CEREBELLAR HEMORRHAGE AS A COMPLICATION OF TEMPORAL LOBECTOMY FOR REFRACTORY MEDIAL TEMPORAL EPILEPSY

Report of three cases

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ABSTRACT - Cerebellar hemorrhage is listed among the potential complications following neurosurgical procedures. In this scenario it is usually reported as a rare condition. However, it seems that epilepsy surgery patients are somewhat more prone to this kind of complication, compared to other surgical groups. Head positioning, excessive cerebral spinal fluid draining and the excision of non-expanding encephalic tissue (or combinations among the three) are likely to be cause underlying remote cerebellar hemorrhage. Out of the 118 ATL/AH performed at our institution, between 1996 and 2002, we identified 3 (2.5%) patients presenting with cerebellar hemorrhage. We report on such cases and review the literature on the topic.

KEY WORDS: cerebellar hemorrhage, epilepsy surgery, neurosurgical complications.

Hemorragia cerebelar como complicação de lobectomia temporal para epilepsia do lobo temporal medial: relato de três casos

RESUMO - A hemorragia cerebelar faz parte das potenciais complicações dos procedimentos neurocirúrgicos. De forma geral, é considerada uma condição rara. Entretanto, há aparente propensão dos pacientes submetidos ao tratamento cirúrgico de epilepsia em apresentar este tipo de complicação, quando comparados com outros grupos cirúrgicos. O posicionamento da cabeça, excessiva drenagem de líquido cefalorraquidiano e a excisão de tecido cerebral não expansível (ou talvez combinações entre os três) constituem as potenciais causas da hemorragia cerebelar remota. Entre as 118 pacientes em nossa série de LTA ⁄ AH, identificamos 3(2.5%) casos de hemorragia cerebelar. Relatamos os três casos desta natureza, com revisão da literatura pertinente a esta complicação.

PALAVRAS-CHAVE: hemorragia cerebelar, cirurgia de epilepsy, complicações neurocirúrgicas.

Anterior temporal lobectomy (ATL) and amygdalohippocampectomy (AH) are effective treatment alternatives in patients with temporal lobe epilepsy refractory to medical treatment. Neuropsychological disturbances (language and memory) are the most common post-operative derangements. Nevertheless, surgical complications are rarely expected, both locally and at remote sites. Recent papers have shed some light on the relative high frequency of cerebellar hemorrhage in patients submitted to anterior temporal lobectomy, when compared to other surgical groups. It seems that ATL/AH patients are particularly prone to this kind of complication. At our institution ATL ⁄ AH are always performed using the same surgical technique (that is, a trans-temporal approach). Out of the 118 ATL/AH performed at our institution we were able to identify 3(2.5%) patients presenting with cerebellar hemorrhage. Their cases are reported.

CASES

Patient 1. A 31 year-old male patient, presenting with a seizure disorder starting at the age of 9 y/o; characterized by an aura (epigastric sensation), shortly followed by a complex partial seizure and on occasion a generalized tonic-clonic seizure. He was tried on phenobarbital and carbamazepine, with unsatisfactory seizure control. A combination of valproic acid, phenytoin and clobazam ultimately led to control of the secondarily generalized seizures. The complex partial seizures still occurred many times per week. Physical and neuropsychological examinations were normal. An electroencephalogram (EEG)
showed left temporal interictal spikes and a brain magnetic resonance image (MRI) disclosed left hippocampal atrophy, consistent with the diagnosis of mesiotemporal sclerosis (MTS). During videoelectroencephalographic (VEEG) monitoring, 3 complex partial and 1 secondary generalized seizures were recorded from the left mesiotemporal lobe.

He was then admitted to undergo left ATL. There were neither metabolic nor coagulation disorders, as verified by normal platelets count and PT/aPTT values. While supine with his head turned to the right, the patient underwent a craniotomy for a left 3 cm ATL and 3.5 cm AH. At the end of the surgery, a subgaleal sucto drain was placed. Pathology was confirmatory of hippocampal sclerosis.

