Case Report

Abducens nerve palsy associated with pseudomeningocele after cervical spine surgery: a case report

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Background: Cerebrospinal fluid leakage can cause abducens nerve palsy (ANP) secondary to downward brain traction, caused by intracranial hypotension. We present the first case after cervical fixation and fusion with spinal cord decompression.

Case Description: We present a 65-year-old male, who undergone C5-C6 decompression by laminectomy and C3-T2 fixation and fusion, without intraoperative complications. Two months later, the patient referred a 2-week history of diplopia, with no other accompanying symptom. Clinical examination revealed a lack of lateral gaze of the left eye. Cervical MRI disclosed findings compatible with pseudomeningocele. Given the time of evolution, the subacute clinical findings and the absence of image or clinical data of infection or intracranial hypotension, we decided to perform conservative treatment. We submitted the patient to periodic clinical examinations and we confirmed progressive clinical improvement of diplopia, in association with neurologic and ophthalmologic specialists. At this time, six months after surgery, the patient is asymptomatic. The swelling has significantly decreased in size. Control MRI revealed no growth of the pseudomeningocele.

Conclusions: ANP secondary to intracranial hypotension after cervical spine surgery requires immediate imaging tests and clinical evaluation from neurology and ophthalmology specialists. Management can be conservative, as long as diplopia is the only clinical and radiological finding and wound does not show signs of infection.

Keywords: Case report; abducens nerve palsy (ANP); cervical surgery; pseudomeningocele; cranial nerve diseases

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Introduction

Unintentional cervical cerebrospinal fluid (CSF) leakage is a not infrequently (incidence in different series between 0.5–9%) and usually self-limiting complication (1-3). When it is warned intraoperatively, it may be repaired primarily (3,4).

Conversely, there is a frequency of 2 per 1,000 cases of "Late-Presenting Dural Tears" after spine surgery (5). This term refers to situations where the patient has experienced a period of time (>5 days) without symptoms and the surgeon

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has not recognised any leakage intraoperatively (4).

A CSF leak can cause cranial nerve palsy induced, theoretically, by excessive traction and ischemia (6,7). The most suitable nerves for suffering this type of injury are the VI (abducens), IV (glossopharyngeal), X (vagus), XI (spinal accessory) and XII (hypoglossal) cranial nerves (8). The most often injured of these nerves is the first one, the abducens nerve, secondary to downward brain traction, caused by intracranial hypotension (9).

To our knowledge, there are few described cases of development of diplopia after spine surgery (6-14). Although there are some cases of abducens nerve palsy secondary to brain skull traction or distraction, we present the first case after cervical fixation and fusion with spinal cord decompression, produced by cerebrospinal fluid leakage.

The aim of this study is to highlight the value of including abducens nerve palsy caused by cerebrospinal fluid leakage and pseudomeningocele in the differential diagnosis, in a patient with diplopia after cervical spine surgery. We present the following case in accordance with the CARE reporting checklist (available at https://jss.amegroups.com/article/view/10.21037/jss-22-92/rc).

Case presentation

All procedures performed in this study were in accordance with the ethical standards of the institutional and national research committees and with the Helsinki Declaration (as revised in 2013). Verbal informed consent was obtained from the patient for publication of this case report and accompanying images.

We present a 65-year-old man (height: 179 cm; weight 84 kg) without clinical history of any disease, diagnosed with degenerative cervical stenosis with myelopathy, who had undergone C5-C6 decompressive laminectomy and C3-T2 fixation and fusion.

With the patient in prone position, the surgeon performed a midline dorsal skin incision and, subsequently, subperiosteal dissection, instrumentation with pedicle screws C3-T2 and laminectomy C5-C6 with ultrasonic osteotome. Collagen matrix was placed on the area of the laminectomy. Posterolateral autograft bone and demineralized bone matrix was placed, and a collecting canister without vacuum.

There were not any intraoperative complications. The patient developed a clinical outcome in the next days, and in the first postoperative visit. During this period, no neurological signs or symptoms or any wound complications were observed.

At the second visit, two months later, the patient referred a 2-week history of diplopia with no other accompanying symptom.

Clinical examination showed a fluctuant and non-inflammatory swelling under the surgical scar, in the midline of the neck. The wound did not show dehiscence or another infection signs.

Neurological and ophthalmologic examination revealed a restriction (Grade-2) of abduction of the left eye with 10 grades of esotropia in Hirchsberg's test. On suspicion of intracranial hypotension, cranial magnetic resonance did not reveal pathological findings, but cervical magnetic resonance disclosed a cerebrospinal fluid leakage and deep plane dehiscence, compatible with a pseudomeningocele (*Figures 1*,*2*).

