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Case Report

Posterior reversible encephalopathy syndrome following spine surgery: A case report and review of the literature ☆,☆☆

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ABSTRACT

Posterior reversible encephalopathy syndrome (PRES) following spine surgery was first documented in 2011. Reports have been rare, and sufficient consensus has not been established for clinical application. We presented a case of PRES following spine surgery. The patient was a 35-year-old woman with a history of hypertension who successfully received microendoscopic L5-S1 lumbar discectomy for lumbar disc herniation at L5-S1 under general anesthesia. Six hours after surgery, she suffered from headache, nausea, visual disturbance, and seizures. Magnetic resonance imaging revealed vasogenic edema in the occipital lobe, and she was diagnosed with PRES. Prompt symptomatic treatment resulted in a full recovery at 3 days after surgery. Subsequently, we reviewed the literature pertaining to PRES following spine surgery. The review of the relevant literature on PRES following spine surgery identified 12 cases (male, n = 2; female, n = 10; average age, 59.5 years). Approximately 92% patients received multi-level decompressive laminectomy and/or fusion. This case and the review of the relevant literature suggest that even minimally invasive spine surgery in a young woman with specific characteristics (eg, hypertension) can cause PRES.

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Introduction

Posterior reversible encephalopathy syndrome (PRES) is a clinical-radiological syndrome, characterized by reversible vasogenic edema in the posterior circulation territory [1]. This syndrome was first described in 1996 [2], and evidence has been well established in the last 2 decades [1]. Risk factors typically include hypertension, pregnancy and puerperal diseases, organ transplantation, immunosuppressive agents or cytotoxic agents, kidney disease, autoimmune disease, infection, and endocrine disease. The symptoms typically include encephalopathy, seizures, headache, visual symptoms, and focal neurologic deficits. PRES is completely curable after prompt symptomatic treatment (eg, antihypertension) in most cases; otherwise, it could result in permanent neurologic deficits or death. In contrast, PRES following spine surgery was first documented in 2011 [3–13]. Reports on this condition have been rare, and sufficient consensus has not been established for clinical application. We herein report a rare case of PRES following spine surgery and discuss currently available evidence on this condition compiled from cases published in the relevant literature.

Case report

A 35-year-old woman presented with sudden-onset dysuria and difficulty walking due to worsening left lateral leg pain. She had a history of untreated prehypertension and pregnancy-induced hypertension. Magnetic resonance imaging (MRI) revealed lumbar disc herniation at L5-S1 and associated compression of the left L5 nerve root. At a later date, she was admitted to our hospital and successfully underwent microendoscopic L5-S1 lumbar discectomy under general anesthesia. Immediately after surgery, she was able to move her lower limbs without any sensory disturbance, and her lateral leg pain was relieved.

Six hours after surgery, she complained of acute severe headache, nausea, and bilateral visual disturbance. A physical examination revealed hypertension (systolic blood pressure ≥200 mmHg) without any positive symptoms (eg, paralysis or anisocoria). The results of immunological blood tests were normal. Head computed tomography revealed no cerebral hemorrhage (Fig. 1A). Head MRI showed multiple areas of high signal intensity with cortical and subcortical predominance in the bilateral parietal to occipital lobes on T2-weighted imaging (Fig. 1B). After these examinations, she developed bilateral tonic seizures followed by impaired consciousness. Subsequently, right conjugate deviation and spasms of the right upper and lower limbs were observed. She was then diagnosed with PRES, and received intravenous diazepam, nicardipine, and fosphenytoin.

Fifteen hours after surgery, she was conscious and responsive. Physical examinations revealed mild foggy vision, but did not find motor deficits in the extremities, speech impairment, headache, or hypertension (systolic blood pressure, 120 mmHg). On the third day after surgery, she had fully recovered. On the sixth day after surgery, follow-up MRI of the head showed improvement of the occipital lobe lesions (Fig. 1C). On the seventh day after surgery, she was discharged. At 1 month after surgery, there had been no recurrence of PRES.

Discussion

We report a rare case of PRES following spine surgery. Subsequently, we reviewed the literature pertaining to PRES following spine surgery. Relevant peer-reviewed articles published in the English language (as of January 2011) were retrieved from PubMed and Google Scholar. The reference lists of publications identified through the database search were also screened.

A total of 12 cases (male, n = 2; female, n = 10; average age, 59.5 years [range, 14-82 years]) of PRES following spine surgery were identified in 11 articles [3–13]. Regarding comorbidities, many of the patients had hypertension (58.3%). Spine diseases included scoliosis (33.3%) and spinal canal stenosis (33.3%). Regarding spine surgeries, most patients received multi-level decompressive laminectomy and/or fusion (91.7%). Symptoms of PRES included visual loss (83.3%), seizure (50.0%), hypertension (50.0%), disorientation (41.7%), and headache (33.3%). Treatments for PRES included antiepileptic (50.0%) and antihypertensive (41.7%) drugs. Regarding the clinical outcome, most patients made a full recovery (91.7%).

