

Case Report

Rare But Severe Complications: Remote Intracerebral Hemorrhage Following Supratentorial Craniotomy

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Introduction

Postoperative Intracerebral Hemorrhage (ICH) is a well-known complication in neurosurgery, usually occurring at the initial site of intracranial intervention. However, bleeding into areas distant from the surgical site, known as Remote Intracerebral hemorrhage (RICH), is a rare but potentially serious occurrence [1,2]. Despite its rarity, RICH poses significant challenges in terms of diagnosis and management. Various factors have been implicated in the etiology of RICH, although the precise mechanisms remain elusive. Speculation abounds regarding the potential roles of arterial hypertension, coagulopathy, Cerebrospinal Fluid (CSF) dynamics, head position during surgery and underlying pathological abnormalities [3]. The multifactorial nature of postoperative hemorrhage underscores the complexity of its pathogenesis. Historically, much attention has been paid to cerebellar hemorrhages following supratentorial craniotomies, or conversely, to supratentorial hemorrhages fol-

Abstract

Remote Intracerebral Hemorrhage supratentorial (RICH) occurring shortly after craniotomy for removal of an intracranial lesion is a rare but serious complication, likely to result in significant morbidity or even death. In this context, we describe the case of a 66-year-old woman presenting to neurosurgery department with progressive headaches for two years, associated with memory and language disorders evolving for two months, without focal neurological deficits. A brain MRI with contrast revealed the presence of a left temporal supratentorial process, compatible with a meningioma confirmed by stereotactic biopsy.

The patient was admitted to the operating room for craniectomy with a left paramedian temporal approach in the supine position, with the head turned laterally, left side up. However, in the immediate postoperative period, she presented with persistent delayed awakening, and remained comatose with a Glasgow Coma Scale (GCS) score of 8. Emergency CT scans revealed a diffuse subarachnoid hemorrhage involving all cerebral hemispheres, graded Fisher IV, as well as a right-sided intracerebral hematoma, contralateral to the operative site.

The patient benefited from a no invasive expective attitude and recovered without residual neurological deficits. This case highlights the crucial importance of close postoperative monitoring and early CT scanning in the event of delayed recovery or neurological deterioration. Remote intracerebral hemorrhage following supratentorial surgery is an extremely rare complication and the underlying mechanism remains unclear.

Keywords: Complication; Craniotomy; Remote; Intracerebral; Hemorrhage; Supratentorial

lowing infratentorial surgeries [4]. However, cases of supratentorial (RICH) following supratentorial craniotomies are extremely rare.

Case Report

A 66-year-old woman with no previous medical history There was no particular history of diabetes, hypertension or coagulation disorders, nor any notion of recent head trauma. She presented to the neurosurgery department with headaches that had been evolving for 24 months and had worsened over the last 2 months, recently associated with memory and language disorders, with no focal neurological deficits, fever or loss of consciousness. There was no fever or disturbance of consciousness, and the general and systemic examination was unremarkable. Neurologically, she was conscious, alert and time-oriented. She had no cerebellar deficits. There were no focal motor

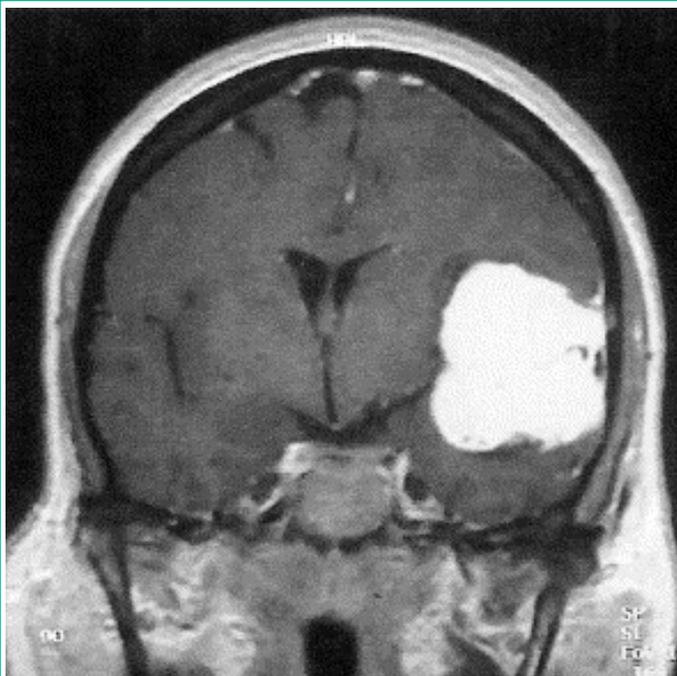


Figure 1: MRI with coronal injection showing a Left temporoparietal lesion enhancing after contrast injection.

