

Case Report

# Multiple hemorrhages in brain after spine surgery supra- and infra-tentorial components together

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Abstract

Remote cerebellar hemorrhage after cranial and spinal surgeries is a well-documented entity, so far concomitant supra- and infra-tentorial hemorrhage after spine surgery has rarely been reported in the literature. A 57-year-old woman presented with intractable low back pain and severely impaired mobility. One year ago, she underwent lumbar laminectomy and fusion with posterior spinal instrumentation between L2 and S1. She developed adjacent segment disease at the upper level of the instrumented vertebra. She had a revision surgery and underwent posterior laminectomy and fusion with bilateral transpedicular instrumentation between T10 and S1. She had severe headache, somnolence, and left hemiparesia 48 h after the surgery. Her emergent head computed tomography depicted intra-parenchymal hemorrhage in the right parietal lobe accompanying with subarachnoid hemorrhage, bilateral symmetrical cerebellar hemorrhages and pneumocephalus. She was treated nonsurgically and she got better despite some residual deficits. Symptoms including constant headache, nausea, vomiting, impaired consciousness, new onset seizure, and focal neurological deficit after spine surgeries should raise suspicion for intracranial intra-parenchymal hemorrhage.

**Key words:** Cerebrospinal fluid, intracranial hemorrhage, spine, surgery

INTRODUCTION

Postoperative remote intracranial hemorrhage has the same risk factors as nontraumatic intracranial bleeding: Hypertension, coagulopathy, anticoagulant therapy, and vascular disorders.<sup>[1]</sup> Remote intracranial hemorrhage, particularly cerebellar hemorrhage after spine surgery, has been well-documented in the literature.<sup>[2-6]</sup> However, concomitant

supra- and infra-tentorial intra-parenchymal hemorrhage after spine surgery is very rare, since 7 cases were reported in the literature.<sup>[7-13]</sup>

We present a 57-year-old female with intracranial multiple hemorrhages after spine surgery and we discuss diagnosis,

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patho-mechanism, and treatment approaches with a review of the relevant data in the literature.

## CASE REPORT

A 57-year-old female presented with intractable low back pain and severely impaired mobility. One year ago, she underwent lumbar laminectomy and fusion with posterior spinal instrumentation between L2 and S1. Her motor strength was 4/5 in her lower limbs, and she had decreased sensation in bilateral dermatomes from L1 to S1. She developed adjacent segment disease at the upper level of the instrumented vertebra [Figure 1a]. Then, she had a revision surgery of posterior laminectomies (T11-L1) and posterior spinal fusion with bilateral transpedicular instrumentation from T10 to S1 [Figure 1b]. A hemovac drain was placed into the epidural space.

Postoperative neurological examination and laboratory values were within normal limits. However, she had severe headache, somnolence, and left hemiparesia 48 h after the surgery. Her emergent head computed tomography revealed intraparenchymal hemorrhage in the right parietal lobe accompanying with subarachnoid hemorrhage, bilateral symmetrical cerebellar hemorrhages and pneumocephalus [Figure 2]. The hemovac drain was removed and the drain exit site was closed with a single suture. The patient was admitted to Intensive Care Unit and managed nonsurgically. She received both antiedema (4 mg dexamethasone intravenous [IV.] every 6 h) and antiepileptic treatment (500 mg levitracetam IV. every 12 h). She improved neurologically and received in-patient rehabilitation. She developed no further complications or additional neurological deficits. However, her cognitive impairment, residual dysphagia, and neurogenic bladder were still present. She was referred to a nursery clinic for ongoing rehabilitation. She died of aspiration pneumonia and sepsis 3 months after the last surgery.

## DISCUSSION

Over-drainage of cerebrospinal fluid (CSF) resulting in remote cerebellar hemorrhage (RCH) has been well-documented in the

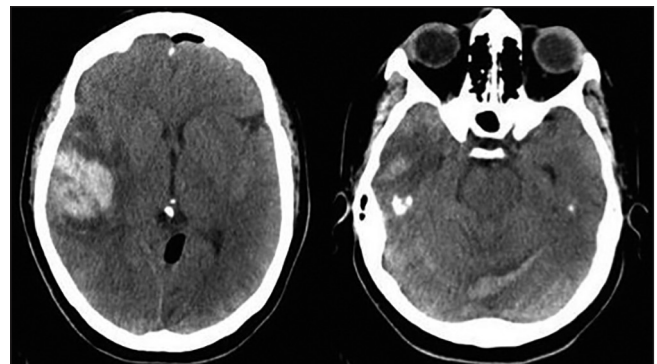


**Figure 1:** Adjacent segment disease is observed at the proximal junction of the instrumentation (a). Lateral spinal X-ray after revision surgery (b)

literature.<sup>[3,9]</sup> RCH is associated with cranial and less with spinal surgeries (100 vs. 15 cases in the literature).<sup>[7,8,14-17]</sup> However, concomitant supra- and infra-tentorial intra-parenchymal hemorrhage after spine surgery is very rare; only 7 cases were reported in the literature [Table 1].<sup>[7-13]</sup> Female:male ratio is 6:2 and the median age is 52.5 years (range = 28-69 years) for patients with concomitant supra- and infra-tentorial intra-parenchymal hemorrhage after spine surgery. These patients underwent spinal surgery for spondylopathic myelopathy, spinal canal stenosis, intervertebral disc herniation, failed back surgery, chordoma, and intradural extramedullary spinal tumor. Signs and symptoms for the intra-parenchymal hemorrhage were headache, nausea, seizure, hemiparesia, delayed arousal from anesthesia, impaired consciousness, dysarthria, dysphasia, lethargy, hypotonia, dysmetria, adiadochokinesia, and dilated nonreactive pupils. These signs and symptoms developed within seconds to 2 days after the spine surgery. None of the surgical levels was more risky than another.

