Remote intracranial parenchymal haematomas as complications of spinal surgery: presentation of three cases with minor or untypical symptoms

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Abstract

Introduction Intracranial haemorrhage is a rare complication of spinal surgery. Three cases of cerebral or cerebellar haemorrhages following spinal operations with CSF loss are reported, and the literature was reviewed.

Case presentations One patient suffered from melancholy after the operation, one patient had moderate headache and nausea, and the third patient suffered from mental confusion and anxiety. The intracranial haemorrhages were treated conservatively. All patients recovered from the bleedings.

Results The cases show that cerebral or cerebellar haemorrhage after spinal CSF loss may be accompanied by minor or rather untypical clinical symptoms.

Conclusion The dangerous complication of intracranial haemorrhage has to be kept in mind when patients have moderate cerebral symptoms after CSF loss due to spinal operations.

Keywords Remote cerebellar haematoma · Cerebrospinal fluid leakage · Spine surgery · Post-operative complication

Introduction

Since the first description [6] of remote cerebellar haemorrhage (RCH) as a complication of a spinal operation with

dural opening and loss of cerebrospinal fluid (CSF), several cases of cerebellar haemorrhage after spinal surgery have been reported [2, 5–12, 14, 15, 18–22, 24, 26]. In two cases, the haemorrhages occurred within the cerebellum as well as the cerebrum [19, 26]. In every case, the haemorrhage was preceded by considerable spinal loss of CSF.

Friedman et al. [9] and Konya et al. [15] reported own cases of RCH after spinal surgery and conducted thorough reviews of the literature. All patients with cerebellar haemorrhage suffered from alarming symptoms such as severe headache, cerebellar signs including ataxia or dysarthria, or reduced consciousness. All patients shared the complication of significant spinal CSF loss prior to the onset of the clinical symptoms. However, post-operative imaging of the brain is uncommon in asymptomatic patients after a spinal procedure, thus the true incidence of RCH may be higher than suggested [9, 20].

We present three patients with cerebellar and/or cerebral haematomas after loss of CSF due to spinal surgery performed in the Neurosurgical Department in Dessau, Germany. But in contrast to the previously reported cases, the presented patients had rather moderate or unspecific clinical symptoms.

Case histories

Case 1

A 61-year-old woman with a paresis of the right arm and leg underwent a resection of a thoracic intradural and extramedullary metastasis (Th 1–3) of a mamma carcinoma via a hemilaminectomy of Th 1–4. After meticulous dural repair, a suction drainage was applied. During the following night, the drainage produced 290 ml of blood and CSF

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and was removed. On the first post-operative day, the patient developed a paresis of the left arm and leg. A control MRI of the thoracic spine revealed a local epidural haematoma as the cause of the motor deficits. On the same day, the patient was re-operated and the epidural haematoma evacuated. A wound drainage without suction produced 250 ml of blood and CSF, before it was disconnected during the night after the second operation. The spinal control MRI showed a complete removal of the spinal epidural haematoma, the patient incompletely recovered from the post-operative paresis.

The patient developed neither symptoms of cerebellar damage nor any signs of increased intracranial pressure. Her consciousness was not altered, but she suffered from melancholy during further post-operative course. For this reason, 7 days after the first operation, a cranial MRI was performed (Fig. 1). Unexpectedly, the MRI revealed a cerebellar haemorrhage in the right hemisphere without enhancement after application of contrast medium. Since the haematoma did not lead to a significant compression of the surrounding structures or the fourth ventricle, no operation was mandatory. The further post-operative course was uneventful, and the patient could be treated with local spinal irradiation.

Case 2

A 69-year-old female patient underwent spinal fusion and dorsal instrumentation in the segment L4–L5 2 years ago. Spinal decompression by laminectomy of L3 and intervertebral fusion and instrumentation was now performed in the segment L3–L4 due to adjacent stenosis and instability. A minor intra-operative dural tear was scrupulously sutured. During careful inspection at the end of the operation, no further CSF leakage was observed. Therefore, the operator decided to apply two suction drainages. However, the drainages produced 900 ml of blood and CSF, rapidly and

early after the operation, before they were closed. On the first and second post-operative days, the patient had moderate headache and nausea, no further cerebral or cerebellar symptoms, no alteration of consciousness. Because the moderate headache persisted on the second postoperative day, a computed tomography (CT) and subsequently a cranial MRI were performed demonstrating two haemorrhages in the left cerebellar hemisphere and in the left temporo-occipital cortex (Fig. 2). An operation of the haematomas was not required, and the patient was monitored in the intensive care unit. After 8 days, a second lumbar operation due to a remaining stenosis revealed that the sutured CSF leak was sufficiently repaired. But there was a second CSF leak due to a formerly unrecognised dural tear adjacent to a pedicle screw. The leakage was repaired, and the patient recovered from the cranial and spinal symptoms.

Case 3

A 62-year-old woman with morbid obesity suffered from severe, multisegmental lumbar spinal stenosis. She underwent a previous decompressive stenosis operation via an interlaminar approach L4–5 one year ago. During the current operation (laminectomy and posterior instrumentation L2–4), several large dural tears due to intense dural adhesions with considerable CSF loss had to be repaired. Because of this intra-operative complication, the intended discectomy and intervertebral fusion with cages in three segments were abandoned. No drainage was applied. Post-operatively, the patient suffered from mental confusion and anxiety, but she did not complain of headache or nausea. The cranial CT on the first post-operative day, performed because of the mental confusion, revealed parieto-occipital cerebral haemorrhages as well as minor cerebellar bleedings on both sides (Fig. 3). Due to the intracranial haemorrhages, she remained on the intensive care unit, where she developed moderate headache. A further operative revision had to be performed because of a considerable persistent dural fistula, the dural defects were closed with a duraplasty. Due to severe obesity and the dural fistula, early mobilization of the patient was delayed and difficult. The further course was complicated by a nosocomial pneumonia and respiratory insufficiency. These complications (intracranial haemorrhages, repair of a large dural fistula, and respiratory insufficiency) in combination with morbid obesity led to treatment and observation in the intensive care unit for 17 days. Finally, the patient recovered completely from the mental disorders as well as post-operative pneumonia.

