

# Pituitary apoplexy following lumbar fusion surgery in prone position

## A case report

Chunghee Joo, MD, Geol Ha, MD, Yeon Jang, MD, PhD\*

### Abstract

**Rationale:** Pituitary apoplexy (PA) is a syndrome caused by acute hemorrhage or infarction of the pituitary gland, generally within a pituitary adenoma. PA following spinal surgery is a very rare complication and may be difficult to diagnose. However, early diagnosis of PA is essential for the timely treatment of pan-hypopituitarism and prevention of severe neurologic complications.

**Patient concerns:** A 73-year-old man had a posterior lumbar fusion surgery over a period of 8 hours on prone position. The patient complained of severe intractable headache accompanied by ophthalmalgia and ptosis on right eye 2 days after the surgery.

**Diagnosis:** Brain magnetic resonance imaging revealed a 1.3 × 2.6 × 2 cm mass in the sellar fossa and suprasellar region and the laboratory tests indicated pan-hypopituitarism.

**Interventions:** High-dose intravenous steroid therapy and trans-sphenoidal hypophysectomy were performed.

**Outcomes:** Pathological evaluation of the surgical specimen revealed a pituitary adenoma with total necrosis, indicating that the PA occurred because of tumor infarction. The patient recovered fully after resection of the pituitary adenoma and hormonal therapy.

**Lessons:** Even though the incidence is low, PA has been related to blood pressure fluctuations or vasospasm during surgery. PA should be considered during differential diagnosis in cases of postoperative severe headache or ophthalmic complications.

**Abbreviations:** BP = blood pressure, CT = Computed tomography, HR = heart rate, ICP = intracranial pressure, MRI = magnetic resonance imaging, PA = Pituitary apoplexy, POD = post-operative day.

**Keywords:** headache, pituitary adenoma, pituitary apoplexy, spinal surgery

## 1. Introduction

Pituitary apoplexy (PA) is a syndrome caused by acute hemorrhage or infarction of the pituitary gland, generally within a pituitary adenoma. The diagnosis of PA is often complicated by the fact that the preexisting pituitary tumor is undiagnosed in 80% of cases.<sup>[1]</sup> Although the exact pathophysiology of PA is unknown, predisposing factors include many types of surgery.<sup>[1]</sup> PA following spinal surgery is a rare complication during the immediate postoperative period<sup>[2]</sup>; here we describe a case of PA following posterior lumbar fusion surgery.

## 2. Case report

A 73-year-old male patient (height, 166.4 cm; weight, 70.8 kg) with persistent back pain was admitted to our hospital for spinal surgery. He had a 5-year history of hypertension, which was managed with atenolol (50 mg), amlodipine besylate (5 mg), and tamsulosin (5 mg). Preoperative blood pressure (BP) was 123/84 mmHg, and heart rate (HR) was 62 beats/minute. Preoperative laboratory test results were all within the normal range. General anesthesia was induced by the administration of 10% desflurane, 60 mg of lidocaine, 150 mg of propofol, and 50 mg of rocuronium; anesthesia was maintained with 8% desflurane. An intra-arterial catheter was placed for continuous BP monitoring. Thirty minutes after prone positioning, BP and HR decreased to 83/50 mmHg and 55 beats/minute, respectively, for <5 minutes before successful management with ephedrine (5 mg). Fifty minutes after induction, BP and HR decreased again to 78/39 mmHg and 53 beats/minute, respectively, and ephedrine was re-administered. After the 2 short episodes of hypotension, dopamine was continuously infused at 9.0 µg/kg/min to maintain an arterial BP of approximately 100/60 mmHg during surgery. Oxygen saturation and end tidal CO<sub>2</sub> values were within normal range throughout anesthesia. An extended decompressive laminectomy and spinal fusion of L2 to S1 was performed during a period of 8 hours. The patient's preoperative hemoglobin level was 11.7 g/dL; intraoperative lowest hemoglobin level was 11.6 g/dL. Blood loss was estimated to be 1000 mL and was replaced with 6100 mL of crystalloid fluid and 2 units of packed red blood cells and fresh frozen plasma. On arrival in the post-anesthesia care unit, the patient's BP, HR, and arterial oxygen saturation

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Department of Anesthesia and Pain Medicine, Incheon St. Mary's hospital, College of Medicine, The Catholic University of Korea, Incheon, Republic of Korea.

