International Journal of Medical Science and Health Research

Vol.7, No. 06; 2023

ISSN: 2581-3366

Anticoagulation in Brain Injury, Always Go One Step Ahead; Case Report

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doi: 10.51505/ijmshr.2023.7602 URL: http://dx.doi.org/10.51505/ijmshr.2023.7602

Received: Nov 11, 2023 Accepted: Dec 12, 2023 Online Published: Dec 15, 2023

Abstract
Traumatic brain trauma (TBI) is defined as the occurrence of a head injury with the presence of at least one of the following elements: altered consciousness and/or amnesia due to the trauma; neurological or neurophysiological changes, or diagnosis of skull fracture or intracranial injuries attributable to trauma. The objective of this case report is to understand the diagnostic-therapeutic approach to craniocerebral trauma in a patient with anticoagulation. Qualitative retrospective observational study with a therapeutic approach. The diagnostic-therapeutic approach to the patient with TBI who receives anticoagulation is a challenge of utmost importance in the emergency department, especially in those who initially present without serious clinical signs and symptoms. All patients with TBI and potential or known use of oral anticoagulants require a CT scan regardless of history or laboratory tests.

Keywords: TBI, Anticoagulation, Head CT

Introduction

Traumatic brain trauma (TBI) is defined as the occurrence of a head injury with the presence of at least one of the following elements: altered consciousness and/or amnesia due to the trauma; neurological or neurophysiological changes, or diagnosis of skull fracture or intracranial injuries attributable to trauma; or the occurrence of death resulting from trauma that includes the diagnoses of head injury and/or traumatic brain injury among the causes that produced death (1).

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TBI mainly affects elderly patients; a considerable proportion of elderly people take oral anticoagulants. TBI is associated with high rates of morbidity and mortality in older patients. Taking oral anticoagulants increases the risk of intracerebral hemorrhage after trauma and secondary progression of hemorrhagic lesions (2). During the hyperacute phase of intracranial hemorrhage, it is necessary to normalize the impaired coagulation as soon as possible to stabilize the hematoma, specifically by administering prothrombin complex concentrates to reduce international normalized ratio (INR) levels to at least less than 1.3. As a consequence of the normalization of coagulation, the risk of thromboembolism increases (3). The new direct anticoagulant rivaroxaban was approved in 2011 for the prophylaxis of thromboembolic events. Its mechanisms of action involve direct inhibition of factor Despite a favorable safety profile, reports of bleeding complications associated with rivaroxaban have recently emerged. Low body weight, older age, and prescribing errors have been associated with an increased risk of bleeding complications. Importantly, the absence of available antidotes for rapid reversal of anticoagulants is a major concern regarding the treatment of respective patients (4). Several evidence-based clinical decision instruments (Table 1.) have been developed to predict the need for CT scans in patients with traumatic brain injury and ECG scores of 14 and 15 (5). It is known that hemorrhage is one of the main factors responsible for mortality associated with accidents (30-40% of cases). However, we must highlight that a priori, bleeding after trauma.

It should be considered as a potentially reversible cause of mortality, either through damage control surgery or by avoiding coagulopathy associated with trauma. However, if the patient is under the effects of any anticoagulant drug, the chances of bleeding increase, especially if it cannot be antagonized early. Although the half-life of all new oral anticoagulants is around 12 hours, there are circumstances, such as those mentioned, in which we cannot expect spontaneous reversal of their effects. The recommendation of the European guidelines suggests monitoring antifactor Xa activity in patients treated with rivaroxaban, apixaban or endoxaban (grade 2C). If bleeding is considered life-threatening, reversal of rivaroxaban, apixaban, and endoxaban with high doses of prothrombotic complex (25 to 50 U/kg) is indicated (grade 2C) (6). To the question, when to reverse anticoagulation in the context of a patient with TBI, different parameters are proposed in the literature review. The population previously anticoagulated to the traumatic event with an INR equal to or greater than the upper limit (≥1.3) is associated with an increase in mortality, while a rapid normalization of anticoagulation mediated by reversal in less than 10 hours with fresh frozen plasma, concentrated prothrombin complex and vitamin K, has been associated with a decrease in the Odds ratio for the evolution of intracranial hemorrhage, for which an almost immediate reversal is suggested (7). Vitamin K antagonist anticoagulants (coumarins) have challenges in the stability and maintenance of their pharmacological action, increased risk of extra- and intracranial bleeding, in addition to their prolonged half-life between 20 and 60 hours, characteristics that put limits on its use in clinical practice. Although an increased risk of bleeding has been established with the use of oral anticoagulants and the efficacy and safety profile is in favor of direct oral anticoagulants, we are aware of the absence of a specific agent to reverse their activity. anticoagulant. In certain situations such as overdose, massive bleeding, the need for prompt restoration of hemostasis due to hemodynamic compromise or in preoperative periods, these antagonists of direct oral anticoagulants may be

