CASE REPORT

When water does not clear the smut from the smoke

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SUMMARY

Water-pipe (shisha) smoking is increasingly popular among young people in Europe and North America. The proponents claim that smoking water-pipe is much 'cleaner' than cigarettes. Although, a recent analysis of toxicant yields during 1–2 h water-pipe smoking resulted comparable to 100–200 cigarettes. We report a case of a 25-year-old patient with elevated haemoglobin, impaired concentration and reduced physical performance. Molecular investigations for JAK2 mutations and BCR–ABL fusion transcripts were negative and the arterial blood gas analysis revealed an elevated carboxyhaemoglobin of 6.1%. In a follow-up visit, the patient disclosed excessive shisha smoking. Secondary polycythaemia was diagnosed caused by chronic carbon monoxide poisoning. After cessation of shisha smoking all blood values returned to normal ranges within 6 weeks. Owing to the increasing popularity of water-pipe smoking and the anticipated health risks, our report should help to enhance awareness and advocate more information in tobacco prevention programmes on its potential toxicities.

BACKGROUND

Water-pipe (shisha, narghile or hookah) smoking is widely used in Turkey, North Africa and the Arabian Peninsula and has become increasingly popular among young people in Europe and North America.^{1–2} Burning charcoal is used to heat flavoured tobacco, which is inhaled with a hose by drawing the smoke through the water bowl. The proponents of water-pipe smoking claim that tobacco inhalation though the water makes the smoke much 'cleaner' than conventional cigarette smoking. However, a recent analysis of toxicant yields, as assessed by a smoking machine, reported that the content of nicotine, carbon monoxide (CO), polyaromatic hydrocarbons, volatile aldehydes and 'tar' inhaled during 1–2 h of water-pipe smoking were equivalent to an impressive amount of 100–200 cigarettes.^{3–4} Therefore, the exposure to relevant toxins is expected to be more relevant than assumed and an increased awareness is required to identify water-pipe smoking as a possible source not only for chronic CO poisoning but also for other toxins.^{5–6}

CASE PRESENTATION

A 25-year-old student of economics and an enthusiastic American football player was referred to our outpatient clinic by his family doctor for evaluation of polycythaemia. His blood values were normal 6 months previously. In the first visit he reported of

irritability, dizziness, impaired concentration and reduced physical performance. Constitutional symptoms, such as fever, night sweats and weight loss were denied as well as itching and erythromelalgia. He assured to be a non-cigarette smoker and did not take any drugs, medicines or herbal remedies. His personal history was, except from an abdominal surgery during early childhood, uneventful and no cancer predisposition or blood diseases were reported in his family history.

INVESTIGATIONS

The clinical assessment showed an athletic, tall and overweight patient (194 cm, 134 kg, body mass index 35.6 kg/m²) with a striking facial plethora. There was no evidence of lymphadenopathy, organomegaly, mucocutaneous eruptions or signs of acromegaly. The cardiopulmonary status was normal (blood pressure 131/70 mm Hg, heart rate 80/min). At presentation, the peripheral blood count revealed a haemoglobin concentration of 190 g/L (haematocrit 51%) without erythrocytosis (5.65×10^{12} /L), but with normocytosis, hyperchromia (mean cell haemoglobin (MCH) 33.6 pg, mean cell haemoglobin concentration (MCHC) 370 g/L, reticulocytosis (2.8%, absolute 157×10^9 /L), thrombocytosis (479×10^9 /L), neutrophilia (7.215×10^9 /L), basophilia (0.098×10^9 /L), 1/200 erythroblasts but without myeloid precursors. Further tests were performed to exclude a myeloproliferative neoplasm. We found an increased erythrocyte volume (26 mL/kg, normal 22.3 mL/kg corrected for body surface), reduced plasma-volume (31 mL/kg, normal 36.3 mL/kg corrected for body surface) and normal erythropoietin serum concentration (13.7 IU/L, normal 4.3–29 IU/L). The molecular investigation for JAK2 V617F and exon 12 mutations as well as BCR–ABL fusion transcripts resulted to be negative and the growth pattern of the stem cell cultures did not show endogenous erythroid colony formation in vitro. The provisional diagnosis of secondary polycythaemia of unknown origin was made.