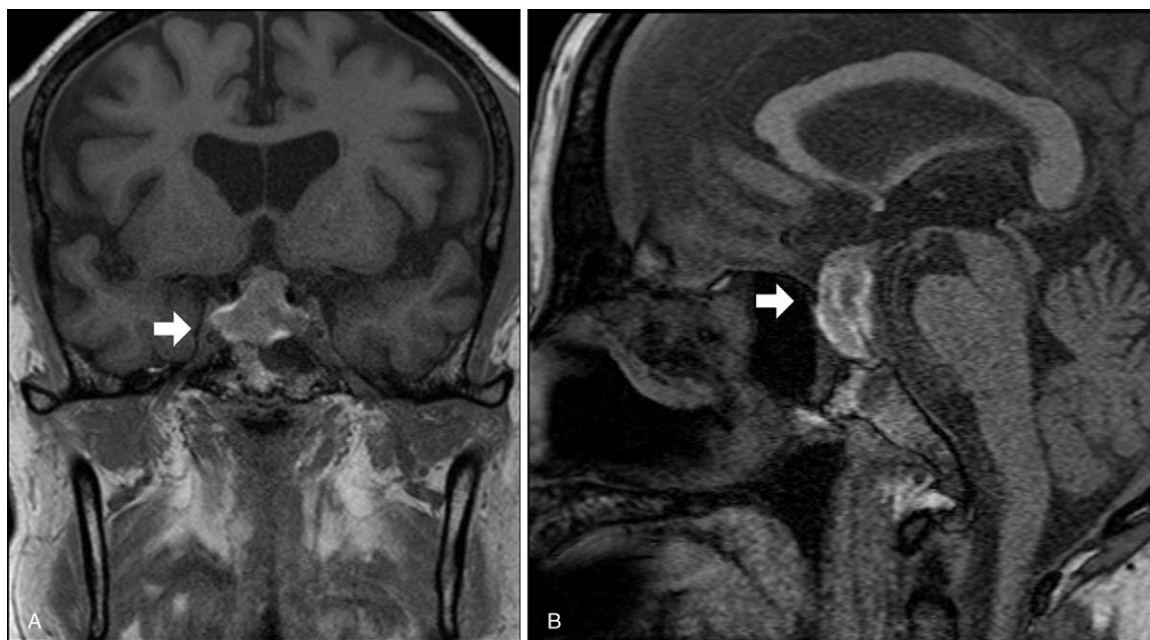
\* Correspondence: Yeon Jang, Department of Anesthesia and Pain Medicine, Incheon St. Mary's hospital, College of Medicine, The Catholic University of Korea, 56, Dongsu-ro, Bupyeong-gu, Incheon 21431, Republic of Korea (e-mail: anesjang@catholic.ac.kr).

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**Figure 1.** Preoperative (before hypophysectomy) contrast-enhanced sellar MRI (A: coronal, B: sagittal) showing 1.3 × 2.6 × 2.0 cm sized pituitary lesion (white arrow) extruding from sellar fossa and suprasellar region and pressing the optic chiasm.

were within the normal range, with no requirement for dopamine infusion or oxygen therapy. On post-operative day (POD) 1, the patient complained of moderate intensity headache, which was persistent and did not improve after treatment with nonsteroidal anti-inflammatory drug, ketorolac. On POD 2, the patient complained of severe intensity headache in the frontal and temporal region, accompanied by ophthalmalgia and nausea. On physical examination, ptosis and anisocoria on right eye (right pupil; dilated and poorly responsive to light) were seen. However, there was no visual field defect or decreased visual acuity. Computed tomography (CT) of the head and brain magnetic resonance imaging (MRI) revealed a 1.3 × 2.6 × 2 cm mass in the sellar fossa and suprasellar region, extending to the optic chiasm, and calcific plaques in the bilateral distal internal carotid artery (Fig. 1A and B). The results of laboratory tests indicated pan-hypopituitarism (thyroid-stimulating hormone, 0.14 uIU/mL [reference, 0.34–5.6]; free T4, 0.55 ng/dL [reference, 0.58–1.64]; testosterone, 0.01 ng/mL [reference, 1.75–7.81]; adrenocorticotropic hormone, 1.14 pg/mL [reference, 5–60]). Based on these findings, the patient was diagnosed as having PA accompanied by right third cranial nerve palsy. High-dose intravenous steroid therapy (hydrocortisone 300 mg/day) was therefore initiated. After the medical conservative treatments, his general condition was recovered. However, the symptoms of ptosis and headache remained unchanged. On POD 14, the patient underwent successful trans-sphenoidal hypophysectomy (Fig. 2A and B). Pathological evaluation of the surgical specimen revealed a pituitary adenoma with total necrosis, indicating that the PA occurred because of tumor infarction. The patient was discharged on POD 18 after trans-sphenoidal hypophysectomy. Eight weeks after surgery, ptosis and anisocoria improved and the patient's general status was good; MRI showed no recurrence of the pituitary tumor.