We found some common clinical characteristics between our report and previous reports. First, PRES was related to pregnancy-induced hypertension [4–10,12,13] and/or a medical history of hypertension [3–7,9–11]. These clinical characteristics may be related to post-operative collapse of circulatory regulation, leading to PRES [3–13]. Second, PRES was related to early-onset after surgery (ie, from 30 minutes to 24 hours after surgery) [3,6,9–11,13]. Possible surgery-related mechanisms include decompressed peripheral blood vessels, sympathetic dysreflexia due to dorsal cord injury/compression, cerebrospinal fluid leakage, general anesthetic agents, and hypertension due to postoperative pain [3–13], all of which may involve collapsed circulatory regulation and an associated loss of cerebral autoregulation. Third, PRES was related to visual loss, seizure, hypertension, disorientation, and headache in the early postoperative period. These symptoms may be induced by vasogenic edema caused by collapsed circulatory regulation in the posterior circulation of the brain, which is involved in vision and related increased intracranial pressure [3–13]. Fourth, PRES was completely curable within one month by prompt symptomatic treatment, such as the administration of antiepileptic and antihypertensive drugs [3–13]. Nevertheless, some patients with PRES have irreversible brain damage if treatment is delayed [10].

We should keep the differential diagnoses of the symptoms in mind. Early postoperative headache may suggest the possibility of remote intracranial hemorrhage due to dural injury [14]. Postoperative visual impairment may suggest the possibility of ischemic optic neuropathy, central retinal vessel occlusion, and posterior cerebral infarction [15]. Postoperative hypertension is one of the symptoms of PRES with spinal cord

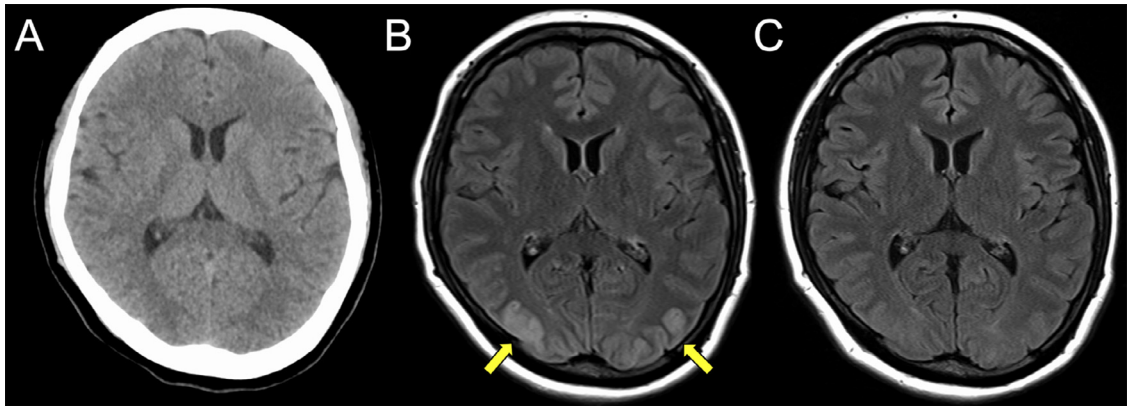

Fig. 1 – A head computed tomography scan obtained 6 hours after surgery showed no significant findings (A). T2-weighted magnetic resonance imaging of the head obtained 6 hours after surgery revealed multiple areas of high signal intensity with cortical and subcortical predominance in the bilateral parietal to occipital lobes (yellow arrow) (B). Follow-up head magnetic resonance imaging 6 days after surgery showed the improvement of the occipital lobe lesions (C).

involvement [16]. Therefore, in addition to CT, MRI is required to distinguish these diseases.

Importantly, this case differed from previously reported cases from the viewpoint of age and the invasiveness of surgery. The average age of patients with PRES following spine surgery was roughly 60 years. Although Gopalakrishnan et al. [8] reported the exceptional case of 14-year-old girl who suffered from PRES after spine surgery, they performed invasive surgery (T4-T7 laminectomy and the excision of a soft tissue lesion, re-exploration, and evacuation of a hematoma). Furthermore, most patients received multi-level decompressive laminectomy and/or fusion. Delgado-López et al. [9] reported an exceptional case of PRES following minimally invasive spine surgery, but the patient was 82 years of age. Therefore, clinicians should retain an index of suspicion for this rare condition when a patient presents visual impairment and hypertension, even after minimally invasive spine surgery and even when the patient is young.

The present case-based review includes some major limitations that affect the generalizability of our results. First, there may be an English language bias and database bias, as we selected English language articles in PubMed and Google Scholar. Second, there may be a publication bias, as we did not include unpublished or gray literature.

