

CASE REPORT

Transient global amnesia following a whole-body cryotherapy session

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SUMMARY

Whole-body cryotherapy (WBC), which consists of a short exposure to very cold and dry air in special 'cryo-chambers', is believed to reduce inflammation and musculoskeletal pain as well as improve athletes' recovery. This is the case of a 63-year-old male, who presented with transient global amnesia (TGA) after undertaking a WBC session. TGA is a clinical syndrome characterised by a sudden onset of anterograde amnesia, sometimes coupled with a retrograde component, lasting up to 24 hours without other neurological deficits. Even though the patient completely recovered, as expected, in 24 hours, this case highlights that WBC is potentially not as risk free as thought to be initially. To conclude, before WBC can be medically recommended, well-conducted studies investigating the possible adverse events are required.

BACKGROUND**Whole-body cryotherapy**

Cold therapy is commonly used to reduce pain locally, particularly in inflammatory diseases and injuries. Whole-body cryotherapy (WBC), which is a subtype of cold therapy, was first proposed in 1978 by Dr T Yamauchi, a Japanese rheumatologist, to treat rheumatic diseases.¹

WBC consists of a short exposure (usually 2–5 min) to very cold and dry air (approximately –110°C to –140°C) in special cryo-chambers.² Participants have to wear a small swimsuit, gloves, an ear band, a face mask, dry shoes and socks to protect their extremities from cold-related injuries.²

It is postulated that the reduction of body temperature induces a decrease in pro-inflammatory cytokines, an increase in antioxidant status and positive effects on muscle soreness and pain scores.² Moreover, the decrease in temperature stimulates cutaneous receptors, which initially activate the sympathetic adrenergic nerves and consequently constricts local blood vessels.³ However, the summative effect of WBC seems to be parasympathetic because peripheral vasoconstriction increases central blood volume, triggering the baroreflex. Lately, WBC has been considered as a potential parasympathetic stimulation therapy, which is believed to be a sign of systemic recovery.⁴

WBC is currently used for the treatment of rheumatic disease (eg, arthritis, fibromyalgia, ankylosing spondylitis), depression, multiple sclerosis and osteoporosis.^{3 5 6} Recently, WBC

has become increasingly popular in sports medicine to treat sport injuries and improve recovery.⁷

A literature review, mainly focused on the use of WBC in sports medicine, stated that 'the most recent studies confirmed the anti-inflammatory, analgesic and antioxidant effects of WBC by highlighting the underlying physiological responses'. However, the same review added that 'a small number of studies that did not report any positive effects should, however, not be neglected'.⁴ Furthermore, most of the studies are of low quality, consisting of a lot of bias (no double-blinded studies, for example), using small groups of patients and a population of mainly young male patients.^{3 4 7} To date, strong evidence is still lacking to recommend it from a medical point of view.^{2–4 8 9}

Regarding the reported adverse effects of WBC, most of them are local such as skin burns or urticaria.^{2 8} In comparison, systemic risks are rarely described (increased blood pressure, nausea, infection), and to the best of our knowledge, no neurological adverse events have been published.^{4 8} However, as Bleakley *et al* and Costello *et al* refer to,^{2 3} the majority of studies do not actively monitor for any potential predefined adverse events. Thus, we have limited knowledge about them.

Transient global amnesia

'Transient global amnesia (TGA) is a clinical syndrome characterised by a sudden onset of anterograde amnesia, accompanied by repetitive questioning, sometimes with a retrograde component, lasting up to 24 hours', without other neurological deficits.⁹ It occurs mostly in middle-aged and elderly adults, and the aetiology is still not well known. Three hypotheses have been suggested: vascular, migraine related and epileptic. According to Arena and Rabinstein,⁹ the leading hypothesis is that venous congestion in the medial temporal lobes causes reactive arterial vasoconstriction, which leads to hypoperfusion and impaired hippocampal activity. It is thought that Valsalva manoeuvres in patients with jugular valve incompetence could cause venous congestion. While patients suffering from migraine have a higher probability of experiencing TGA, it is proposed that both pathologies could share a common pathophysiological mechanism. Following the acute event, an epileptic origin is less probable, as no electrical abnormalities have been seen during the amnesic phase.⁹



