Remote cerebellar hemorrhage as complication of spinal surgery - report of two cases and literature review.

Hemorragia cerebelar remota como complicação de cirurgia de coluna vertebral.

Relato de dois casos e revisão da literatura.

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SUMÁRIO

Introdução: A ocorrência de hemorragia cerebelar remota durante cirurgias da coluna vertebral é um evento raro e pode passar despercebido na maioria dos casos. Uma taxa de mortalidade de até 15% tem sido relatada. Relato de caso: Apresentamos dois casos de pacientes que apresentaram hemorragia cerebelar após cirurgia de coluna lombar complicada com ruptura da dura-mater. Em ambos os casos, o diagnóstico foi feito durante a investigação de déficits neurológicos no pós-operatório inicial. No primeiro caso, houve ruptura dural devido ao rompimento do material de osteossíntese vertebral pré-existente. No segundo caso, foi verificada a existência de fistula dural após o procedimento, responsável pela perda de líquido cefalorraquidiano (LCR). Estudos de neuroimagem nos dois pacientes evidenciaram o clássico “sinal da zebra”. Exspectant treatment was applied in both cases, with complete recovery of symptoms. Discussion: The pathophysiological mechanism of RCH is still unknown, but it’s supposed that it is due to intracranial hypotension caused by CSF leakage, which causes a caudal displacement of the cerebellum, that might lead to stretching and disruption of the vermian veins. Expectant treatment can be applied in cases of minor bleeding, with surgical evacuation in cases of major bleeds. Prognosis is usually favorable, with minor transient neurological deficits.

Keywords: Remote cerebellar hemorrhage, spinal surgery, cerebellar hemorrhage

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INTRODUCTION

The occurrence of remote cerebellar hemorrhage (RCH) after neurological surgery is a rare but well known complication\(^1\)-\(^3\),\(^9\),\(^13\),\(^14\), with the majority of cases being seen after supratentorial intracranial procedures\(^1\),\(^6\)-\(^9\),\(^10\),\(^12\),\(^14\); however its occurrence in the intercourse of spinal surgery has been described more frequently in recent years. It was first described by Chadduck\(^4\) in 1981 and, since then, many theories have been proposed to explain the origin and when such bleeding occurs: the theory of the cerebellar sagging with distention of the vermal veins is more widely accepted, however, some uncertainties persist\(^1\)-\(^3\),\(^5\),\(^6\),\(^7\),\(^9\),\(^11\)-\(^14\). At the moment, what it’s known for sure is that for the occurrence of this complication is necessary an opening in the duramater with loss of cerebrospinal fluid\(^1\)-\(^3\),\(^5\),\(^6\),\(^7\),\(^9\),\(^11\)-\(^14\). The treatment to be instituted depends primarily on the patient’s neurological status and extent of injury\(^2\),\(^7\).

We present the case of two patients who developed RCH after spinal surgery and a review on the pathophysiological basis of this complication is undertaken.

REPORT OF CASES

Case One:

A 62-year-old female patient underwent fixation of the lumbo-sacral spine eight years before, with banding with steel wires of the spinous processes of L3 to S1 levels. Recently, she presented with low back pain and neuroimaging studies revealed cerclage wires disruption and subsequent vertebral instability and nerve root compression. We proceeded a decompressive laminectomy of previously set levels, with a new pedicle screws posterior fusion (Fig. 1). During the operation, we found that the broken wires had lacerated the duramater with CSF leakage. Postoperatively the patient awoke without neurological deficits, evolving in the early hours with headache and later progressed with cerebellar symptoms. Brain computed tomography (CT) revealed moderate bilateral hemorrhage in the subarachnoid spaces of cerebellar hemispheres (Fig. 2). A non-surgical management was decided, and the patient evolved with complete clinical improvement.

Figure 1. Postoperative lumbar spine X-ray (AP view): wide decompressive laminectomy with L3-S1 pedicle screws.