One of the theories for intracranial hemorrhage after CSF leakage in spine surgery suggests that intra-luminal pressure in vessels increases and ruptures the vessels.<sup>[15]</sup> Subdural hematoma develops, when large venous sinuses rupture.<sup>[18]</sup> The second theory suggests that the inferior displacement of cerebellum causes the entrapment of venous sinuses between the cerebellum and skull base. Therefore, the venous infarction of the brain parenchyma occurs.<sup>[15,19]</sup> The third theory is associated with the second one. However, the third one suggests that massive loss of CSF causes acute occlusion of the intracranial bridging veins.<sup>[7,9]</sup> In a postmortem case study, Cornips *et al.* demonstrated many occluded small veins.<sup>[13]</sup> Massive loss of CSF has been considered a risk factor for more devastating intracranial hemorrhage.<sup>[9]</sup>

In 8 patients with concomitant supra- and infra-tentorial hemorrhage after spine surgeries, 2 patients underwent spinal dural repair and 6 patients were treated nonsurgically (in one case, family refused any further surgery).<sup>[7-13]</sup> Two patients died of brain herniation and 1 patient died of aspiration pneumonia and sepsis.<sup>[12,13]</sup> Four patients totally recovered and 1 patient partially recovered with residual findings.<sup>[7-11]</sup>



**Figure 2:** Intra-parenchymal hemorrhages in right parietal lobe and bilateral cerebellum accompanied with pneumocephalus and subarachnoid hemorrhage

**Table 1: Concomitant supra-and infra-tentorial intra-parenchymal hemorrhages after spine surgery in the literature**

Authors/ year	Age (year)/ gender	Signs and Symptoms	Neurological findings	Spinal diagnosis	Spinal level	Cranial findings for intracranial hemorrhages	Symptom onset for intracranial hemorrhages (days)	Dural tear	Treatment	Follow-up
Morandi et al./2001	34/male	Pain in right arm radiating to hand and fingers	Decreased light touch and pinprick in C8-T1 dermatomes	Intradural extramedullary tumor	C7-T1	Difficult arousal from anesthesia, dysarthria, lethargy, hypotonia, dysmetria, adiadochokinesia	Immediately	Intradural tumor removal*	Nonsurgical	Recovery
Thomas et al./2002	38/female	Low back pain, decreased strength and sensation in right leg	4/5 strength, decreased patellar and ankle reflexes, decreased sensation in L4-S2 dermatomes of right leg	Schwannoma	T11-L1	Headache, nausea	Immediately	Intradural tumor removal*	Nonsurgical	Recovery
Cornips et al./2007	48/female	Progressive gait disturbance, numbness in right leg and left foot, burning sensation in buttocks, pain in the middle and lower thoracic spine	Axial T8-9 pain with decreased sensation in right lower leg and right foot	Intervertebral disc herniation	T8-T9	Headache, dysphasia	Immediately	Not observed	Nonsurgical (severe deterioration with devastating brain damage in short-term)	Died
Bowers et al./2011	64/female	N/A	N/A	Recurrent chordoma	Sacrum	Seizure, headache	2	Present	Dural repair (primary, dural graft, fibrin glue)	Recovery
Takahashi et al./2012	69/female	Numbness in hands, gait instability	N/A	Spondylopathic myelopathy	C3-C7	Impaired consciousness	Immediately	Present	Nonsurgical	Partial recovery
You et al./2012	63/male	Pain in buttocks, claudication with walking	N/A	Intervertebral disc herniation, failed back syndrome	L3-S1	No cranial findings after the spinal surgery, yet headache occurred after surgery for dural closure	Immediately after the 2 <sup>nd</sup> surgery	Present	Dural repair (primary)	Recovery
Leung et al./2014	28/female	Acute onset bilateral lower extremity weakness	Muscle strength 1/5 in bilateral lower limbs, sensory level at T10 dermatome, acute urinary retention	Ewing's sarcoma	T4-T5	Dilated nonreactive pupils	Immediately	Intra-dural tumor removal*	Family refused a second surgery due to poor prognosis of her disease	Died 2 days after the surgery
Present case	57/female	Low back pain and impaired functional mobility	Motor strength 4/5 in bilateral lower limbs, and decreased sensation in bilateral L1-S1 dermatomes	Adjacent segment disease	T10-S1	Headache, impaired consciousness, left hemiparesis	2	Not observed	Nonsurgical	Died of aspiration pneumonia and sepsis 3 months after the surgery

\*CSF leakage was not mentioned after dural closure. N/A = not available; CSF = Cerebrospinal fluid

## CONCLUSION

Symptoms including constant headache, nausea, vomiting, impaired consciousness, new onset seizure and focal neurological deficit after spine surgeries should raise the suspicion of intracranial intra-parenchymal hemorrhage. Intracranial intra-parenchymal hemorrhage should be evaluated neuro-radiologically to determine the severity and to treat patient surgically or nonsurgically in a timely manner.

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## Conflicts of interest

There are no conflicts of interest.

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