Case report

Remote extradural hematoma as a complication of endoscopic transsphenoidal surgery: A case report with literature review

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ABSTRACT

Introduction: The sellar region is one of the most areas to access in skull base surgery. The endoscopic transsphenoidal approach is a minimally invasive technique developed to create a clear trajectory to the sellar region through the sellar floor. Conversely, this area is surrounded by major intracranial vessels and multiple cranial nerves, hence, every surgical procedure to access this area carries dangerous complications, including hematoma. Remote extradural hematoma is an extremely rare complication following the endoscopic transsphenoidal approach, and the pathogenesis has not been elucidated.

Case presentation: This study reported a case of 38-years old female suffered from chronic cephalgia and bilateral vision loss since one year ago. Further neuroimaging examination showed solid extra-axial mass, suggesting pituitary adenoma. Laboratory result showed increased Prolactin (216.2 ng/dl) with no other hormonal disturbance. Urgent endoscopic transsphenoidal surgery was planned to excise the tumor. Post-operative CT showed acute right frontal extradural hematoma, in which the patient was planned to have immediate surgery afterwards.

Discussion: The specific mechanism of developing EDH post-surgery is unknown because it is an unusual consequence of endoscopic transsphenoidal surgery. Rapid CSF draining during surgery may have led to the formation of a remote extradural hematoma in our patient.

Conclusion: Endoscopic transsphenoidal surgery also carries the potential risk of remote extradural hematoma, careful steps must be taken to prevent this serious complication during transsphenoidal surgery.

1. Introduction

The endoscopic transsphenoidal approach is a minimally invasive surgical technique developed for sellar-region mass resection. However, this approach still carries dangerous complications during surgery, such as bleeding and carotid artery injury. Extradural hematoma following endoscopic transsphenoidal surgery is an extremely rare complication and the pathogenesis underlying this complication has not been clearly understood. We describe a case report of right frontal extradural hematoma following endoscopic transsphenoidal surgery for pituitary macroadenoma. This article is reported based on SCARE 2020 [1].

2. Case presentation

A 38-years old woman suffered from chronic cephalgia for one year, which worsened in the past one week before hospital admission. She also experienced a decreased vision in the right eye one year ago, and since January 2021, the right eye was completely blind. Four months ago, the patient felt her left eye vision began to decrease and afterwards, she lost her sight at that eye. There was no vomiting, seizures, facial spasm, impaired smell, slurred speech, hemiparesis, and tingling in half of the body. From physical examination, the patient had GCS of 15, pupil with 3 mm diameter on both eyes, no light reflex shown and vision loss on both eyes.

From laboratory result, Prolactin was increased (216.2 ng/dl) with...
no other hormonal disturbance. Head MRI (Fig. 1) showed extra-axial solid mass with a cystic component, calcification, and internal bleeding. It was a well-defined mass with irregular edges measuring approximately $4.21 \times 4.14 \times 4.18$ cm in suprasellar. The mass shown affected midline shift to the left side, approximately 0.7 cm, with perifocal edema, pushed the third ventricle to the left side, the frontal lobe to the antero-superior and the optic chiasm upward. Moreover, the tumor destroyed the base of the sphenoid bone, invaded the posterior side of the right and left sphenoid sinus, and compressed the right and left anterior cerebral arteries. Sellar region tumor of pituitary macroadenoma was assessed and urgent endoscopic tumor excision was planned due to the mass effect, such as decrease of consciousness because of hydrocephalus, and hormonal disturbances.

Intraoperatively, we found a bulged sellar dura. Dural incision was made by telescopic knife, pliable and silky mass came out directly afterwards. Tumor excision was done by curettage and suction. Intraoperative bleeding was voluminous with approximately 1,5 l. The tumor was hyper vascularized, with several intra-tumoral vascularization crossed inside the tumor (Fig. 2a), which was thought to cause the bleeding and treated by meticulous cauterization and hemostatic agents. Surgery ended as optic chiasm can be seen (Fig. 2b) and we could observe arachnoid. Closure was done by absorbable hemostatic agents, fat, and fibrin sealant. Patient was brought to Intensive Care Unit postoperatively, no CSF leakage was shown. On immediate observation after surgery, patient was in a good condition with stable vital signs, GCS 15, normal pupil reflex and no impairment of other neurologic function. However, there was no improvement on visual acuity. 3 h after admission to ICU, patient began to chatter vaguely, and consciousness began to decrease to GCS 12, shortly after.

Complication after surgery was emphasized, contrast head CT was done and showed a large hyperdense mass on right frontal (Fig. 3a), giving an impression of extradural hematoma, with 1 cm midline shifting to the left side. Patient was directly brought to the OR, extradural mass was evacuated within 1 h and patient was brought back to the ICU right after the second surgery. A 24-hour observation showed no other deterioration and neurological complication, patient was brought back to the ward and discharged 3 days after head CT evaluation was clear (Fig. 3b).

Three months after surgery, patient came to our outpatient clinic with stable condition, without any complaints presented, but visual loss persisted. Follow-up head MRI was done, showed small residual mass on sellar region with Prolactin level of 130 ng/dl, a dopamine agonist (Bromocriptine 2,5 mg) was given to the patient (Fig. 4).

