

From Biermer's Disease to STEMI: Hyperhomocysteinemia as a Thrombotic Bridge

Abstract

Vitamin B12 deficiency due to pernicious anaemia may be accompanied by hyperhomocysteinaemia, a potential contributor to thrombosis. Its identification during the assessment of myocardial infarction in a young adult can reveal an otherwise unrecognised, treatable disorder.

A 32-year-old man without known conventional cardiovascular risk factors presented six hours after the onset of chest pain with an anterior ST-elevation myocardial infarction (STEMI). Coronary angiography showed a sub-occlusive thrombotic lesion of the proximal left anterior descending artery with TIMI II flow. Tirofiban was administered, and stenting was deferred. Repeat angiography showed thrombus regression without significant residual stenosis, and no stent was implanted. The aetiological work-up identified macrocytic anaemia, vitamin B12 deficiency and hyperhomocysteinaemia. Positive anti-intrinsic-factor and anti-parietal-cell antibodies, together with biopsy-confirmed atrophic gastritis, supported the diagnosis of pernicious anaemia. The in-hospital course was favourable, and parenteral vitamin B12 replacement was initiated alongside cardiovascular treatment.

This case highlights the value of investigating vitamin B12 deficiency when coronary thrombosis in a young adult is accompanied by macrocytic anaemia. Hyperhomocysteinaemia was a plausible contributing factor, but a causal relationship could not be established. Treatment of the underlying deficiency remains indicated independently of any unproven benefit on recurrent coronary events.

Keywords: Coronary Thrombosis; ST-Elevation Myocardial Infarction; Hyperhomocysteinaemia; Vitamin B12; Pernicious Anaemia.

Introduction

Pernicious anaemia, also known as Biermer's disease, is a manifestation of autoimmune gastritis associated with impaired vitamin B12 absorption. Vitamin B12 deficiency may cause macrocytic anaemia and neurological complications and can increase homocysteine concentrations by impairing its remethylation to methionine.[1]

Observational evidence links hyperhomocysteinaemia with acute coronary syndromes in young adults, although this association does not establish causality.[2] Proposed mechanisms include endothelial dysfunction, oxidative stress and altered haemostasis.[3] We report the case of a young man presenting with anterior ST-elevation myocardial infarction (STEMI) and angiographic coronary thrombosis in whom the subsequent investigation revealed previously unrecognized pernicious anaemia associated with hyperhomocysteinemia.

Case presentation

A 32-year-old man presented six hours after the onset of prolonged retrosternal chest pain. He had no relevant medical history, was a non-smoker and reported no hypertension, diabetes mellitus, dyslipidaemia or family history of premature coronary disease. He was haemodynamically stable, and cardiovascular examination showed no signs of heart failure (Killip class I). The twelve-lead electrocardiogram demonstrated anterior ST-segment elevation with T-wave inversion (Figure 1).

Emergency coronary angiography demonstrated a sub-occlusive thrombotic lesion in the proximal left anterior descending artery, with slow antegrade flow (TIMI II; Figure 2). The findings were interpreted as compatible with partial spontaneous reperfusion. In view of the thrombotic appearance and the absence of an evident fixed stenosis, tirofiban was administered and immediate stenting was deferred. Repeated angiography after treatment showed regression of the thrombus without significant residual stenosis; no stent was implanted.

An aetiological investigation was undertaken during hospitalisation because of the patient's young age and absence of known conventional cardiovascular risk factors. The reported findings included macrocytic anaemia, low serum vitamin B12 and elevated plasma homocysteine. Anti-intrinsic-factor and anti-parietal-cell antibodies were positive. Upper gastrointestinal endoscopy showed an atrophic appearance of the fundal mucosa (Figure 3), and gastric biopsies demonstrated atrophic gastritis. These findings supported the diagnosis of pernicious anaemia with associated hyperhomocysteinaemia.

The in-hospital course was favourable, without reported recurrent ischaemia, arrhythmic complications or mechanical complications. The patient was discharged on dual antiplatelet therapy, a high-intensity statin and a beta-blocker, together with parenteral vitamin B12 replacement.

Discussion

The educational value of this observation lies in the recognition of pernicious anaemia during the investigation of coronary thrombosis in a young adult. The combination of macrocytic anaemia, vitamin B12 deficiency, positive gastric autoantibodies and atrophic gastritis provides a coherent explanation for the associated hyperhomocysteinaemia.

A plausible metabolic contribution

Vitamin B12 is required for the remethylation of homocysteine to methionine. Its deficiency can therefore lead to accumulation of homocysteine.[1] Experimental work describes several mechanisms through which elevated homocysteine could favour vascular injury, including impaired nitric oxide availability, oxidative stress and a procoagulant endothelial phenotype.[3]

In a study of adults aged 35 years or younger, hyperhomocysteinaemia was associated with the presence of acute coronary syndrome and the severity of coronary stenosis.[2] Such findings support clinical interest in this metabolic abnormality, but should not be interpreted as evidence that correcting it necessarily prevents recurrent coronary thrombosis.

Implications for investigation and treatment

Macrocytic anaemia was an important clue to an underlying systemic disorder. In this setting, assessment of vitamin B12 status and investigation of the cause of deficiency can identify a condition requiring specific treatment.[1] This observation supports a targeted approach guided by clinical and haematological findings; it does not justify systematic homocysteine testing in all patients with myocardial infarction.