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needed. Patients who could benefit from new oral anticoagulation antagonist agents are in clinical situations where there has been accidental or intentional overdose, life-threatening bleeding, central nervous system hemorrhage, or who will undergo emergency surgery where it is not possible. Possible suspension of direct oral anticoagulants for 12 - 24 hours. Antidotes for DOACs are in full development. Currently, three agents are available to reverse the effect of these anticoagulants: Andexanet alfa, a modified recombinant derivative of factor Xa in development, Ciraparantag, a synthetic molecule that binds to factor, antibody fragment.(FAB), which binds to dabigatran with high affinity (8).

Table 1. Clinical instruments in TBI for therapeutic diagnostic approach

Clinical Finding	Canadian	NCWFNS	New Orleans	NEXUS-II	NICE	Scandinavian
GCS score	<15 At 2 h	<15	<15	Abnormal alertness, behavior	<15 At 2 h	<15
Amnesia	Retrograde >30 min*	Any	Antegrade	—	Retrograde >30 min	Any
Suspected fracture	Open, depressed, basal	Any	Any injury above clavicles	Any	Open, depressed, basal	Basal, depressed, confirmed
Vomiting	Recurrent	Any	Any	Recurrent	Recurrent	—
Age, y	≥65	—	>60	≥65	≥65†	—
Coagulopathy	—	Any	—	Any	Any†	Any
Focal deficit	—	Any	—	Any	Any	Any
Seizure	—	History	Any	—	Any	Any
LOC	If GCS=14	Any	—	—	—	Any
Visible trauma	—	—	Above clavicles	Scalp hematoma	—	Multiple injuries
Headache	—	Any	Severe	—	—	—
Injury mechanism	Dangerous*†	—	—	—	Dangerous††	—
Intoxication	—	Abuse history	Drug, alcohol	—	—	—
Previous neurosurgery	—	Yes	—	—	—	Shunt

NCWFNS, Neurotraumatology Committee of the World Federation of Neurosurgical Societies; *NICE*, National Institute of Clinical Excellence; —, indicates the item is not considered an indication for CT scanning by author(s) of the rule; *LOC*, loss of consciousness.
*Used to determine medium risk for the Canadian Rule.
†CT scan only if also loss of consciousness or any amnesia.
†Dangerous injury mechanism=ejected from motor vehicle, pedestrian struck by motor vehicle, fall of >3 feet or 5 steps.

Bibliographic reference: Stein SC, Fabbri A, Servadei F, Glick HA. A critical comparison of clinical decision instruments for computed tomographic scanning in mild closed traumatic brain injury in adolescents and adults. Ann Emerg Med. 2009 Feb;53(2):180-8.