In agreement with the patient and given the time of evolution, the subacute clinical findings and the absence of image or clinical data of infection or other symptoms of intracranial hypotension, we decided to perform conservative management and clinical monitoring, in weekly serial visits.

The next months, we submitted the patient to periodic clinical examinations and we confirmed progressive clinical improvement of the palsy with disappearance of the abduction limitation and esotropia in the primary gaze position, in association with neurologic and ophthalmologic specialists.

At this time, 6 months after surgery, the patient is asymptomatic and has recovered his previous basal life.

Highlight box

Key findings:
- Development of diplopia in a patient following cervical surgery should lead us to suspect VI cranial nerve injury.
- Abducens nerve injury may be due to intracranial hypotension following cerebrospinal fluid leakage.

What is known and what is new?
- Acute dural leaks require urgent surgery revision.
- On Late-Presenting Dural Tears, clinical manifestations of cranial nerve involvement usually resolve spontaneously and can be managed conservatively.

What is the implication, and what should change now?
- This clinical presentation requires immediate imaging tests and clinical evaluation by neurology and ophthalmology specialists.

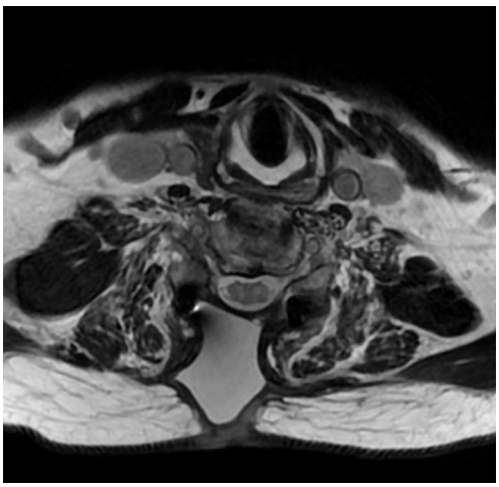

Figure 1 Axial view T2 weighted image, at 2 months post-op.

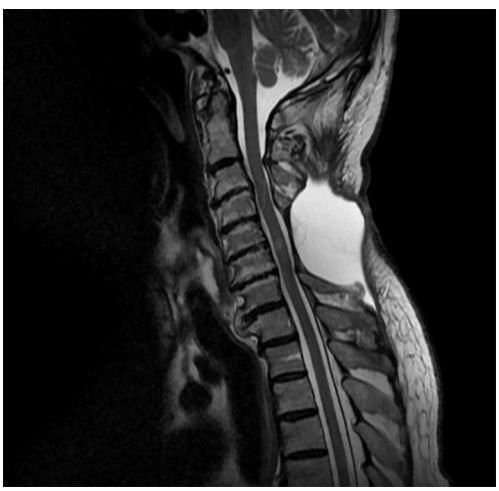

Figure 2 Sagittal view T2 weighted image, at 2 months post-op.

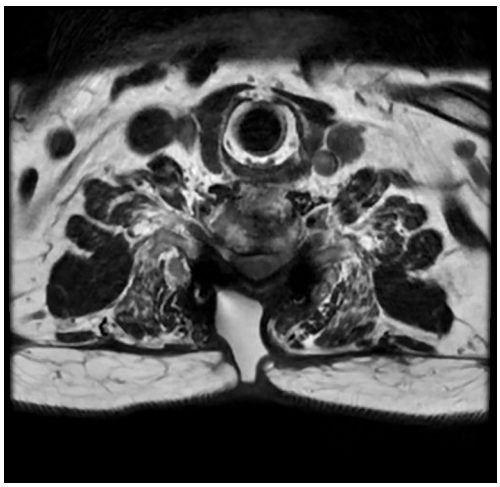

Figure 3 Axial view T2 weighted image, at 6 months post-op.

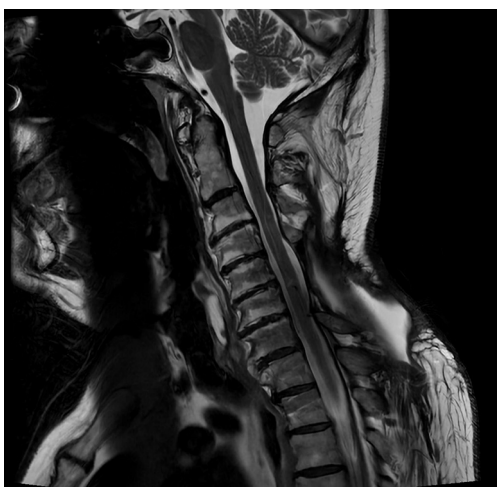

Figure 4 Sagittal view T2 weighted image, at 6 months post-op.