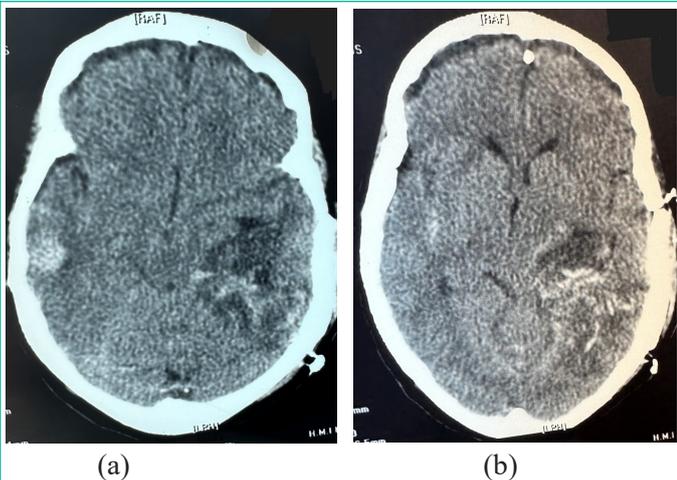


Figure 2: Postoperative CT scan showed a right temporal hematoma (A) a diffuse subarachnoid hemorrhage distributed over all bilateral cerebral hemispheres with diffuse cerebral edema (B).

or sensory neurological deficits. Routine blood and biochemical tests revealed no abnormalities. Cerebral Magnetic Resonance Imaging (MRI) was performed, demonstrating the presence of a left supratentorial lesion consistent with a large meningioma, exerting pressure on adjacent cortical regions (Figure 1) Given these radiological findings and the patient's clinical symptomatology, surgical resection of the meningioma was planned.

The patient was scheduled for tumor resection under general anesthesia in Jim supine position with head fixation via May field according to standard practice, and craniectomy performed with a left paramedian temporal approach with the head turned laterally left side up without notable incident during the procedure. The meningioma was successfully resected, with an estimated blood loss of 400 ml and took almost 180 minutes (skin-to-skin). No intraoperative complications were reported, and the patient was transferred to the ICU for postoperative monitoring. In the hours following surgery, the patient showed delayed awakening, responding only partially to verbal stimuli and exhibiting increasing lethargy.

There was no eye opening, but she could move all four limbs, the pupils were bilateral and smaller in size and responded to

light. Her GCS (Glasgow Coma Scale) was assessed at 8. Immediate CT scan showed a right temporal hematoma, and a diffuse subarachnoid hemorrhage distributed over all bilateral cerebral hemispheres with diffuse cerebral edema (Figure 2). It should be noted that the patient had no history of hypertension, and her blood pressure was stable during the perioperative period. She was not treated with anticoagulants and her laboratory results, including coagulation parameters, were normal. Preoperative MRI revealed no frontal lobe abnormalities The coagulation profile was normal. We managed the patient conservatively, she was artificially ventilated with blood pressure control and seizure prevention, The patient recovered after 5 days without any deficits. The patient was transferred to the neurosurgical ward for further treatment.

Discussion

Most postoperative Intra cerebral hemorrhage develop close to the surgical site and are generally attributed to inadequate intraoperative hemostasis [5]. The Remote Intracerebral Hemorrhage is defined as hemorrhage away from the operative site that occurs mainly during supratentorial craniotomies and classified into supratentorial and infratentorial RICH.

(RICH) after supratentorial craniotomy is rare. RICH occurs with an incidence of 0.08% to 0.6% after supratentorial procedures [6]. Frequently reported procedures were aneurysm clipping, temporal lobectomies and hematoma evacuation. Removal of a supratentorial tumor is relatively rare to cause RICH [7]. Although, there are few reports of supratentorial RICH following supratentorial craniotomy. In one case series of RICH, the reported incidence of RICH after supratentorial surgery was around 16%. [4] Chi Wang et al. have demonstrated that the incidence of RICH IT is higher than that of ST, while the mortality rate of RICH is higher [8].

