

Hyperglycemic hyperosmolar state causing multiple thrombosis

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ABSTRACT

Introduction: Diabetes mellitus is regarded as a pro-thrombotic state¹. Extreme hyperglycemia and dehydration in the hyperglycemic hyperosmolar state (HHS) add to the risk for thrombo-ischemic events^{2,3}. Lower limb ischemia and occlusion of the femoral arteries in HHS is a distinct association, but its development may be hard to recognize due to its infrequent occurrence in daily practice. Prompt recognition is important to prevent irreversible damage^{3,4,5}. Case Presentation: A 50-year old female was admitted to the intensive care unit (ICU) with epigastric pain for 1 day. She reported no other medical conditions except hypertension. Clinical examination showed a fully conscious female who was severely dehydrated. Clinical and laboratory parameters on admission are represented in Table 1. Based on a glucose level > 30 mmol/L and an osmolarity > 320 mOsm/L, HHS was diagnosed. Other investigations (septic work up, chest X ray, and ECG) were normal. The patient received a total of 9 liters of 0.9% saline with insulin/potassium over 6 hours. Dalteparin was given subcutaneously (5000 IU daily). On the second day of admission signs of acute ischemia were noticed in the left upper and left lower limbs. An ultrasound doppler and CT angiography confirmed the occlusion of the left subclavian, left femoral artery and aortic arch thrombosis

Table 1. Characteristics of the patient & coagulation profile of the patient in week 1.

Characteristics	Clinical parameters	Normal range
Age	50 years	
Gender	female	
BMI	31.1 Kg/m ²	
Heart rate	126 beats/min	
Blood pressure	93/40 mm Hg	
Temperature	38°C	
Resp. rate	28 breaths/min	normal range
Blood sugar	84.4 mmol/L	3.3 – 5.5 mmol/L
Calculated osmolarity	348.4 mOsm/Kg	275 – 295 mOsm/Kg
Sodium	132 mmol/L	135 – 145 mmol/L
Potassium	6.1 mmol/L	3.5 – 5.5 mmol/L
Urea	18 mmol/L	2.5 – 7.1 mmol/L
Creatinine	312 µmol/L	50 – 98 µmol/L
Leucocytes	23 × 10 ⁹ /L	4 – 10 × 10 ⁹ /L
Platelets	425 × 10 ³	150 – 400 × 10 ³
Serum lipase	1400 IU/L	13 – 60 IU/L

Item (normal range)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Platelets (150 – 400 × 10.3/µL)	415	226	99	32	19	17	48	106
INR (1 – 1.1)		1.1	1.2	1.3	2.9	3	2.4	1.7
D-Dimer (less than 0.46 mg/L)			4.48		23.26			35.2
Fibrinogen (1.8 – 3.5 g/L)			2.6		2.3			2.2

(Figures 1A). Echocardiography showed a thrombus in the aortic arch. An emergency thrombectomy of the brachial and femoral arteries and a left arm fasciotomy took place and therapeutic unfractionated heparin infusion was started. A thrombophilia work up for antiphospholipid syndrome, heparin induced thrombocytopenia, complements 3 and 5, antinuclear antibody (ANCA), lupus screen, homocysteine, antithrombin, Factor V leiden, anticardiolipin, anti-B2 glycoprotein, protein S and C activity were normal. The patient and the family denied a personal or

family history of thromboembolic events. On the fifth day post-admission, the patient developed septic shock with multi-organ failure (circulatory, respiratory, renal, and coagulation). The patient responded to ICU management. Parameters of her coagulation profile are given in Table 1. On the ninth day the patient developed dry gangrene in the left foot, which required a below the knee amputation. On the eleventh day the patient was extubated, neurological assessment was showing right-sided hemiparesis. The MRI was showing multiple microcerebral

