Abducens Palsy Following Shunting for Hydrocephalus

J.A. Espinosa, M. Giroux, K. Johnston, T. Kirkham and J.G. Villemure

ABSTRACT: Over a period of 12 years, 80 patients underwent ventricular shunting for normal pressure hydrocephalus. Three developed sixth cranial nerve palsy in the first two weeks after surgery. This uncommon complication is usually transitory following the same pattern of abducens palsy after lumbar puncture or spinal anesthesia. Traction on the nerve with local ischemia has been involved as the responsible mechanism in both instances.

CASE REPORTS

Patient 1

A 69-year-old male presented with a 4-year history of unsteady gait, progressive memory impairment and recent onset of urinary incontinence. On examination there was difficulty recalling current events, gait apraxia and hyperreflexia of the lower extremities. Computerized tomography (CT) of the brain demonstrated ventricular dilatation. The results of an isotope cisternogram and lumbar subarachnoid infusion test suggested a diagnosis of NPH. A ventriculostial shunt was placed and the opening pressure was 18 cm of CSF. A Pudenz valve with a closing pressure of 5 cm of H₂O was used. Postoperative CT scan showed marked decrease in the ventricular size and brain atrophy.

Nine days after surgery the patient returned to his previous occupation. His gait improved and one year after surgery the patient returned to his previous occupation.

Patient 3

A 67-year-old male, retired engineer, was admitted with a history of four years characterized by progressive gait unsteadiness, tendency to drop objects, decreased sex drive and recent inability to concentrate in his daily tasks. Physical examination revealed recent memory impairment, increased tone in lower limbs and bilateral up-going toes. His gait was characterized by short, shuffling steps that improved temporarily after a lumbar puncture. CT scan of the brain showed an enlarged ventricular system with minimal signs of atrophy. MRI findings were suggestive of NPH. He underwent ventriculoperitoneal shunting with no obvious complication during the procedure. The ventricular pressure measured 15 cm of CSF and a low pressure Pudenz valve with a closing pressure of 4 cm of H₂O was used.

Fourteen days after surgery he developed a short episode of nausea, vomiting and severe headache that was followed by diplopia on either right or left gaze. Marked limitation of abduction was seen in both eyes, consistent with bilateral sixth cranial nerve palsies. There were 40 dioptres of esotropia in the primary position. Three weeks later the abducens palsies started to improve and cleared completely 11 weeks after surgery.

From the Division of Neurosurgery (J.A.E., M.G., K.J., J.G.V.) and Neuro-ophthalmology (T.K.), Montreal Neurological Institute, McGill University, Montreal

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Reprint requests to: J.G. Villemure M.D., Montreal Neurological Institute, 3801 University Street, Montreal, Quebec, Canada H3A 2B4
Abducens nerve palsy as a complication of ventricular shunting has been reported previously in only two patients. In those cases and in ours, diplopia developed within two weeks of shunting and was preceded by a short period of headache and nausea. In four of the five patients, the condition cleared within three months. One patient developed permanent bilateral abducens palsies that required extraocular muscle surgery.

The same clinical pattern of sixth nerve palsies may follow lumbar puncture, myelography or spinal anesthesia. It has been proposed that in these cases the mechanism is related to traction on the nerve, resulting from displacement of the brain after loss of CSF support in the basal cisterns. The abducens nerve may be susceptible to traction because it bends abruptly at the petrous ridge to pass forward under the petrosphenoid ligament. Two of our patients had a lumbar puncture as part of the pre-operative investigations; however, these were done well before surgery and could not account for the abducens palsies.

The mechanism outlined above could explain the association of sixth nerve palsies and ventricular shunting. Other mechanical factors like prominent petrous ridges, large branches of the basilar artery crossing over the abducens, and variant courses of the sixth cranial nerve rendering it more susceptible to changes in intracranial pressure have been invoked trying to explain this condition. These factors, if present unilaterally, could justify the delayed onset of sixth cranial nerve palsy experienced by our patients, associated with headache and nausea, suggest overdrainage of CSF with consequent traction on the nerve (Figure 1). It is not known if this complication could have been prevented by using a valve with a higher closing pressure; however, this is suggested by the fact that all our patients, as well as those reported by Black, had valves with closing pressures lower than 100 mm of CSF.

REFERENCES

Figure 1 — Pre (A) and postoperative (B) MRI’s from patient 2 showing a decrease in the amount of CSF at the pontine cistern after ventriculoperitoneal shunting. This study was obtained seven days after the onset of diplopia.