In a follow-up visit, we tried to identify the possible cause of secondary polycythaemia. In the meantime, haemoglobin rose to 201 g/L (haematocrit 55%) with maintenance of hyperchromia (MCH 33.9 pg, MCHC 368 g/L) and slight basophilia (0.102×10^9 /L) but normalisation of all other blood values. The patient denied respiratory symptoms indicative for asthma as well as snoring, altitude training, ingestion of anabolic steroids or other power boosters. A blood gas analysis revealed a carboxyhaemoglobin (COHb) content of 6.1%, in line with a relevant CO exposure from a yet

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unidentified source. His history was taken in more detail. The patient told us about his excessive shisha-smoking habit that started 6 months ago after the breakdown of his relationship with his girlfriend. He reported smoking regularly for 1–2 h a day and recalled often feeling nauseated, dizzy and having headaches after smoking. Moreover he reported about a single syncope some weeks ago. We learned from him that shisha smoking was trendy in his American football player peer group. The laboratory values and the patient's history led us to the diagnosis of secondary polycythaemia caused by chronic CO poisoning related to excessive water-pipe smoking.

OUTCOME AND FOLLOW-UP

The patient was surprised to hear about the relevant toxicities of water-pipe smoking and promised to stop his exaggerated habit immediately. All blood values returned to normal ranges within 6 weeks without requirement of phlebotomies and all his discomforts disappeared (figure 1). However, the unchanged COHb content of 6% during follow-up led us to assume that he continued smoking at lower intensity.

DISCUSSION

Our case report is noteworthy for the diagnostic odyssey we experienced in identifying an unexpected cause of polycythaemia. The initial blood values were suggestive for a myeloproliferative neoplasm, however, normal molecular testing for JAK2 mutations and BCR-ABL fusion transcripts as well as the normal stem cell cultures made a clonal disorder unlikely.⁷ The serum erythropoietin level was inadequately normal for the degree of haemoglobin and thus indicative of secondary polycythaemia. The secondary cause was further supported by the blood gas analysis, which revealed a considerably increased CO content, in line with chronic

poisoning from, at that point, an unidentified source. Similar to chronic CO poisoning in heavy cigarette smokers, we found an increased erythrocyte volume with reduced plasma volume.^{8–10} However, the patient credibly denied cigarette smoking. Retrospectively, increased awareness and a more detailed personal history would have facilitated identifying water-pipe smoking as the possible cause for CO poisoning. The clinical spectrum of CO poisoning is non-specific including headache, dizziness, nausea, confusion, fatigue, chest pain, shortness of breath and loss of consciousness. The correlation with COHb seems to be poor and life threatening symptoms appear at COHb >25% with metabolic acidosis.¹¹ In heavy cigarette smokers, COHb up to 10% have been observed, which is in the range of our case report. Secondary polycythaemia and patients presenting with syncope to the emergency ward have been described as manifestation of CO poisoning from water-pipe smoking.^{12–13}

Learning points

- Exposure to relevant toxins is expected to be more relevant than assumed in water-pipe smoking.
- Increased awareness is required to identify water-pipe smoking as a possible source for chronic carbon monoxide (CO) poisoning and other toxins.
- Secondary polycythaemia can be caused by chronic CO poisoning related to excessive water-pipe smoking.
- Our report should help to enhance awareness and advocate more information on potential toxicities of water-pipe smoking.

Contributors NB, AT and AR have contributed in writing the manuscript.

Competing interests None.

Patient consent Obtained.

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Figure 1 Course of haemoglobin, erythrocytes and haematocrit after cessation of water-pipe smoking.

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