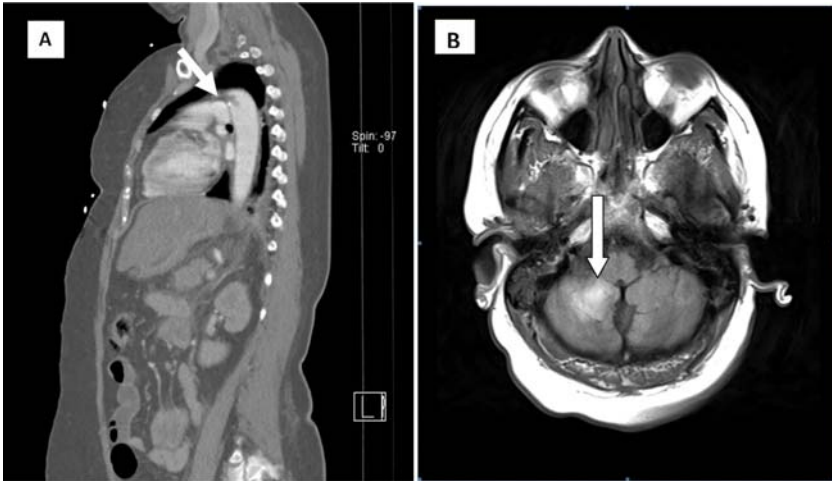


Figure 1. (A) CT angiogram showing aortic arch thrombosis. (B) MRI showing cerebellar infarction.

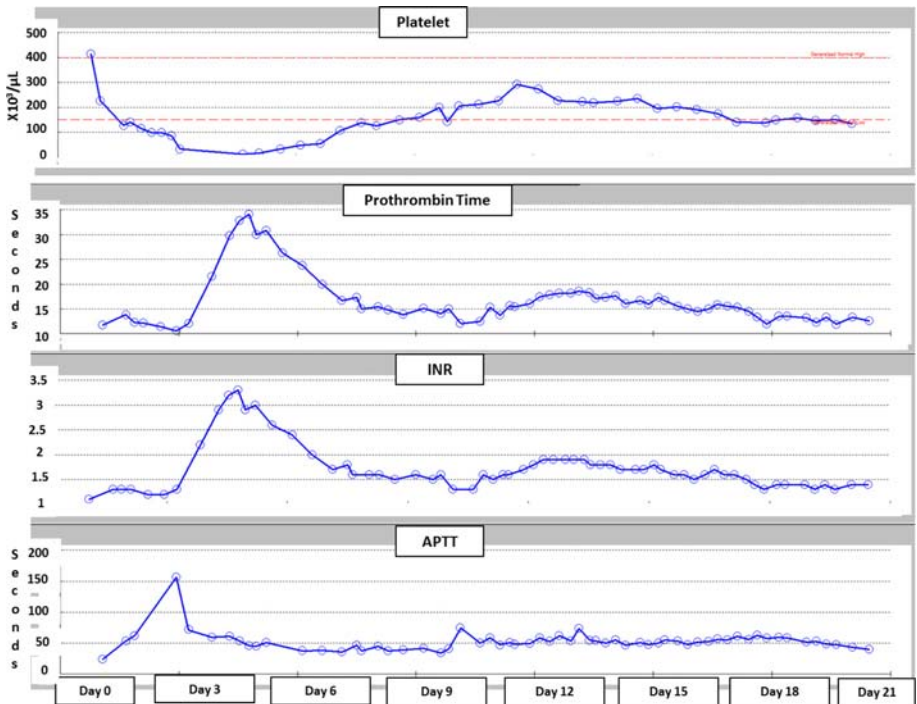


Figure 2. Coagulation during the patient stay in the intensive care unit.

hemorrhages, an infarction in the left paramedian pons and a cerebellar infarction (Figures 1B). On the fourteenth day the patient developed abdominal distension. The CT showed partial mesenteric vein thrombosis despite the patient being on therapeutic heparin (Figure 2). On the seventeenth day the patient had a tracheostomy and was discharged from the ICU for rehabilitation on a therapeutic dose of dalteparin.

Conclusion: Current guidelines provide for thromboprophylaxis in HHS, i.e., heparin during admission. This covers the risk for deep venous thrombosis (DVT), but might be insufficient in case of an imminent arterial thrombosis, especially in cases of long existing diabetes.

Alternative therapy targeting crucial factors in the coagulation pathway leading to an arterial thrombus should be searched.

The development of an algorithm for thromboprophylaxis in a hyperglycemic crisis needs our attention to improve the outcome of this high-risk condition.

Keywords: Hyperglycemic hyperosmolar state, diabetes mellitus, embolectomy, thrombosis

Ethical approval

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