In conclusion, this case and our review of the relevant literature suggest that even minimally invasive spine surgery in a young woman with specific characteristics (eg, hypertension) can cause PRES.

Author contributions

Misaki Matsuo and Takaomi Kobayashi equally contributed to this work (wrote and prepared the manuscript). All authors have read, reviewed, and approved the article.

Ethical committee approval

None (because a case report and review of the literature is not research that must be approved by the institutional review board).

Patient consent

Written informed consent for the publication of this case report was obtained from the patient.

REFERENCES

[1] Liu C, Cao J, Su Z, Xu S. Isolated brainstem involvement in posterior reversible encephalopathy syndrome: a case report and review of the literature. Int J Neurosci 2019;129(8):808–13. doi:10.1080/00207454.2018.1561452.

[2] Hinchey J, Chaves C, Appignani B, Breen J, Pao L, Wang A, et al. A reversible posterior leukoencephalopathy syndrome. N Engl J Med 1996;334(8):494–500. doi:10.1056/NEJM199602223340803.

[3] Barbara DW, Smith BC, Onigkeit JA. Posterior reversible encephalopathy syndrome as a cause of postoperative blindness. Anesthesiology 2012;116(2):472. doi:10.1097/ALN.0b013e3182315ed0.

[4] Valone F 3rd, Lieberman JA, Burch S. Postoperative blindness due to posterior reversible encephalopathy syndrome following spine surgery: a case report and review of the literature. JBJS Case Connect 2014;4(2):e30. doi:10.2106/JBJS.CC.M.00222.

[5] Kueper J, Loftus ML, Boachie-Adjei O, Lebl D. Posterior reversible encephalopathy syndrome: temporary visual loss after spinal deformity surgery. Am J Orthop (Belle Mead NJ) 2015;44(11):E465–8.

[6] Yi JH, Ha SH, Kim YK, Choi EM. Posterior reversible encephalopathy syndrome in an untreated hypertensive patient after spinal surgery under general anesthesia—a case report. Korean J Anesthesiol 2011;60(5):369–72. doi:10.4097/kjae.2011.60.5.369.
[7] Vakharia K, Siasios I, Dimopoulos VG, Pollina J. Posterior reversible encephalopathy syndrome resolving within 48 hours in a normotensive patient who underwent thoracic spine surgery. J Clin Med Res 2016;8(3):263–6. doi:10.14740/jocmr2472w.
[8] Gopalakrishnan CV, Vikas V, Nair S. Posterior reversible encephalopathy syndrome in a case of postoperative spinal extradural haematoma: case report and review of literature. Asian Spine J 2011;5(1):64–7. doi:10.4184/asj.2011.5.1.64.
[9] Delgado-López PD, Garcés-Pérez G, García-Carrasco J, Alonso-García E, Gómez-Menéndez AI, Martín-Alonso J. Posterior reversible encephalopathy syndrome with status epilepticus following surgery for lumbar stenosis and spondylolisthesis. World Neurosurg 2018;116:309–15. doi:10.1016/j.wneu.2018.05.174.
[10] Shields LB, Johnson JR, Shields CB. Posterior reversible encephalopathy syndrome following a thoracic discectomy-induced dural leak: case report. J Neurosurg Spine 2016;25:586–90. doi:10.3171/2016.4.SPINE1623.
[11] Ibrahim TF, Sweis RT, Nockels RP. Reversible postoperative blindness caused by bilateral status epilepticus amauroticus following thoracolumbar deformity correction: case report. J Neurosurg Spine 2017;27(1):63–7. doi:10.3171/2016.12.SPINE16540.
[12] Arasu M, Swaminathan S, Kannamani B, Elakkumanan LB. Posterior reversible encephalopathy syndrome causing transient postoperative blindness following spine surgery. J Neuroanaesthesiol Crit Care 2021;09(00):1–2. doi:10.1055/s-0041-1731919.
[13] Porter M, Schmitz MA. Posterior reversible encephalopathy syndrome with postoperative hematoma after C4-C6 spinal fusion: a case report. JBJS Case Connect 2022;12(2). doi:10.2106/JBJS.CC.21.00700.
[14] Morimoto T, Shiraki M, Otani K, Sonohata M, Mawatari M. Supratentorial subdural hemorrhage of a previous head injury and cerebellar hemorrhage after cervical spinal surgery: a case report and review of the literature. Spine (Phila Pa 1976) 2014;39(12):E743–7. doi:10.1097/BRS.0000000000000323.
[15] Nickels TJ, Manlapaz MR, Farag E. Perioperative visual loss after spine surgery. World J Orthop 2014;5(2):100–6. doi:10.5312/wjo.v5.i2.100.
[16] Liu L, Dai D, Cao F, Zhang L, Wang X. Posterior reversible encephalopathy syndrome with spinal cord involvement but without hemisphere lesions: a case report. Medicine (Baltimore) 2019;98(2):e13649. doi:10.1097/MD.0000000000013649.