Case report

81-year-old male from San Luis Potosí, resident of the city of Monterrey, Nuevo León, with a personal history of vascular dementia since 2022 secondary to ischemic stroke in 2018, treated with memantine 10 mg every 24 hours, sertraline 50 mg every 24 hours, and quetiapine 50 mg. every 12 hours, abdominal sepsis secondary to pyocholecytitis treated on 06/01/23 by laparoscopic cholecystectomy and ERCP with placement of a biliary stent, benign prostatic hyperplasia treated with tamsulosin 0.4 mg every 24 hours and finasteride 5 mg every 24 hours. Previous history of venous insufficiency under treatment with pentoxifylline 400 mg every 24 hours. Smoking from 17 years to 30 years of age.

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Go on 08/02/23 to High Specialty Hospital No. 34 through Continuous medical admission for evaluation by the angiology service due to the previous 4 days reporting pain in the left pelvic limb of moderate intensity located in the middle and distal third. The aforementioned service performs an approach with a Doppler ultrasound, finding signs of deep vein thrombosis in the ileofemoral sector, which is why they indicate discharge with treatment based on the oral anticoagulant Rivaroxaban 15 mg every 12 hours for 3 weeks for subsequent escalation to 20 mg every 24 hours for 6 months. During his stay in the continuous medical admission area, when he joined the standing position, he suffered a fall from his own height with a direct impact on the skull in the occipital region against the railing of the stretcher and subsequently against the floor without presenting acute neurological deterioration, so in the first instance in said service He decides to take radiographic images to rule out bone injury (Image 1) and subsequently be referred by his own means to the General Hospital of Zone No. 2 of affiliation.

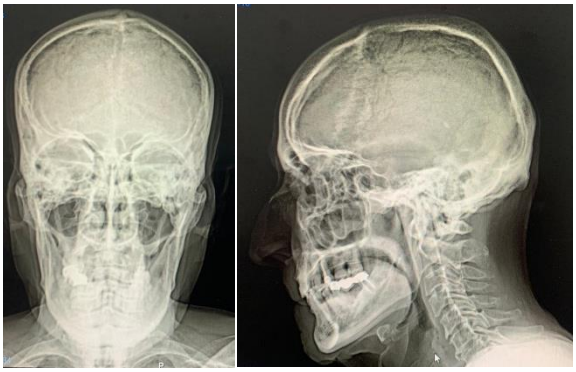

Image 1. AP and lateral skull x-ray

Patient begins treatment for established deep vein thrombosis and goes to the referral hospital with signs of drowsiness, upon admission he is received.

With Glasgow Coma Scale of 13 points (O4 V4 M5) which deteriorates 12 hours after 08/03/23 to a score of 8, so advanced management of the airway is performed with deep sedation and neuroprotective measures with subsequent intake. paraclinical image CT scan of the simple skull (Image 2) showing acute right hemispheric subdural hematoma with a maximum thickness of 26mm exerting a volume effect on the adjacent neural structures and the ventricular system with midline displacement of 20mm in vector from right to left and the following laboratory paraclinicals Leukocytes 10.1 Total neutrophils 6.92 Hemoglobin 11.8 Hematocrit 35.2 Platelets 335 Total Ck 111 Creatinine 0.6 Sodium 135 Potassium 3.9 Chlorine 102.2 Prothrombin time 13.4 INR 1.1 Thromboplastin time 31 Fibrinogen 618 pH 7.42 pCO2 34 HCO3 22.1 Eb -2 SatO2 94% making his referral to High Specialty Hospital No. 21 for evaluation and management by the neurosurgery service where he was received under sedation with Propofol at a dose of 1 mg/kg/hr, being suspended for 30 min.

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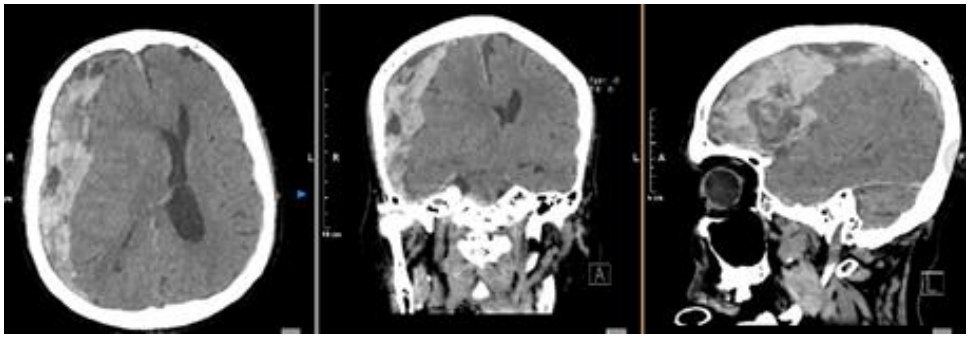