3. Discussion

Post-operative extradural hematoma (EDH) remained as an important complication after intracranial operations. The exact incidence is unknown with only partly identified risk factors [2]. One study found EDH after craniotomy of various indications occur in 0.8 % of all patients studied, with complication usually occurs within 24 h after surgery [3], while others found a 1 % incidence of hematoma from various intracranial operations [4]. Post-operative EDH were found after surgeries include brain tumors, aneurysms, arteriovenous malformations, intracerebral hematomas, traumatic lesions, ventricular drainage or shunting procedures, and microvascular decompression [4]. EDH could develop in the operation site, either its regional or adjacent, or remotely, further from operation site [4]. Remote EDH were reported to occur after decompressive craniectomy [5], ventriculoperitoneal shunt (VP shunt) procedure [4], subdural hygroma drainage [6], clipping aneurysm [7] and intracranial tumor resection [8].

Endoscopic endonasal transsphenoidal approach is considered to be the safest approach for pituitary tumor and would be the first choice if no contraindication present [9]. The most common complication after transsphenoidal surgery is cerebrospinal fluid (CSF) leakage, sinusitis, and meningitis [10]. In the case of bleeding, trauma to the sphenopalatine and internal carotid arteries is the most common. In addition, the most dangerous complication that can arise was thought to be

Fig. 1. Preoperative MRI (a) Sequence T1 with contrast; (b) Sequence T2.
intracerebral hematoma from internal carotid artery injury [11]. Extradural hematoma is a very rare complication in transsphenoidal surgery. To the best of our knowledge, to date, only two cases have been reported. Youichi Saitoh et al. reported a bifrontal EDH after transsphenoidal surgery [12] while Yamaguchi-Okada et al. reported remote extradural hematoma following endoscopic transsphenoidal surgery on craniopharyngioma case [13].

As an extremely rare complication of endoscopic transsphenoidal surgery, the detailed mechanism of development of EDH post-surgery is not known. A sudden drop of intracranial pressure from the abrupt loss of cerebrospinal fluid was deemed as major cause of remote EDH [8]. A separation of dura and traction which tear bridging veins resulted in hematoma formation. Other cause of postoperative EDH might be due to inadequate hemostasis, coagulopathy [2], and hypertension [2]. In this case, for our patient, we ruled out coagulopathy and hypertension during the perioperative period. However, rapid draining of a large amount of CSF during surgery may have contributed to the development of an extradural hematoma at a distant location in our patient. Current study also showed patients developing remote EDH after surgery to be younger than 50 years old; while our patient was 38 years old, as the adhesion of dura and skull grew tighter with age, resulting in easier separation of dura [5]. We also found that the dural opening in the presented case was much larger than normal due to the mass size and anterior extension of the tumor which probably increase the amount of CSF loss during the procedure. Previously reported case suggests that rapid and severe CSF loss during endoscopic transsphenoidal surgery, as well as leaking through a dural patch following surgery, most likely produced a significant intracranial hypotension, leading to extradural hematoma development [14].

Intraoperatively, our patient suffered an immense blood loss of 1.5 l, probably contributing to the development of EDH through the loss of coagulation factors or platelet dysfunction. Kim et al. had found intraoperative blood loss of 800 ml to be an independent risk factor for post-operative EDH [2]. During the hematoma evacuation surgery, the source of bleeding could not be identified. Earlier report explained that severe intracranial hypotension could cause intracranial venous hypertension, thereby expanding dural sinuses as a result of an increased gradient between intravascular and CSF pressure in the extradural space. Furthermore, increased transluminal venous pressure and subsequent dural sinus rupture could result from a further drop in intracranial pressure caused by continuous CSF loss [15]. It is said that the arachnoid granulation in proximity to the sinuses could easily induce hemorrhage after loss of CSF [8]. However, our patient did not experience any CSF leak and the hemorrhage location happened in right frontal area, farther from the sinuses. Therefore, the exact pathogenesis of post-operative EDH in our patient remained unclear. It is likely the amount of bleeding resulting in coagulopathy with rapid and enormous CSF loss during the procedure caused intracranial hypotension resulted in the development of EDH. Although it was considered as an extremely rare complication, extradural hematoma should be accentuated as a possible serious complication to be prevented during transsphenoidal surgery.

4. Conclusion

In addition to carotid artery injury as a hemorrhagic complication, endoscopic transsphenoidal surgery also carries the potential risk of remote extradural hematoma. Therefore, careful steps must be taken to prevent this serious complication during transsphenoidal surgery.
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Author contribution

The roles are distributed as follows:

1. Conception and Design were done by RAD, IBIH, CMAS
2. Supervision was done by RIS, JW, IBIH
3. Materials and data collection were done by IWW, RIS, JW, CMAS
4. Analysis were done by RAD, CMAS, IBIH
5. Literature Review and Editing were done by IWW, RAD, CMAS, RIS, JW, IBIH

Guarantor

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Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Declaration of competing interest

None.

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