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# Peripheral facial palsy following ventriculoperitoneal shunt. The lesson we have learned

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ABSTRACT

The most frequent complications after shunt surgery are infective and obstructive. Other types are less common, and eventually occur due to technical errors during brain ventricular puncture, opening the intraperitoneal cavity or the tunnelling of the catheter between the two points. Although rare, there are well-reported complications related to the poor positioning of the distal catheter, with perforation of organs and tissues.

We report a very rare case of a male patient with normal pressure hydrocephalus submitted to ventriculoperitoneal shunt. During tunnelling of the shunt stylet, a peripheral facial palsy due to injury to the extra cranial segment of the facial nerve occurred.

To the best of our knowledge this is the second case described in Literature.

The patient and the surgeon should be aware of this very rare but possible complication in shunt surgery being careful to the course of the facial nerve in the mastoid region.

## 1. Introduction

Placement of a ventriculoperitoneal (VP) shunt is a common procedure in Neurosurgery for the treatment of hydrocephalus.

Complications of this technique have been reported extensively in the literature and they may occur anywhere along the course of the shunt, from the cerebral ventricle to the peritoneal cavity. The most frequent side effects associated with this procedure are obstructive and infectious. Although rare, there are well reported complications related to the poor positioning of the distal catheter, with perforation of organs and tissues. Migration or dislocation of the catheter have been described into the stomach, liver, bladder, scrotum, bowel, pulmonary artery, diaphragm, cardiac ventricle, cervical area, umbilicus, rectum, anus, and mouth [3,6].

We report a case of a male patient with normal pressure hydrocephalus (NPH) submitted to VP shunt. During tunnelling of the passer, a peripheral facial nerve paralysis (FNP), due to injury to the mastoid segment of the facial nerve (FN) occurred. Neurological deficit solved after one months following oral steroids. Trauma to the FN can result in serious consequences including ocular complications, impaired speech, feeding difficulties, and serious alteration of facial expression with a significant effect on the social, psychological, and economic aspects of a person's life [7,12].

To the best of our knowledge this is the second case described in Literature about a post operative injury to the peripheral course of the facial nerve during a ventriculoperitoneal procedure.

### 1.1. Case report

In 2009 a 69 year old male patient presented with over 1 year of classic triad of dementia, urinary incontinence, and ataxia march. The diagnosis of NPH was confirmed by CT scan, with Evans index of 0.69. Therapeutic test (tap test) was positive for improvement of symptoms after 45 mL drain of cerebrospinal fluid (CSF) by lumbar puncture. VP

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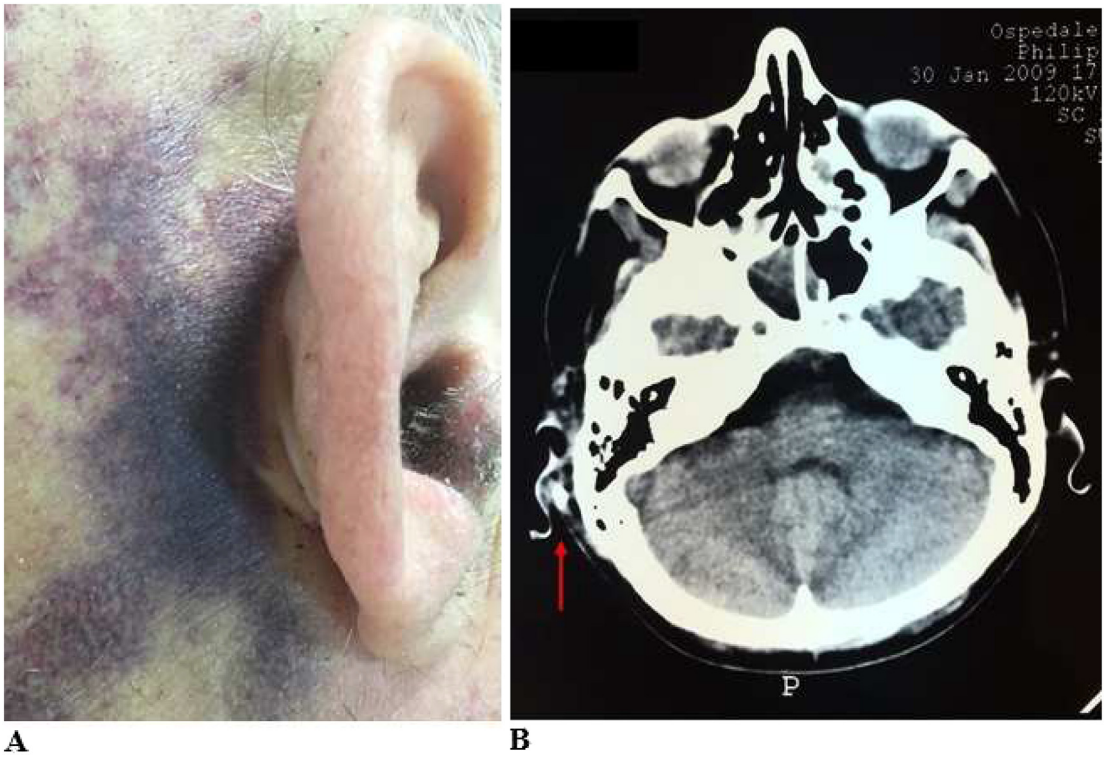


