CASE REPORT

Coma from wall suction-induced CSF leak complicating spinal surgery

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SUMMARY

A 72-year-old woman was admitted for elective L4/L5 laminectomy. The operative procedure was extradural, and a Jackson-Pratt (JP) drain was placed in the tissue bed and set to wall suction during skin closure. During closure, the patient developed a 15 s period of asystole. The patient was haemodynamically stable, but was comatose for 3 days postoperatively. Cardiac enzymes and EEG were unrevealing. Head CT showed traces of subarachnoid haemorrhage and signs suggestive of cerebral anoxia. JP drain at the incision produced 170–210 mL/day of fluid, positive for β -2 transferrin, indicating cerebrospinal fluid (CSF). The patient fully returned to baseline on hospital day 10. MRI on hospital day 8 normalised. The reversible coma and radiographic findings were most consistent with acute intracranial hypotension relating to acute loss of CSF. Because radiographic findings can mimic hypoxic-ischaemic injury, acute intracranial hypotension should be considered in the differential diagnosis of postoperative coma after cranial or spinal surgery.

BACKGROUND

Elective spinal surgery is a common procedure in the USA and around the world. Although subacute and chronic intracranial hypotension are common and familiar, abrupt catastrophic intracranial hypotension is rare. Because radiographic findings mimic hypoxic-ischaemic injury, the correct diagnosis might be missed. Our case represents the first known report of reversible coma from intracranial hypotension associated with wall suction and lumbar spinal surgery.

CASE PRESENTATION

A 72-year-old woman was admitted to the hospital for elective L4/L5 laminectomy with facet cyst removal. She had a history of spinocerebellar ataxia type 3 (Machado-Joseph disease), causing chronic ataxia and diplopia. She walked with a cane but was otherwise fully independent.

General anaesthesia was administered with the sequence of ketorolac, midazolam, propofol, remifentanyl, vecuronium and sevoflurane. The operative procedure was extradural, and no cerebrospinal fluid (CSF) leak was noted in the surgical bed. A Jackson-Pratt (JP) drain was placed in the tissue bed and set to wall suction during skin closure. During closure, the patient developed asystole. Atropine was given, and a perfusing sinus rhythm returned within 15–30 s. Subsequent neurological examination revealed no motor response to sternal rub despite reversal of neuromuscular blockade

confirmed by train-of-four testing. Flumazenil was given without improvement. The patient exhibited generalised rhythmic posturing which abated with propofol.

Non-contrast head CT revealed subarachnoid haemorrhage in the interpeduncular cistern and hyperdensity of the tentorium suggestive of tentorial engorgement with acute venous haemorrhage (figure 1A). Neurological examination was notable for coma. She was unable to follow verbal commands. There were no cranial nerve abnormalities. She exhibited localising movement of upper and lower extremities to noxious stimulation.

INVESTIGATIONS

EEG monitoring revealed generalised irregular δ and θ slowing without epileptiform features. CT angiogram showed no vessel abnormality. Non-contrast head CT performed 6 h after the event showed symmetric loss of grey–white differentiation of the basal ganglia and internal capsule with reduced ventricular size suggestive of cerebral anoxia and oedema (figure 1B). Intracranial pressure monitoring recorded negative values. A JP drain at the incision site produced 170–210 mL/day of serosanguinous fluid, positive for β -2 transferrin, indicating CSF.

DIFFERENTIAL DIAGNOSIS

Acute intracranial hypotension: most likely based known spinal CSF leak, neuroimaging and reversibility of coma.

Acute brainstem infarction: no evidence for brainstem infarction was seen on MRI of the brain. Seizure: continuous EEG monitoring was without epileptiform activity.

Anoxic brain injury: reversibility of the patient's coma and imaging findings makes this an unlikely diagnosis. The patient's episode of asystole was brief and without significant haemodynamic compromise, and therefore it would be unlikely to result in the clinical scenario and imaging findings presented here.

TREATMENT

The JP drain was removed on postoperative day 2. The patient remained intubated in the neuroscience intensive care unit with the head of bed flat to promote dural closure. On postoperative day 3, she began to follow simple commands. The head of the bed was elevated on postoperative day 5, and she was extubated. The patient's neurological examination returned to baseline over the next 5 days. She did not require duraplasty or blood patch.

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Figure 1 Images suggesting acute intracranial hypotension. (A) Axial unenhanced CT with hyperdensity within the interpeduncular cistern and overlaying the tentorium. (B) Axial unenhanced CT at interval of 6 h with slit ventricles and loss of deep nuclei differentiation. (C) Axial T2-weighted MRI with dilated dural veins at the cervicomedullary junction. (D) Axial T2/fluid-attenuated inversion recovery MRI with hyperintensity in deep mid-line nuclei. All changes normalised on repeat imaging.

OUTCOME AND FOLLOW-UP

The patient was discharged to acute rehabilitation on hospital day 13, and eventually returned home where she resumed her prior activities of daily living.

DISCUSSION

Our case represents the first known report of reversible coma from intracranial hypotension associated with wall suction and lumbar spinal surgery. Wall suction via the JP drain, utilised only briefly during wound closure, most likely induced a dural tear or exacerbated an occult CSF leak.

CSF leak, a known complication of spine surgery, is typically obvious to the surgeon as a show of clear fluid in the surgical bed. Prior reports of postoperative CSF leak describe loss of deep grey–white differentiation suggesting cerebral anoxia.^{1 2} The degree and duration of intracranial hypotension may be severe enough to result in cerebellar oedema with herniation,

mesencephalic infarction and death.^{3 4} Space occupying cerebellar haemorrhage and herniation may also occur.⁵

The Monro-Kellie doctrine holds that loss of CSF from the cranial cavity should lead to a compensatory inflow of venous blood. Evidence of venous engorgement can be seen in our case as hyperdensity of the tentorial dura (figure 1A), and as visibly dilated dural veins (figure 1C). Haemorrhage in the interpeduncular fossa (figure 1A) was likely due to leakage of engorged veins or tearing from direct downward traction with acute CSF loss. Oedema of deep structures (figure 1B,D) was likely due to engorgement of the deep cerebral venous system rather than hypoxia.

Coma in acute intracranial hypotension may occur as a result of brainstem traction or from deep venous engorgement. Other authors have found demonstrable downward displacement of deep brain structures with JP suction in the setting of cranial surgery.⁶ Such changes were not present in our case. Asystole at the time of wall suction likely occurred from the sudden forceful vacuum effect of wall suction, causing brainstem traction,

and excessive outflow from parasympathetic neurons in the nucleus ambiguus. Witnessed adventitious movements were likely posturing from dysfunction of brainstem and deep cerebral structures.

Although subacute and chronic intracranial hypotension are common and familiar, abrupt catastrophic intracranial hypotension is rare. Because radiographic findings mimic hypoxic-ischaemic injury, the correct diagnosis might be missed. Acute intracranial hypotension should be considered in the differential diagnosis of postoperative coma after cranial or spinal surgery. Careful determination of pathophysiology in coma has major implications for treatment and prognosis. Wall suction via JP drains should not be used to avoid this severe complication.

Learning points

- ▶ Acute intracranial hypotension should be considered in the differential diagnosis of postoperative coma after cranial or spinal surgery.
- ▶ Careful determination of pathophysiology in coma has major implications for treatment and prognosis.
- ▶ Wall suction via JP drains during spinal surgery should not be used to avoid this severe complication.

Contributors CRF conceptualised, devised, drafted and revised the manuscript. AR drafted and revised the manuscript. SKF conceptualised, drafted and revised the manuscript.

Competing interests None.

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