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Short communication

Management and outcome of cerebral venous thrombosis after head trauma: A case series



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ABSTRACT

Cerebral venous thrombosis (CVT) is an underdiagnosed complication of head trauma. To date, initiation of anticoagulation is still a matter of debate because of the risk of worsening traumatic hemorrhage. This report describes a case series of five patients admitted for head injury complicated by CVT. The main associated radiological signs were skull fractures crossing the venous sinus and adjacent traumatic hematoma. In four patients, anticoagulation was introduced within 48–72 h of CVT diagnosis, with no subsequent hemorrhagic complications. The present report and data from the literature raise the question of systematic additional venoscans when confronted by associated radiological features of post-traumatic CVT. The safety of anticoagulation in selected patients is also discussed.

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1. Introduction

Recent awareness of cerebral venous thrombosis (CVT) as a possible complication of head trauma has led to its more frequent diagnosis. The pathogenesis of post-traumatic CVT (ptCVT) implicates extravascular factors, such as direct compression or endothelial damage to the venous sinus, and intravascular factors, such as a hypercoagulable state [1]. Classical associated radiological features are skull fracture or intracranial hematoma adjacent to the sinus [2,3]. Nevertheless, the diagnosis and management of ptCVT remains a

challenge. Indeed, symptoms of ptCVT, such as headache, can be masked by disturbances of consciousness or confusion with traumatic headache. In cases of delayed diagnosis, there is an increased risk of morbidity [1]. Therapeutic care is another challenge, considering the risk of worsening traumatic hemorrhage. To date, there are no specific guidelines for anticoagulation (ACT) in this traumatic context [4], and very few data regarding the specific management and outcome of ptCVT are available in the literature. To better characterize ptCVT, our present study reviewed every patient admitted for head trauma to our neurosurgery department. Thus, we report here a case series of patients diagnosed with CVT and present

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their outcomes, and also discuss the management of ptCVT in the literature.

2. Materials and methods

This retrospective study enrolled consecutive patients admitted to the neurosurgery department of Rouen University Hospital for head trauma between October 2014 and June 2016. On admission, patients who were victims of polytrauma, high-speed collisions or high-rise falls underwent either cranial or full-body computed tomography (CT). Additional CT venography was performed in patients presenting with radiological suspicion of CVT.

The primary objective of our study was to analyze therapeutic care according to imaging results, medical history and clinical findings. The secondary objectives were to analyze clinical and radiological outcomes during the post-acute phase.

The circumstances of the head injury, initial Glasgow Coma Scale (GCS) score, association with other systemic injuries, time interval between admission and diagnosis of thrombosis were described, as well as the therapeutic care. Clinical outcomes were estimated by modified Rankin Scale (mRS) scores at follow-up consultation after 3 months.

Radiological findings were reported, which included skull fractures crossing the sinus, the presence of hematoma adjacent to the sinus and air bubbles in the sinus. ptCVT was categorized as 'non-occlusive' if thrombus partially filled the sinus lumen, but blood flow reconstituted distally. If blood flow was absent below the thrombus, this was considered 'occlusive'. All CT scans showing skull fractures possibly crossing the sinus were compared, with an additional interpretation by a blinded neuroradiologist. Each patient with ptCVT underwent at least one follow-up CT or magnetic resonance imaging (MRI) examination during the post-acute phase and, if applicable, after 3 months of anticoagulation.

3. Results

3.1. Clinical findings

During the study period, 168 patients were admitted to the neurosurgical department at Rouen University Hospital for head trauma. Among these patients, five male patients (2.97%) were diagnosed with ptCVT (mean age: 38.4 years). Four of the five patients were not taking any medication and had no particular medical history. Patient #1 had kidney cancer complicated by cerebellar metastases, and had been treated with surgery and radiotherapy the year before. He was also taking 160 mg/day of aspirin because of a stroke occurred 2 years ago. Clinical features and CT findings of the five patients are presented in Table 1. All suffered from isolated head trauma, which was severe in four of the patients; one (#1) had fallen from his full height while standing.

Concerning their initial clinical presentation, three patients presented with disturbances of consciousness, with GCS scores < 12. Two patients (#2 and #3) needed intubation due to their neurological state at admission. Both underwent

emergency surgery for associated cerebral edema and acute subdural hematoma, respectively. The paediatric patient (#5) had no altered consciousness.

3.2. Radiological risk factors and diagnostic delay

Initial CT without contrast showed indirect signs of thrombosis, with a hyperdense sinus in four cases, all of which presented with occipital or temporal bone fractures crossing the thrombosed sinus, which more often was the transverse sinus. One patient (#2) presented with air bubbles in the sinus, and another (#3) had intracranial hematoma adjacent to the sinus (Fig. 1). In one patient (#1), initial CT showed no hyperdense sinus, and the diagnosis of ptCVT was made later after additional imaging because of secondary neurological deterioration. No patients suffered a deep CVT, and there was no arterial injury such as vertebral or carotid artery dissection.

3.3. Biological data

Thorough coagulation profiles performed in three patients, including protein S and protein C levels, antithrombin and coagulation factors, were unremarkable.

3.4. Therapeutic care

Efficient anticoagulation using intravenous (IV) unfractionated heparin (UFH) was introduced in four patients after a collaborative decision by the neurosurgeon and neurologist, except for patient #1, given his advanced age and poor medical condition. In addition, this patient had an associated bilateral chronic subdural hematoma, the ptCVT was non-occlusive (Fig. 2A). In patients #2 and #3, UFH therapy was started after additional CT scans performed 24–48 h after surgery. In patient #4, because of a serious frontal contusion, an additional CT scan 48 h after ptCVT diagnosis was also performed (Fig. 2B). The decision to deliver anticoagulation was based on this patient's young age, the occlusive nature of the ptCVT and the onset of hematoma regression on the additional CT. The targeted activated partial thromboplastin time (APTT) was between 2 and 3 sec except for patient #4, whose target was 1.5 sec. There were no hemorrhagic complications with antithrombotic therapy.

3.5. Outcomes

Patient #1 worsened with progressive neurological deterioration. Additional CT venography revealed attenuation in the distribution of the transverse sinus, consistent with extension of thrombosis. He died on day 14.

In the other cases, follow-up CT performed 15 days after the introduction of heparin treatment showed no extension of thrombosis or venous infarcts. To limit radiation exposure, the pediatric patient underwent cerebral MRI, which revealed complete resolution of the thrombus (Fig. 3); as a consequence, antithrombotic therapy was stopped immediately.

In two patients, follow-up MRI at 3 months revealed complete sinus recanalization: the total duration of anticoagulation was 3 months in these patients. Also, after 3 months, three patients with normalized mRS scores were able

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