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Exercise-induced anaemia:

a forgotten cause of iron deficiency anaemia in young adults

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INTRODUCTION

Iron deficiency anaemia (IDA) is a common finding in general practice. The prevalence of IDA in the general population is around 2% and rises to >5% in premenopausal females.[1] The presenting symptoms of IDA vary, but mostly include fatigue, exercise intolerance, weakness, headache, and irritability. These symptoms may also be present in iron deficiency without anaemia. The main causes of IDA are age-dependent. Iron loss by menstrual or gastrointestinal bleeding and malabsorption of iron in the small intestine are the most reported causes of IDA.[2] Less known and therefore an often forgotten cause of IDA, is physical exercise. Here we present three cases of young white female adults in whom IDA was induced by intensive physical training.

CASE PRESENTATIONS

Case 1

A 24-year-old female with a medical history of exercise-induced asthma, was referred to the internal medicine outpatient clinic with IDA (haemoglobin [Hb] 4.3 mmol/l, MCV [mean corpuscular haemoglobin] 57.4 fl, ferritin 1 ug/l). A year before presentation, the patient began intensive gymnastic training and subsequently noticed palpitations, fatigue, and dyspnoea on exertion. Aside from occasional constipation, she had no gastrointestinal complaints. She used oral contraceptives continuously, did not experience any intercurrent menstrual bleedings, and was not on any dietary restrictions. She underwent an extensive work-up with gastroscopy, colonoscopy, and a video capsule endoscopy (VCE) of the small intestine; excluding focal gastrointestinal blood loss, coeliac disease, infection with *Helicobacter pylori* and an inflammatory bowel disease. Additional laboratory tests showed no signs of haemolysis or vitamin deficiencies. Iron supplementation was started and the patient discontinued exercising. Three months later the anaemia completely resolved and ferritin level normalised.

Case 2

A 29-year-old female contacted her GP because of fatigue. Laboratory tests showed IDA. The GP started with iron supplementation and referred the patient to our hospital to determine the cause of the anaemia. The patient complained of recurrent pains in her stomach, which had existed for several years. Because chronic gastritis was suspected, a gastroscopy was performed, which did not reveal any abnormalities. In addition, gastric biopsies were negative for *H. pylori* and no signs of villous atrophy or infection with *Giardia lamblia* were present. A colonoscopy and VCE of the small intestine were normal. The patient did not experience extensive menstrual bleedings and was not on any dietary restrictions. During a follow-up visit, the patient mentioned that she was preparing to run a marathon and would like to optimise her Hb value, raising our suspicion for an exercise-induced IDA. After several months of iron supplementation, despite continued exercising, the anaemia resolved. However, the ferritin levels remained low.

Case 3

A 27-year-old female was referred by the GP because of IDA. Her medical history included amenorrhoea secondary to low bodyweight, as diagnosed by an endocrinologist 4 years earlier. At that time, she also had anaemia, considered to be caused by a recent blood donation. At the time of her visit to our hospital, the patient had no menstrual bleeding while on continuous use of oral contraceptives. Apart from some fatigue and decreased exercise intolerance, she had no further complaints. The patient was a vegetarian, but used several vegetarian meat substitutes and ran 10–20 km 4 times a week. Additional colonoscopy, gastroscopy, and VCE results were normal. After starting oral iron supplementation Hb, MCV, and ferritin-level normalised.

DISCUSSION

These cases demonstrate intensive physical

exercise as a potential cause of IDA, particularly in young females. All three of the patients underwent an extensive work-up with endoscopic procedures, which could have been prevented when exercise-induced IDA was considered earlier. Due to an increased risk for malignancy, gastroscopy and colonoscopy is always indicated in males and postmenopausal females with an unexplained IDA, irrespective of the presence of gastrointestinal complaints. However, in premenopausal females, the indication for endoscopy should be guided by the presence of symptoms (except for females aged >40 years with a positive family history of colon carcinoma).[2] If gastrointestinal symptoms are not present and the most common causes of IDA in premenopausal females are excluded (for example, menstrual bleeding, pregnancy, and use of NSAIDs) intensive physical exercise should be considered as a possible cause. Discontinuing intensive training should resolve the anaemia after several months if exercise is found to be the causative factor. As illustrated by Case 2, iron supplementation cannot always fully compensate for the chronic loss of iron if sporting activities continue. When physical exercise is discontinued and the anaemia remains refractory to oral iron treatment, the patient should be tested for gastrointestinal disease such as coeliac disease, atrophic gastritis, and infection with *H. pylori*.[2]

Iron deficiency is common in athletes involved in endurance sports.[3–5] In female marathon runners, the prevalence is as high as 28% (compared to 11% in the general female population).[5] Around 10–15% of athletes with iron deficiency do have a mild form of anaemia.[3–5] Particularly if other contributory factors are involved (for example, dietary restrictions and menstrual bleeding), anaemia can be more severe, as described in the above cases. Several mechanisms are generally accepted to cause iron loss during exercise:

- exercise-induced haemolysis, due to mechanical forces and oxidative stress;
- blood loss in the gastrointestinal and urinary tract, due to microscopic lesions by the reduced visceral circulation during exercise; and
- sequestration of iron in macrophages and decreased iron absorption, due to increased hepcidin production by the induction of an inflammatory response.[6–8] Increased pro-inflammatory markers, occult blood loss in urine and faeces, and a decreased haptoglobin level are observed in patients immediately after intensive training (<24 hours).[6,9] Iron loss due to excessive sweating has also been proposed as an underlying mechanism. Although high levels of iron have been measured in sweat, this iron is probably derived from or contaminated by cellular debris. Therefore, this concept is questioned and its contributory role to IDA is, most likely, minimal.[6]

In conclusion, exercise-induced anaemia must be considered in young female adults with unexplained IDA. A thorough history taking is warranted in order to uncover this, often forgotten, cause of anaemia and may prevent unnecessary diagnostic invasive procedures.

Patient consent

The three patients consented to the publication of this article.

Provenance

Freely submitted; externally peer reviewed.

Competing interests

The authors have declared no competing interests.

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