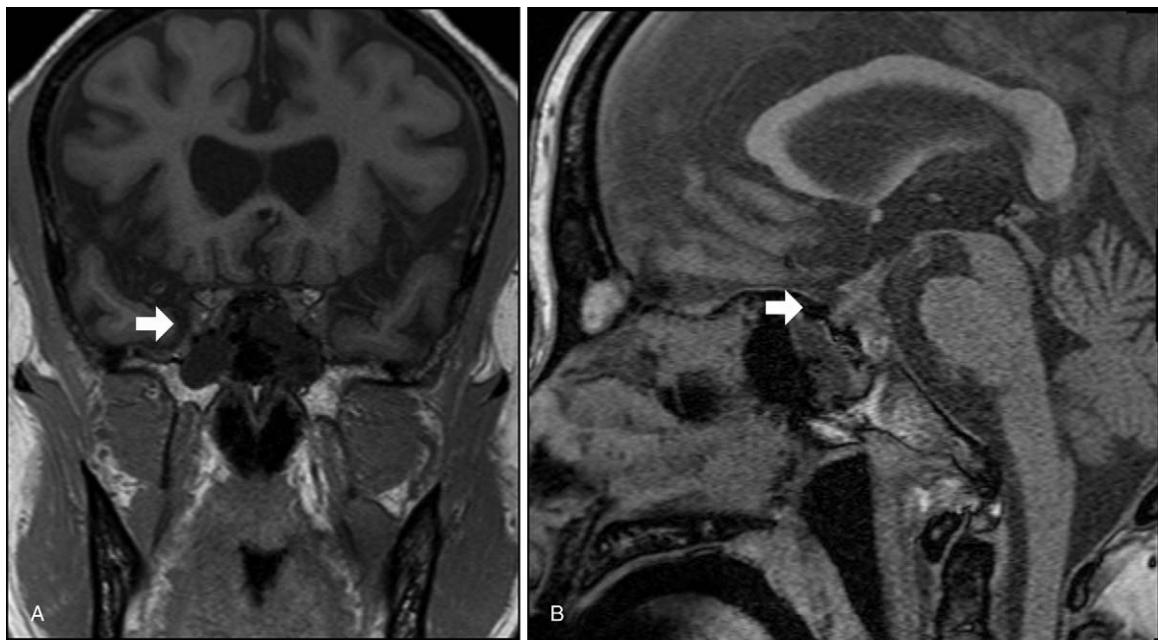
This case was approved by the Ethics Review Committee and the Institutional Review Board (IRB No. OC17ZESE0129). The

patient provided informed consent for publication of this case report and accompanying images.

### 3. Discussion

PA is a rare, but potentially life-threatening, condition in high-risk patients with pituitary adenomas. The prevalence of pituitary adenoma is approximately 17%<sup>[3]</sup> and 2% to 12% of patients with adenoma develop apoplexy. The presence of a pituitary tumor has been shown to be undiagnosed at the time of apoplexy in >75% of cases.<sup>[1,4]</sup> Factors precipitating PA diverse and include head trauma, sudden changes in arterial BP, hormone therapy, somatostatin analog therapy, use of dopamine agonists, diabetes mellitus, diabetic ketoacidosis, cardiac surgery, laparoscopic surgery, dynamic pituitary function tests, radiotherapy, anticoagulation, pneumo-encephalography, repetitive coughing, transiently increased intracranial pressure (ICP), positive pressure mechanical ventilation, and high altitude.<sup>[5–10]</sup> These factors are associated with fluctuations in blood flow, stimulation of the pituitary gland, and an anticoagulated state. In particular, PA has been related to BP fluctuations or vasospasm during surgery, with patients undergoing orthopedic and cardiac surgery being more prone to PA than those undergoing pulmonary and gastrointestinal surgery or thyroidectomy.<sup>[1]</sup>

Along with these extrinsic precipitating factors, changes in the vascularization of the pituitary adenoma are an important intrinsic factor for PA. Pituitary vascularization is supported by a capillary network called the hypophyseal portal system, coming from the hypothalamus via the long portal veins, and by direct arterial blood supply from the hypophyseal arteries (superior or inferior), originating from the internal carotid artery. Venous drainage is directed via hypophyseal veins to adjacent venous sinuses and then to the jugular veins.<sup>[1]</sup> In contrast with the normal pituitary gland, vascularization of pituitary adenomas is predominantly supported by a direct arterial blood supply rather



**Figure 2.** Postoperative coronal (A) and sagittal (B) sellar magnetic resonance imaging showing removed pituitary lesion.