There is no evidence of neurological disease. The swelling has significantly decreased in size, and there is no sign of wound infection.

Control magnetic resonance revealed modest improvement of the pseudomeningocele, and no evidence of other complications (*Figures 3*,*4*).

Discussion

Abducens nerve palsy is the most common cranial nerve palsy, which causes diplopia without any accompanying sign or symptom. It had been reported following lumbar and thoracic spine surgery, and also following cervical spine surgery related to operative skull traction or distraction (6-14).

Furthermore, abducens nerve palsy has been described as a complication of lumbar puncture (15) and spontaneously due to degenerative pathology (16) or intradural herniae (17,18), in all cases due to cerebrospinal fluid leakage. This nerve has the longer intracranial course of all cranial nerves, going through Dorello's canal from the brainstem to the cavernous sinus. A cerebrospinal fluid leakage secondary to caudal brain traction and compression of this canal (by the pons, the dura mater, the petrous apex of the temporal bone or the basilar artery) may lead to this nerve palsy (9).

In 2014, by O'Neill (1), several risk factors for CSF leakage after cervical surgery were published, such as advanced age, rheumatoid arthritis, the presence of an ossified posterior longitudinal ligament or multilevel or

revision surgeries. In our case, the patient was relatively young but underwent a multilevel release.

Furthermore, the spine surgeon must be alert of a life-threatening situation when a patient who had underwent spine surgery starts with diplopia or another neurological symptom. This clinical feature can be associated with subdural hematoma and transtentorial herniation (9,15). This situation requires evaluation with a cranial and cervical magnetic resonance imaging scan, and clinical evaluation by neurology and ophthalmology specialists.

Few cases of diplopia after spine surgery have been described (8,12-14), so there is not enough evidence about the right first line of treatment.

The adequate treatment of late-presenting dural tears, due to initially lack of treatment, that can result in the development of a pseudomeningocele, is not clear. However, there is a trend to conservative management, in order to avoid potential risks of reoperation (4,19).

In our case, bed rest with the headrest at 30º and hospitalization (2) did not make sense as the patient lived a normal life for 2 weeks after the onset of symptoms, so we decided to perform close clinical surveillance for worsening or onset of neurological symptoms, given the non-progressive nature of the symptoms and their subacute etiology.

Standard surgical management of pseudomeningocele consists of revising the wound and dural fistula closure with stitches and adding collagen matrix (19).

Recently, and given the good results and its widespread use in lumbar surgery, the use of the epidural blood patch has been published, injecting 2.5 to 15 mL of autologous blood into the epidural space at the level of the lesion (20) with the possibility of using CT scan as a guide, or even ultrasound (21). In a recent case series, this method has been postulated to be used as a second line after persistence of postural headache or surgical wound drainage following failure of primary dural leak repair (22). In our case, since most cranial nerve palsies tend to resolve spontaneously (10), and in the absence of other neurological symptoms or signs, we did not consider trying this option.

Vascularised abdominal fat grafting can be used in case of massive pseudomeningocele (23). Percutaneous treatments with infusion of different substances have also been described (hydrogel sealant, polyethylene glycol, or BMP-2) (19,24).

Currently, it is only clear that surgical treatment should be the first option in cases of acute clinical findings in the first postoperative days, pathological cranial findings on MRI or wound drainage with cerebrospinal fluid fistula (19).

Conclusions

In conclusion, abducens nerve palsy secondary to intracranial hypotension after cervical spine surgery is a rare complication, and its treatment must be individualized.

This clinical presentation requires immediate imaging tests and clinical evaluation by neurology and ophthalmology specialists.

Management can be conservative, as long as diplopia is the only clinical and radiological finding and wound does not show signs of infection. Given the rarity of the case, further studies are needed to establish sufficient evidence.

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Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at https://jss.amegroups.com/article/view/10.21037/jss-22-92/rc

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jss.amegroups.com/article/view/10.21037/jss-22-92/coif). The authors have no conflicts of interests to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and national research committees and with the Helsinki Declaration (as revised in 2013). Verbal informed consent was obtained from the patient for publication of this case report and accompanying images.

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