Figure 2. Brain CT shows intrafoliar hemorrhage in both cerebellar hemispheres.
Case Two:

A 41-year-old female patient with hourglass schwannoma at L3-L4 levels (Fig. 3), with paravertebral muscles infiltration, underwent surgical resection by posterior approach with complete excision. Postoperatively, she presented with occipital headache and neck stiffness. Brain CT revealed bilateral subarachnoid hemorrhage among the cerebellar folia, with mild compression of the fourth ventricle and ventricular dilation (Fig. 4). The patient was placed in Trendelenburg position, with clinical improvement in few days. Control neuroimaging showed persistence of mild bleeding without ventricular dilation. During the investigation, a CSF leak at the surgical site was found, which was surgically treated with satisfactory neurological improvement.

**DISCUSSION**

Remote cerebellar hemorrhage is a rare neurosurgical complication that consists in a cerebellar subarachnoid hemorrhage after neurosurgical procedures in anatomically distant areas. It is considered one of the most serious complications of spinal surgery, being potentially lethal. Its appearance after supratentorial interventions is already well known, with an incidence ranging from 0.2% to 4.9%. The operations that more likely present with this complication are frontal or temporal lobectomy for epilepsy treatment and excision of aneurysms.

The occurrence of RCH as a complication of spinal surgery was first reported after a cervical laminectomy and, since then, has been reported after procedures in all spine levels. Its incidence has been progressively increasing in recent years but is still significantly lower than after supratentorial procedures. This difference in incidence can be explained by the fact that most of RCH cases remain asymptomatic, being diagnosed incidentally by cranial CT for postoperative control. As cranial CT are not routinely used after spinal surgery, only symptomatic cases of HCR after spinal procedures are diagnosed.

Clinically, RCH can be present as cerebellar syndrome, headaches or dizziness, which usually appears between 10 and 120 hours after surgery. Intracranial hypertension signs may occur if the hematoma increases and compress the IV ventricle, leading to acute hydrocephalus, a condition rapidly fatal. Other symptoms resulting from CSF leakage may arise due to brain sag because of the low CSF pressure, causing traction of the cranial nerves, leading to diplopia, visual field defects and facial paralysis.

The pathophysiological mechanism that explains the occurrence of the RCH is still unknown, and what it’s known is that in all documented cases there were dural opening with excessive cerebrospinal fluid leakage. The amount of loss enough to cause bleeding is unknown. Among all the proposed theories, there seems to be a consensus between the authors that there is a downward displacement of the cerebellum due to low cerebrospinal fluid pressure, causing stretching and disruption of superior cerebellar veins. This hypothesis is supported by the fact that most cerebellar bleeds occur in the upper vermis, where the cerebellar draining veins are located. In addition, bleeding also affect the cerebellar hemispheres bilaterally, unlike what would happen in cases of arterial bleeding, which would be unilateral.

The study of perioperative factors, like pre-existing coagulopathy, postoperative hypertension, anticoagulant use, vascular
abnormalities and intracranial jugular vein obstruction due to extreme head rotation, as well as the position taken during the surgery, did not show association with cerebellar bleeding. Thus, the only way to prevent the occurrence of RCH is to avoid excessive loss of CSF when opening the dura by head-down position and the rapid closure of the gap. Despite the possibility of diagnostic suspicion by knowledge of intraoperative loss of CSF and signs of cerebellar syndrome, the diagnosis of HCR can be demonstrated by neuroimaging exams. Both CT and magnetic resonance imaging (MRI) allow immediate diagnosis of this complication. The findings are the presence of blood in-between the cerebellar folia in curvilinear configuration which, in contrast to the cerebellar parenchyma of lower density, forms a classical image, called as “zebra-sign”.

The treatment basically depends on the neurological status of the patient and the characteristics of the bleeding, and can be done by expectant management in cases of minor bleeding and unchanged neurological status, with monitoring of the hemorrhage with serial neuroimaging. In cases of major bleeds, with compression of adjacent structures - IV ventricle and brainstem-, the evacuation must be immediate. Despite the risks of an intracranial bleeding, prognosis is favorable, and more than 50% of cases improve with minor neurological deficit and less than 15% die.

Although a rare neurosurgical complication, remote cerebellar hemorrhage presents as potentially lethal and should always be suspected in case of patients who have had severe loss of CSF during surgery or who have sudden or unexplained neurological deficits in the postoperative period, and must be promptly investigated with neuroimaging.

REFERENCES


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