in our daily practice can potentially save lives. Appropriate referrals can be made to help our patients recover as much of their premorbid function as possible.

Other possible causes of ED include smoking, which affects blood flow in veins and arteries, and hormonal abnormalities, such as low levels of testosterone.