Alpha-2 antiplasmin-associated aortic valve thrombus presenting as a STEMI in a patient with Graves disease

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DESCRIPTION

A 36-year-old Caucasian woman with a medical history of Graves disease presented to the emergency department with typical chest pain, and she was found to have a ST-elevation myocardial infarction (STEMI) via ECG and elevated troponins. Emergent cardiac catheterisation revealed distal blockages in the left anterior descending artery and second obtuse marginal artery (figure 1A,B). After distal balloon angioplasty, the decision was made to further treat the patient medically and discharge home after clinical stability was achieved. She was readmitted 2 days later for new onset of palpitations with up-trending troponins. Laboratory tests were significant for a low thyroid-stimulating hormone of $<0.01 \mu\text{LU/mL}$ (reference range: $0.27\text{--}4.2 \mu\text{LU/mL}$), and elevated free T4 of $4.02 \mu\text{LU/mL}$ (reference range: $0.9\text{--}1.7 \text{ ng/dL}$), free T3 of 4.8 pg/mL (reference range: $2.5\text{--}4.3 \text{ pg/mL}$) and a thyroid stimulating immunoglobulin of 386 (reference range: $<140\%$ baseline). She was immediately started on both methimazole 20 mg and potassium iodine oral solution (SSKI). Further workup revealed the patient's Graves disease had been undertreated for the past several months. The patient stabilised shortly after commencing treatment. As a result of the patient's relatively young age, current hyperthyroid state and negative cardiovascular disease history, an exploration for a potential embolic cause for the patient's STEMI was initiated. A transoesophageal echocardiography discovered two globular sessile echodensities on the surface of the non-coronary cusp of the aortic valve (figure 2). Due to the increased risk of a repeat embolic event, she underwent urgent cardiothoracic surgery for excision of the aortic masses which were found to be organised thrombi. An extensive hypercoagulable work-up was negative except for an elevated alpha-2 antiplasmin (a2AP) of 195%

Figure 2 Transoesophageal echocardiography of two globular sessile echodensities (7×6 mm and 6×4 mm; arrows) on the aortic surface of the non-coronary cusp.

(reference range: 86%–156%). Her recovery was uncomplicated, and she was discharged home with propranolol, methimazole, aspirin, SSKI and warfarin with close follow-up with cardiology and haematology.

Graves disease is the most common cause of hyperthyroidism. The increased production of thyroid hormone is known to place patients with this condition at an increased risk of thromboembolic events.¹ While the exact cause of this is not completely understood, several mechanisms are thought to be involved.^{1,2} The unusual cause of a STEMI in this case is believed to be due a hypercoagulable state in the setting of hyperthyroidism. Thus, leading to the formation of an aortic valve thrombus and a subsequently induced embolic STEMI. It has been previously suggested that an elevation in thyroid hormones can cause an increased synthetic capacity of the liver and resultant overproduction of procoagulant proteins, such as a2AP.^{1–3} The protein a2AP is known to stabilise clots by inactivating plasmin, thus serving to inhibit clot lysis. In this case, with the other unremarkable hypercoagulable studies, we believe the hyperthyroid state contributed to the elevated a2AP level which may have led to the suppression of the natural clot-breaking mechanisms of plasmin. Of note, once the hyperthyroidism was successfully treated, the elevated a2AP level in our patient recovered as well. Although rare, Graves disease and a2AP has been associated with cerebrovascular thromboembolism.^{3,4} However to our knowledge, this is the first reported case where a2AP was found to be associated with a STEMI. Moreover, its association with Graves disease offers a potential explanation and area of investigation

Figure 1 Coronary angiogram. (A) Left anterior descending distal blockage (arrow). (B) Second obtuse marginal artery blockage (arrow).

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into the pathogenesis of thrombus formation in hyperthyroidism. Further research is needed to fully understand the role α 2AP has in the complexities of haemostasis as it may provide a potential space for therapeutic intervention. In addition, this case highlights an important consequence to be aware of in patients with undertreated Graves disease. We recommend regularly scheduled thyroid function testing and close follow-up to monitor similar patients.

Learning points

- ▶ Graves disease is the most common cause of hyperthyroidism worldwide.
- ▶ Although not fully understood, a potential consequence of Graves disease in the setting of hyperthyroidism is a hypercoagulable state.
- ▶ An elevation of α -2 antiplasmin provides a possible explanation for hypercoagulation and thrombus formation in the setting of hyperthyroidism.

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