In the immediate post-operative (PO) period, he was observed in the Intensive Care Unit (ICU) with an initial Glasgow Coma Scale (GCS) of 10. On the second day at the ICU he was still judged as "unusually drowsy and dysarthric". On the 3rd PO day a brain computed tomography (CT) scan disclosed multiple foci of cerebellar hemorrhage, predominantly on the right cerebellar hemisphere, but no surgical drainage was necessary (Fig 1). A cerebral angiographic study was normal.

In the 9th PO day the patient developed a liquoric fistula and fever. A cerebrospinal fluid (CSF) study showed 21 red cells/mm³, 7680 leucocytes/mm³, 80% neutrophils, glucose 1mg/dL and proteins 404mg/dL. He was put on cefepime for 14 days, after which CSF showed 58 red cells/mm³, 19 leucocytes/mm³, 87% lymphocytes, glucose 39 mg/dL and proteins 124 mg/dL. While supine with his head turned to the right, the patient underwent a craniotomy for a left 3 cm ATL and 3.5 cm AH. At the end of the surgery, a subgaleal sucto drain was placed. Pathology was confirmatory of hippocampal sclerosis.

A follow-up CT scan performed on the 28th PO day showed resolution of the hemorrhage on both cerebellar hemispheres.

Patient 2. A 37 year-old female patient with a seizure disorder starting at the age of 7 y/o, characterized by an aura (“light-headedness” sensation), shortly followed by a complex partial seizure with secondarily generalization. He was tried on phenytoin, valproic acid, lamotrigine, clonazepam and clonazepam, with unsatisfactory seizure control. A combination of carbamazepine and phenobarbital led to a better control of the generalized seizures, whereas complex partial seizures still occurred monthly, usually in clusters of up to four seizures a day. Physical and neurological examinations were normal. An EEG showed left temporal interictal spikes and a brain MRI disclosed left hippocampal atrophy, consistent with the diagnosis of MTS. During VEEG monitoring, 6 complex partial seizures were recorded from the left mesiotemporal lobe.

He was then admitted to undergo left ATL. There were neither metabolic nor coagulation disorders. While supine with his head turned to the right, the patient underwent a craniotomy for a left 3 cm ATL and 3.5 cm AH. A subgaleal sucto drain was placed. At the ICU, in the immediate PO, he presented with a GCS of 8, aphasic and had a generalized tonic-clinic seizure. Diazepam 5 mg was administered intravenously, as well as, a bolus of mannitol, with improvement of consciousness. A skull CT scan disclosed laminar...
cerebellar hemorrhage, more prominent on the left cerebellar hemisphere (Fig 3). Once again, no surgical drainage was necessary. On the 7th PO day he was discharged, with no further cerebellar signs. He later returned in the out-patient clinic for reevaluation of his seizures and he has remained seizure-free on AEDs for seven months. A follow-up CT scan was obtained on the 30th PO day, showing good resolution of the cerebellar hemorrhage.

DISCUSSION

Although infrequent, cerebellar hemorrhage may be a potential complication following neurosurgical interventions. Nevertheless, its development at a distant site from the operative incision is definitively a rare situation to which attention has been drawn only in the past few years. In a retrospective survey of 4992 intracranial procedures, Kalfas and Little found 40 patients (0.8%) to present hemorrhages, 33 of them at the operative site (intracerebral, epidural, subdural or intrasellar) and 7 at a distant location. The most common etiology that led to surgical treatment was brain tumor in 56%, with meningioma as the leading pathological type.

A group analysis of 37 cases of remote intracerebral hemorrhage conducted by Brisman et al. included supratentorial hemorrhages in infratentorial craniotomies and the reverse. Seventy-eight percent of patients had symptoms suggestive of acute intracranial hypertension in the first few hours after surgery. In the setting of infratentorial hemorrhage, 81% of the patients underwent access through the deep sylvian fissure and paracallosal regions. The cerebellar vermis was the focus in 67%. Such derangements were not related to hypertension, coagulopathies or the volume of cerebrospinal fluid drainage. Fourteen percent of patients from this heterogeneous sample were disabled, and 32% died.