**Fig. 1.** A: Retromastoid hematoma post ventriculoperitoneal shunt after 3 days. B: Head CT scan. The red arrow points the course of the catheter, apparently very close to the peripheral course of the facial nerve. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

shunt operation was performed for hydrocephalus using a Codman-Medos programmable valve (Codman, Johnson & Johnson Co., Raynham, MA) set at 140 mm H2O. The shunt tube was placed subcutaneously by tunnelling with an ordinary shunt passer. The 25 cm long distal catheter was introduced into the peritoneum uneventfully.

It was quite difficult to tunnel the passer in the subcutaneous tract in the right mastoid region (Fig. 1A).

In the immediate postoperative period, the patient developed a hematoma in the right para-mastoid region and, when awake, the neurological examination revealed a peripheral FNP (grade V, House–Brackmann Facial Nerve Grading System) without alteration in taste. He showed a decreased frontal contraction, lagophthalmos, and lack of movement in the right hemiface, with contralateral deviation of the mouth.

The patient was suddenly subjected to radiological investigations. CT scan of the head and of the temporal bone was performed, but it detected no bone or soft tissue abnormalities, besides reduction of the hydrocephalus (Fig. 1B and Fig. 2). Pure tone audiometry showed normal hearing threshold (15 dB) in both ears.

A brain Magnetic Resonance (MR), required when a facial nerve paralysis is unexplained by CT findings, was not performed because of a Thoracic Pace Maker.

On the basis of clinical presentation and radiological findings, the FNP was thought to result from facial nerve swelling following a blunt trauma by the shunt stylet in the extra temporal course of FN, as an episode of neuropraxia.

The patient was managed conservatively with oral steroids (Methylprednisolone 1 mg/kg/day, for 3 weeks) and 1 month later paralysis fully recovered to grade 1/2 (House–Brackmann Facial Nerve Grading System). At 1-year follow-up, no FN impairment was seen.

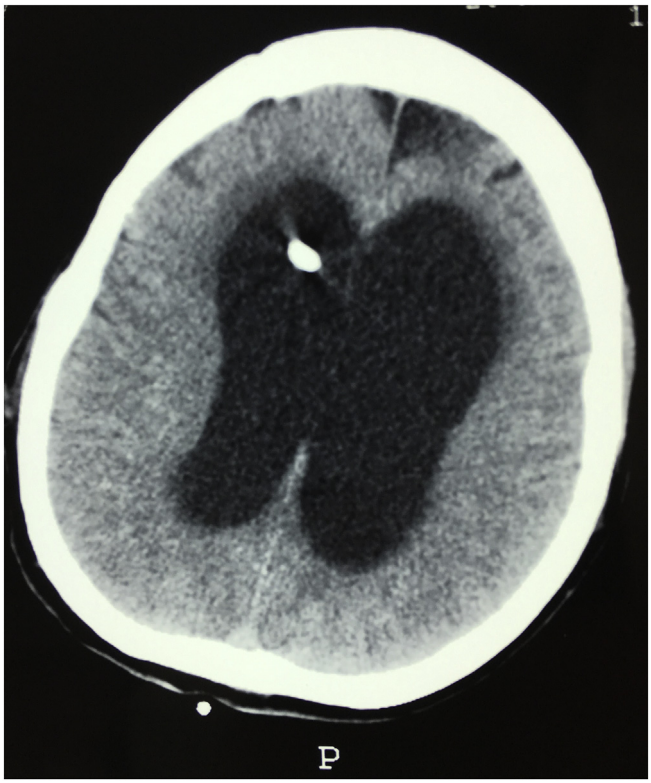


**Fig. 2.** Head CT scan. Intracranial final position of the catheter.

## 2. Discussion

The most frequent complications after shunt surgery are infective and obstructive. Other types are less common, and eventually occur due to technical errors during brain ventricular puncture, opening the intraperitoneal cavity and the catheter tunnelling between the two points [3].