The etiology of RICH remains unclear. Many authors have proposed different factors that predict the occurrence of RICH. Chronic increased intracranial pressure, coagulation disorders, and hypertension were the commonest [7]

Recent reports suggest that supratentorial RICH is not related to hypertension or coagulopathy. [9] Altered cerebral hemodynamics after craniotomy and total tumor resection

may contribute to the development of RICH. Surgical manipulation, including retraction of brain tissue and disruption of normal vascular pathways, can lead to changes in blood flow dynamics. This alteration in cerebral perfusion can lead to ischemia or hemorrhage in distant regions of the brain [10].

Several publications have described distant on-site bleeding caused by induced coagulopathy. They have suggested potential mechanisms for the development of coagulative changes after GBM resection. Tumor resection triggers local release of tissue plasminogen activator. In addition, the release of systemic fibrinolytic substances leads to a remotely-injured gliomatous syndrome [11,12].

The exact pathophysiological mechanism remains unknown. However, many authors have speculated on cerebrospinal fluid loss or over drainage as the cause [1,8,12,13,14], Loss of a substantial volume of CSF during surgery plays a central role. Excessive CSF withdrawal causes cerebellar collapse and tearing of the superior vermian veins and their tributaries, leading to RICH [15]. There are studies on the pathomechanism of RICH without substantial CSF loss [16,17]. A large supratentorial mass

with chronically elevated intracranial pressure accompanied by a compensatory reduction in CSF volume. Consequently, a few hours after surgery, the relative reduction in CSF volume causes compensatory acute engorgement of the venous sinuses with resultant hemorrhagic venous

Impaired auto regulation, the ability of cerebral blood vessels to maintain constant blood flow despite changes in perfusion pressure, may also play a role [18]. Disruption of autoregulation during surgery and the subsequent release of increased intracranial pressure after total resection of the tumor mass can lead to deregulation of cerebral blood flow, predisposing to RICH [19].

Our patient had neither hypertension nor pre-existing coagulopathy. Blood pressure remained normal during the perioperative periods. The coagulation profile was within normal limits. Neither massive intraoperative CSF loss nor excessive CSF drainage occurred. The possibility of distant wounded glioma syndrome or risk of venous thromboembolism from tumor factor are specific to malignant gliomas [12,20]. The theory of a consumption coagulopathy due to injured brain tissue could be the cause. But there is no specific literature on meningiomas.

Our patient presented with chronically elevated intracranial pressure. Sudden decompression could lead to intracranial hypotension, with consequent multiple distant intracranial haemorrhages.

Diagnosis of RICH requires rapid imaging, usually by CT or MRI. These modalities can identify the presence of a distant hemorrhage, assess its size and location, evaluate midline displacement and detect associated mass effect. Management of RICH depends on the patient's clinical condition, the extent of hemorrhage and the presence of a mass effect [21]. Surgical intervention, such as hematoma evacuation and decompressive craniectomy, may be required to relieve the mass effect and prevent further neurological deterioration. Medical management, including blood pressure control and correction of coagulopathy, is also important.

The prognosis of patients with RICH varies and depends on factors such as the initial severity of the hemorrhage, the extent of neurological damage and the speed of intervention. Rehabilitation and neurorehabilitation play a crucial role in optimizing functional recovery and improving the patient's quality of life.

Conclusion

The occurrence of RICH after supratentorial surgery remains an extremely rare complication, and the underlying mechanism is still largely misunderstood. Nevertheless, in the present context, abrupt changes associated with tumor resection, coupled with intracranial hypotension following lobectomy, may have contributed to this particular case. Although remote cerebral hemorrhage is an uncommon event, it is imperative that practitioners be alert to this possibility and closely monitor indicative clinical signs. A thorough post-operative neurological examination remains the cornerstone for minimizing the risk of serious sequelae and ensuring prompt intervention to prevent deleterious complications.

Author Statements

Author Contributions

Tarek BAADI: Conceptualization; data curation; methodology; software; validation; writing – original draft; writing – review

and editing. Hamza Hafiani: Conceptualization; data curation; writing – review and editing. Driss SAID: Data curation; methodology; visualization; writing – review and editing. Mouncef CHOUBHI: Supervision. Khalil ABOUELALAA: Supervision; validation; writing – review and editing.

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Conflict of Interest Statement

The authors declare no conflicts of interest related to this case report.

Consentient

Written informed consent was obtained from the patient's next of kin.

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