The specific concern of cerebellar hemorrhage after epilepsy surgery is illustrated by the reports of Toczek et al. and Yacubian et al. The former presented four patients treated with ATL and/or AH who presented uni or bilateral cerebellar hemorrhage 1 to 4 days after surgery. Blood pressure, platelets count and coagulation were normal in all patients except for one, promptly treated with anti-hypertensive drugs. Varying amounts of cerebrospinal fluid drained in the PO period (215 to 525mL) was reported as the only potentially implicated factor. One patient had a ventricle drain placed to compensate hydrocephalus, the others needed nothing but conservative measures. All of them had normal neurological examinations at one month follow-up. A series of three patients submitted to ATL/AH found similar results both on patient profile and clinical outcome. One patient did not have his lateral ventricles opened or a suctor drain in the post-operative period.

Doubt about the timing of cerebellar hemorrhage, whether intra or post-operatory, was fed by discordant data on patients who did not recover consciousness after surgery and those who, after awakening from anesthesia, re-entered coma state or developed cerebellar signs. This issue was addressed by Honegger et al. with data from a neurosurgical institution in which all patients are routinely CT scanned in the first hour after surgery. Of 1650 patients who undergone supratentorial craniotomy over a three-year period, 16 had cerebellar hemorrhage. Seven of these had been submitted to ATL/AH. In addition, out of the original ten, seven patients had an initial normal CT scan, an indicator that posterior fossa bleeding appeared over the next few hours following surgery (mean time for diagnosis: 7
hours and 35 minutes).

Systemic hypertension, the top-ranking etiologic factor of spontaneous cerebellar hemorrhage, is not related to this entity. Apparently, the same applies to coagulation disorders and anticoagulant treatment. Sodium valproate was once blamed as a cause to peri-operative excessive bleeding, but even this remote cause has been recently questioned in the literature.6

Positioning of the patient during surgery might play a secondary role in increasing venous pressure over the posterior fossa. Seoane and Rhoton7, in an elegant microsurgical anatomical study in adult cadaveric specimens, showed unilateral jugular compression, to the point of occlusion, by transverse process of C1 when the head is turned contralaterally. That perhaps would be sufficient explanation if remote cerebellar hemorrhage was secondary to virtually any surgical access based on head tilting, which certainly does not hold true on neurosurgical routine. Nevertheless, we still lack a better hypothesis, since evidence shows that most supratentorial approaches other than epilepsy surgery do not present with cerebellar bleeding. Plus, according to Kalfas and Little, the recumbent position does not seem safer than the sitting position in preventing posterior fossa bleeding.1

The most accepted theory to date underlying remote cerebellar hemorrhage is an association between liquor overdraining and the excision of non-expanding encephalic tissue. ATL/AH is commonly carried out with opening of lateral ventricles and subsequent CSF flow. Intracranial drains and suckers are part of the post-operative protocol in various institutions. Moreover, removal of a brain tumor would cause supratentorial pressure to return to near normal values, but lobectomy is an adjunct factor to create a gradient between supra and infratentorial compartments. Such pressure gradient may act as a suction mechanism over the capillary veins of cerebellum, which are then traumatized, leading to intraparenchymatous bleeding.4,5 The association of fluid overdraining and removal of non-tumorous tissue is specially prone to happen in epilepsy surgery, and this might be the reason why such complication is infrequently seen involving other neurosurgical approaches.

In conclusion, cerebellar hemorrhage in post-operative supratentorial craniotomy for epilepsy surgery constitutes a rare complication and its physiopathology is yet to be entirely understood. Some patients may not even present with clear symptomatology, and hyperdense signals on posterior fossa may be an occasional finding in follow-up CT studies. Treatment of such complication is similar to that of nontraumatic cerebellar hematomas and must be individualized. Most cases are associated with an excellent outcome.

REFERENCES
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