Image 2. Acute right hemispheric subdural hematoma

In order to perform a neurological window, observing a patient with a Glasgow Coma Scale of 6 points (O1 V1 M4) and admitted for urgent surgical treatment such as a decompressive craniectomy, exiting the surgical procedure appropriately with a Glasgow Coma Scale of 14 points, tolerating extubation with a control CT scan. postsurgical in which a residual right hemispheric hygroma is observed (Image 3) with a maximum thickness of 15mm without exerting a volume effect on the adjacent neural structures and the ventricular system with a midline deviation of 6mm in a vector from right to left, sending it to General Hospital of the corresponding area to continue neurological surveillance with pharmacological management based on phenytoin 100 mg every 8 hours and be discharged home days later with follow-up by outpatient consultation.

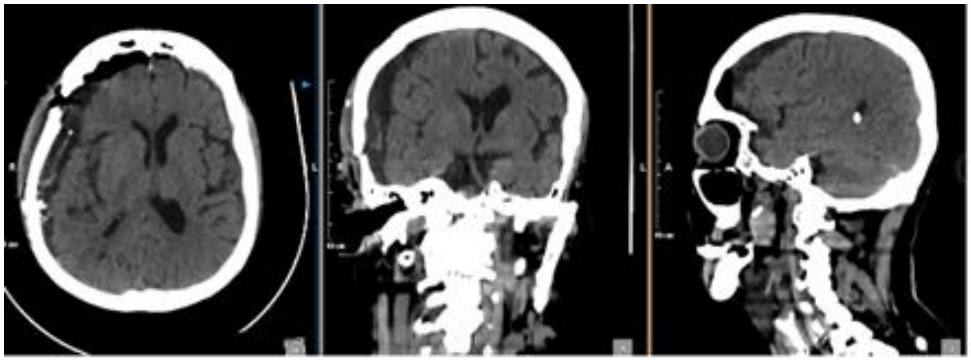

Image 3. Post-surgical residual right hemispheric hygroma

Conclusions

The diagnostic-therapeutic approach of the patient with TBI who receives anticoagulation is a challenge of utmost importance in the emergency area, especially in those who initially present without signs and clinical symptoms of severity and for this it is of great relevance that the emergency doctor has knowledge of each diagnostic and predictive instrument in this way an analysis can be carried out that leads us to be one step ahead in said pathology and carry out timely therapy that minimizes the damage and complications that may arise. Knowing the history of each patient will give us a complete picture of the situation to face and provide a treatment

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that counteracts the effects of drugs that may increase the risk of complications from another pathology, being clear about the risk-benefit definitions that every doctor must anticipate any clinical case to face. It is of great importance to understand the dynamism in the evolution of pathologies in the emergency area since this will lead us to not minimize and miss any relevant point of the "whole" that each patient represents.

Discussion:

All patients with TBI and potential or known use of oral anticoagulants require a CT scan regardless of history or examinations.

All patients with TBI and potential or known intake of oral anticoagulants with a normal CT scan should be admitted and observed for at least 24 h after the trauma.

Platelet function tests are capable of detecting and/or ruling out the presence of a platelet inhibitor. The intensity of platelet inhibition can be assessed, allowing the risk of bleeding to be estimated. And based on this, make decisions for the administration of pharmacotherapy to reverse anticoagulation, in addition to carrying out a standardized approach protocol in situations specific ones such as the one discussed in this case report, with the use of new anticoagulation reversal therapies.

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