All three of the patients have been treated with antihypertonic medication for years prior to the operations. During the peri-operative periods, no excessive blood pressure elevations were noted. Prothrombin time and partial thromboplastin time were within normal ranges in

Fig. 1 Post-operative noncontrast MRI after resection of a thoracic intradural metastasis (Th 1–3) and re-operation due to a spinal epidural haematoma. The images show an acute haematoma in the superior parts of the cerebellum, mainly on the right side. The bleeding has a streaky pattern, which is characteristic for a remote cerebellar haematoma [6, 10]

Fig. 2 Post-operative noncontrast MRI after draining of blood and CSF following intervertebral fusion and instrumentation as well as reoperation in the segment L3–L4. The pictures demonstrate two

haemorrhages in the left cerebellar hemisphere and in the left temporo-occipital cortex

Fig. 3 Post-operative noncontrast CT after laminectomy and posterior instrumentation (L2–4) with considerable CSF loss due to several large dural tears. The scan reveals parieto-occipital cerebral haemorrhages as well as minor cerebellar bleedings on both sides. The presence of subdural air is due to the spinal dural opening. The bifrontal subdural CSF collections may be pre-existing hygromas or a consequence of CSF hypotension

all of the cases. Patients one and two had moderate thrombocytopenia (120 and 80 Gpt/l, respectively). CT- or MRI-controls were performed during the post-operative period and after discharge of the patients until the haematomas completely disappeared.

Discussion

Recently, Konya et al. [15] reported a patient suffering from RCH succeeding spinal surgery. The authors presented a detailed literature review of ten previously published cases [2, 6, 9, 10, 18, 19, 22, 26]. Two of these patients had additional supratentorial haematomas [19, 26]. The pattern of RCHs frequently differs from the mostly unilateral, compact feature of arterial bleedings. The typical bilateral bleedings, following the cerebellar folia, have been termed “zebra sign” [4].

We found two further documentations of remote cerebellar bleedings after spine surgery in the German literature [11, 24]. Since then, eight more cases of patients with cerebellar haematoma after spinal operations have been published [5 (2 cases), 7, 8, 12, 14, 20, 21].

Konya et al. [15] discussed possible pathological mechanisms underlying the occurrence of cerebellar haematomas after spinal CSF loss. Because the reported patients were operated in different positions, patient positioning did not appear to play a crucial role in the development of the bleedings. Furthermore, age, gender, type of interventions, arterial hypertension, coagulopathy, or intraparenchymal vascular malformations have not been found to be sole causes or predominant causative factors.

All previously reported cases of intracranial intraparenchymal haematomas following spine surgery as well as the currently presented patients share the problem of considerable CSF loss due to spinal surgery. Cases of intracerebral, intracerebellar, intrapontine as well as subarachnoid haemorrhages have been described following lumbar dural puncture by reason of myelography [13, 28, for review: 25], spinal anaesthesia [3, 16, 17, 23, 27, 29], or intrathecal drug administration [1]. Thus, it seems plausible that the liquor loss is the main factor that causes the cerebellar and cerebral haematomas after spine surgery. A downward dislocation of the cerebellum resulting in occlusion of cerebellar veins with consequent haemorrhagic venous infarction has been postulated [9]. Others speculated that the cerebellar haemorrhage was a consequence of reperfusion after occlusion of the superior cerebellar arteries [2]. However, the cerebellar descent seems to be the most feasible pathogenetic mechanism that can explain the bleedings in all presented cases.

In contrast to the three cases of the present publication, all formerly reported individuals with RCHs following spinal operations exhibited alarming clinical symptoms

such as severe headache, neurological deficits including ataxia, dysarthria, diplopia and tetraparesis, or decreased levels of consciousness up to comatose states.

The real incidence of intracranial haemorrhage due to intended or unintended CSF loss during spinal operations is not known because imaging of the brain is usually exclusively performed in symptomatic patients. But asymptomatic bleedings may be more often than expected [9, 20]. The three reported cases of patients with minor or atypical symptoms support this assumption.

Conclusion

The present cases show that remote cerebellar or cerebral haemorrhage has to be kept in mind when intra- or post-operative spinal CSF loss occurs, even in patients with minor headache or symptoms not typical for a cerebellar or cerebral lesion. Even after meticulous dural repair, a suction drainage should be avoided, and, if necessary, a balanced system without suction can be applied. A policy of bed rest at least for 24 h for patients after surgery with spinal liquor loss will eventually lower the risk of developing an intracranial complication and should be used.

The observation of intracranial intraparenchymal haemorrhage after spinal liquor loss in patients with minor symptoms suggests that this phenomenon may occur more frequently than expected. Therefore, we recommend the performance of a post-operative cranial CT or MRI in patients with considerable CSF loss during spinal operations and minor cerebral symptoms. In cases of atypical haematomas, the follow up investigation should be completed by MR (or CT) angiography to exclude a morphological intracranial bleeding source.

Conflict of interest None of the authors have any potential conflict of interest.

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