than portal system<sup>[11,12]</sup> and blood supply to pituitary adenomas is lower than that normal pituitary tissue.<sup>[13]</sup> Furthermore, pituitary adenomas are prone to bleeding and undergo infarction and necrosis, possibly because of the tumors outgrowing its blood supply, or as a result of ischemia because of compression of the infundibular or superior hypophyseal vessels against the sellar diaphragm by the expanding tumor mass.<sup>[14]</sup> In these conditions, PA may occur as a result of fluctuations in BP and vasospasm associated with surgery, bleeding, anesthesia, and stimulation of the pituitary glands.<sup>[1]</sup>

Türker et al reported the first case of PA following posterior lumbar surgery and assumed that the PA occurred because the patient was prone during the operation.<sup>[2]</sup> The cardiovascular effects of a prone position have been studied since the early 1990s. In a prone position, transesophageal echocardiography showed a 10% to 29% reduction in cardiac index in healthy anesthetized patients because of elevation of intra-abdominal pressure and compression of the vena cava.<sup>[15,16]</sup> A prone position is also associated with mild cerebral oxygen desaturation in elderly patients.<sup>[17]</sup> Compression of vertebral arteries, as a result of the prone position and unusual neck rotation with prolonged surgery, cause cerebellar hypoperfusion.<sup>[18–20]</sup> Furthermore, a prone position can cause increases in ICP in patients with intracranial pathology.<sup>[21]</sup> ICP may moderate the relationship between cerebral blood flow and brain oxygenation, and perfusion pressure may decline when either ICP or central venous pressure increases.<sup>[22]</sup>

Our patient underwent surgery in the prone position on the Wilson frame. During the lengthy surgical procedure (8 hours), the prone position may have decreased cardiac output and increased ICP; it is, therefore, possible that the resulting decrease in perfusion pressure may have caused cerebral ischemia. Despite the short duration of episodic hypotension, this may have also resulted in diminished blood supply to the pituitary gland and adenoma. In addition, our patient had calcific plaques in the bilateral distal internal carotid artery and vertebral artery (V4 segment). The inferior hypophyseal artery, a branch of the

internal carotid artery, supplies the neurohypophysis of the pituitary gland. Both the position and the minimal arterial occlusion may have contributed to the ischemia involving both sides of the pituitary tumor.

The clinical symptoms of PA are highly variable and may include headache, nausea/vomiting, ophthalmoplegia, visual loss, and electrolyte imbalance.<sup>[23]</sup> Headache is the most prominent symptom and is present in >80% of patients. Visual disturbances and corticotrophic deficiency are present in >50% of PA patients. As with our case, oculomotor palsies are also common and the third cranial nerve is most frequently affected.<sup>[1,23]</sup> In the acute and severe forms, blindness, coma, neurological signs, and hemodynamic complications may occur within hours. Without the correct diagnosis, and decompression and corticosteroid treatment, death may ensue as a result of adrenal failure and neurological complications.<sup>[24]</sup>

There have been many controversies about the treatment strategy of PA. Recently, Rajasekaran et al<sup>[25]</sup> proposed therapeutic guidelines aimed at identifying the best therapeutic approach. According to these guidelines, a decision regarding the timing of the surgery should be based on the severity and the progression of the signs and symptoms.<sup>[23–25]</sup> They recommended early surgical management in case of significant neuro-ophthalmic signs such as deteriorating visual acuity, visual field defects, or reduced level of consciousness. In contrast, ocular paresis because of involvement of 3rd, 4<sup>th</sup>, or 6<sup>th</sup> cranial nerves without other neuro-ophthalmic signs is not considered indication for immediate surgical decompression.<sup>[1,23,25]</sup> In our case, the patient was clinically stable without visual field defects. In addition, he needed postoperative care of spine surgery because he was just after the major spine surgery. Accordingly, semielective trans-sphenoidal surgery was done after conservative medical treatment.

In conclusion, we describe a rare case of PA following posterior lumbar fusion surgery performed while the patient was prone. Pituitary adenomas are frequently asymptomatic and therefore difficult to diagnose; the low incidence also contributes to the difficulty in diagnosing PA after spinal surgery. However, early

diagnosis of PA is essential for the timely treatment of pan-hypopituitarism and prevention of severe neurologic complications. It is therefore important to recognize the symptoms of PA, which include headache, visual changes, and altered mental status, and to be aware of any electrolyte imbalances

### Author contributions

**Conceptualization:** Yeon Jang.

**Data curation:** Chunghee Joo, Geol Ha, Yeon Jang.

**Formal analysis:** Chunghee Joo.

**Investigation:** Geol Ha.

**Methodology:** Chunghee Joo.

**Supervision:** Yeon Jang.

**Validation:** Chunghee Joo, Yeon Jang.

**Visualization:** Geol Ha.

**Writing – original draft:** Chunghee Joo, Yeon Jang.

**Writing – review & editing:** Chunghee Joo, Yeon Jang.

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