We report a very rare case of a male patient with NPH submitted to

VP shunt. During tunnelling of the shunt stylet, a peripheral FPN, due to injury to the extra temporal segment of the FN occurred.

To the best of our knowledge this is the second case described in Literature of this complication.

In 2015 Ramdasi described a lower motor neuron-type FNP immediately occurred after a VP shunt of a hydrocephalus, focusing the site of the injury in the distal fallopian canal probably as effect of the tunnelling of the subcutaneous tract of the shunt [11].

The FN is mainly responsible for the facial movement, and its injury may cause great discomfort for the patient. It is the most commonly injured cranial nerve and occurs by several etiologies: tumor, trauma, infection, cerebral infarction, idiopathic, and others [4,5]. Among facial nerve injury cases, trauma is the second most common cause. Post-traumatic facial paralysis is often associated with high-energy trauma with facial bone fracture, especially the temporal bone and the base of head. Isolated soft-tissue trauma rarely leads to facial nerve injury, and, when it occurs, it is related to open trauma in the vast majority [2]. Injuries to the facial nerve can also occur iatrogenically and arise most frequently during salivary gland and otologic surgeries [4,5,7].

Therapeutic management of FN injury is complex depending on the grade of damage. Nerve repair after a segmental defect injury remains a challenge for surgeons. Fibrin glue, a useful tool in several surgical fields, can be used to expedite operating procedures and maintain proper nerve spatial orientation to potentially optimize recovery [8–10,14].

The injured segment of the facial nerve can be classified according to its location: intracranial, infratemporal, or extra temporal. The infratemporal component includes the portion of the nerve from within the IAC to the stylomastoid foramen and is subdivided to include the meatal, labyrinthine, tympanic (horizontal), and mastoid (vertical) segments. The tympanic segment is dehiscent in 40% to 50% of people, and is therefore the most commonly injured segment during middle ear, mastoid or regional surgery. The extra temporal nerve then begins at the level of the stylomastoid foramen and ends at the motor end plates of the muscles of facial expression [7].

A FNP as a result of VP shunt surgery has been already described as consequence of several mechanisms: intracranial hypertension by failure of VP shunt, isolated fourth ventricle, iatrogenic facial nuclear injury in the floor of fourth ventricle but not by a direct trauma of the shunt stylet than in the description of Ramsay [1,11,13]. Our case was caused by a blunt trauma, following the tunnelling of the shunt passer that generated a unilateral facial palsy at the most precarious extra temporal nerve segment. On the basis of clinical features and of radiological findings, a surgical exploration was not considered as treatment of first choice. A conservative therapy was preferred with satisfactory results. The only medication used, in addition to analgesics, was oral corticosteroid (Methylprednisolone) for 3 weeks, which was given based on its anti-inflammatory properties and the assumption that the facial nerve swelling is a factor that increases neural injury [2]. Within 1 month, patient exhibited complete recovery of the palsy.

Facial nerve palsy can be categorized as either immediate or delayed onset. Immediate onset results from transaction or other forms of severe neural trauma and carries the worst prognosis. Delayed onset palsy occurs due to external compression by edema, hematoma, or swelling of the nerve, and in these cases prognosis is more favourable [2,4,7]. In our case although an immediate onset, patient recovered completely maybe as natural evolution of neuropraxia.

In order to avoid iatrogenic facial nerve injury, surgeon should be basically familiar with the normal course of the facial nerve, also with any anatomical variations that may be encountered [12]. The patient should be informed about rare presentation of this complication in VP surgery.

Possible measures to minimize the chance of a similar event include using a blunt tunnelling device, positioning always the head tilted enough to the opposite side, maintaining the trocar as superficial as possible in the subcutaneous plane avoiding deep pathway along the neck, adding a one more incision in the mastoid region when excessive force is required to pass the tunneller.

## 3. Conclusion

Facial nerve trauma can be an overwhelming injury resulting in functional deficits and psychological distress. Surgeons should keep in mind the course of the facial nerve and be aware of the importance of careful and proper placement of the distal catheter during the tunnelling procedure to prevent complications.

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## Conflicts of interest

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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