Vitamin replacement and prevention of recurrent cardiovascular events are distinct treatment objectives. In HOPE-2, folic acid and vitamins B6 and B12 lowered homocysteine but did not significantly reduce the primary composite cardiovascular outcome. NORVIT similarly found no reduction in recurrent cardiovascular disease after myocardial infarction.[4,5] These trials do not establish the effect of treating pernicious anaemia in a young patient with coronary thrombosis. They nevertheless caution against assuming that biochemical correction alone provides proven coronary protection.

Treatment of confirmed vitamin B12 deficiency remains necessary to address its haematological and neurological consequences.[1] Autoimmune atrophic gastritis also requires appropriate gastroenterological

assessment, with surveillance considered according to individual risk.[6] In this patient, parenteral replacement was initiated, but the lack of subsequent laboratory measurements and clinical follow-up prevents assessment of the treatment response or longer-term cardiovascular outcome.

Limitations

This report is limited by the absence of post-treatment homocysteine and vitamin B12 levels, Intravascular imaging findings and a complete assessment of alternative thrombotic mechanisms were not documented in the available material. These gaps limit diagnostic characterization and causal attribution. The observation should therefore be regarded as a clinically relevant association rather than proof of hyperhomocysteinaemia-induced coronary thrombosis.

Conclusion

STEMI with coronary thrombosis in a young adult may lead to the recognition of previously undiagnosed pernicious anaemia. Associated macrocytic anaemia provides a useful reason to investigate vitamin B12 deficiency and its cause. In this case, hyperhomocysteinaemia was a plausible contributing factor.

Recognition and treatment of pernicious anaemia remain clinically important despite uncertainty regarding the effect of homocysteine lowering on recurrent coronary events.

Declarations

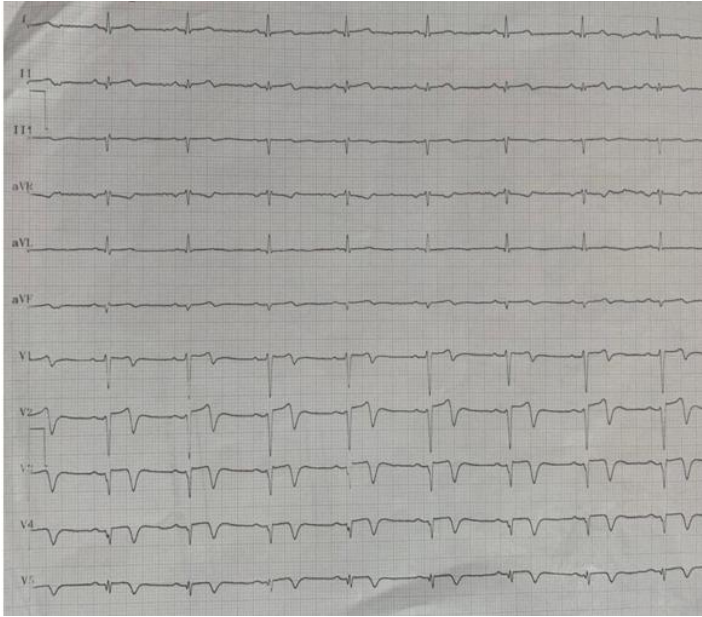
Conflicts of interest: The authors declare no conflicts of interest.

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115 **Figures**



116

117 **Figure 1. Twelve-lead electrocardiogram obtained six hours after symptom onset, showing anterior ST-segment**
118 **elevation with T-wave inversion.**



119

120 **Figure 2. Coronary angiogram in a caudal left anterior oblique projection, showing a sub-occlusive thrombotic**
121 **lesion of the proximal left anterior descending artery. Antegrade flow was assessed as TIMI II during**
122 **angiography.**

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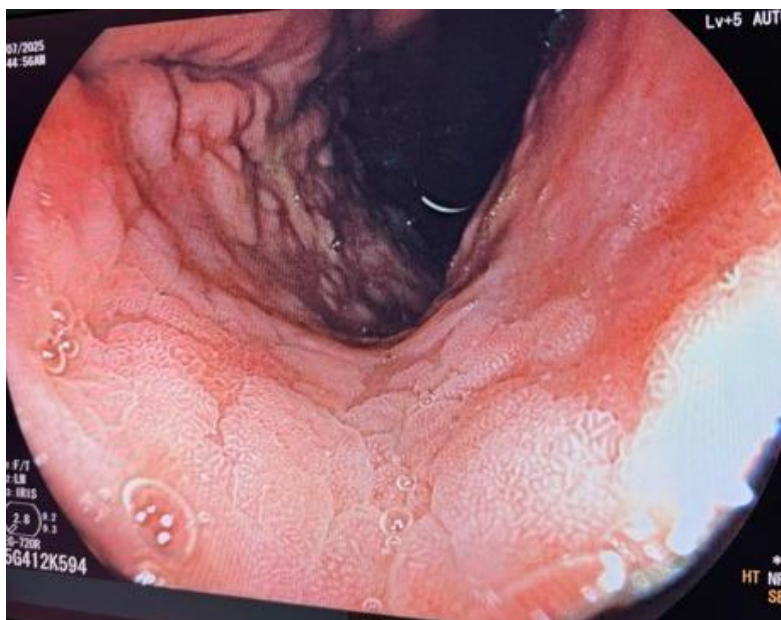


Figure 3. Upper gastrointestinal endoscopic image showing an atrophic appearance of the fundal mucosa with reduced gastric folds. The diagnosis of atrophic gastritis was supported by gastric biopsies.