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In addition to Valsalva manoeuvre, cold and hot water immersion, emotional stress, pain and sexual intercourse are supposed to be able to trigger a TGA.^{9–11}

CASE PRESENTATION

A 63-year-old male patient presented in the emergency department of a Swiss regional hospital (Biel/Bienne) after undertaking a WBC session with his working colleagues. About 30 min after the WBC session, he wanted to pay for his colleagues and was unable to remember the code of his credit card. He then repeatedly asked where they were and what they had done in the last few hours. His colleagues took him to a private clinic, where a brain MR angiography revealed nothing abnormal. He then came to our regional hospital. At his arrival, the patient presented with anterograde and retrograde amnesia (he did not remember if his mother was still alive or that he had had a prostate operation a couple of years ago). Apart from this amnesia, the patient did not present with any other symptoms. He added that this session was the second one in his life and that the first one went without any problems.

The patient has gastro-oesophageal reflux disease and had an inguinal hernia operation in 2015 and a prostate operation in 2013. The only medication the patient took on a daily basis was 20 mg of omeprazole.

In the physical examination, the vital parameters were normal (heart rate 70 bpm, oxygen saturation 100%, temperature 36.9°C, breath rate 12 bpm), apart from a slightly elevated blood pressure (154/77 mmHg). The neurological (with exception of the amnesia), cardiovascular, respiratory and abdominal examinations were without abnormal particularities. The ABCD² score for transient ischaemic attack was 4, which corresponds to a moderate risk of suffering a subsequent stroke.¹²

INVESTIGATIONS

The primary blood analysis showed a slightly elevated glycaemia (5.9 mmol/L), which persisted on the following day (6.0 mmol/L). The coagulation, basic haematological, hepatic, renal, electrolytic, thyroid parameters and the arterial gas analysis were within the norms. On the second day of the hospitalisation, a dyslipidaemia was observed (total cholesterol 5.43 mmol/L, high-density lipoprotein (HDL) cholesterol 1.25 mmol/L, cholesterol:HDL ratio 4.3, low-density lipoprotein cholesterol 3.54 mmol/L, triglyceride 1.75 mmol/L). Additionally, vitamin D and B₁₂ deficiencies were diagnosed (vitamin D 39 nmol/L and vitamin B₁₂ 178 pmol/L).

The brain MR angiography, done about 1 hour after the beginning of the event, revealed no signs of ischaemic or haemorrhagic lesions and no stenosis of the supra-aortic arteries supplying the brain. Since ischaemic and haemorrhagic strokes were ruled out and TGA was considered a benign pathology, we decided not to perform further MR procedures.

In order to exclude a cardiac source for an embolism, an ECG, a Holter monitoring and a transthoracic echocardiogram were performed. The ECG showed a normal sinus rhythm without any abnormalities, and the Holter monitor confirmed that. Lastly, the echocardiography revealed normal morphology and heart function.

According to a normal cerebral MR angiography and diminishing symptoms, we monitored the patient during 24 hours and investigated the cardiovascular risk factor in order to treat them.

We calculated the Hard Framingham Coronary Heart Disease Risk Score (estimates risk of heart attack in 10 years) and the GSLA Score ('groupe de travail lipides et

athérosclérose', taskforce for lipid and atherosclerosis of the Swiss society for cardiology).^{13 14} These scores were 13.3% and 5.3%, respectively, which indicates a low risk for a cardiovascular event in the next 10 years.

OUTCOME AND FOLLOW-UP

During the hospitalisation, the patient totally recovered his memory except for the 3–4 hours surrounding the WBC session. Indeed, the amnesia covers a period of time starting about 30 min before the WBC session and ending 3 hours after it. Thus, the patient left the hospital with permanent amnesia for the period of his TGA as expected according to the literature.⁹ Consequently, no special treatment was needed.

Concerning the dyslipidaemia and according to the low risk for the patient, we advised him to improve his lifestyle (diet and exercise). We supplied the patient with vitamins D and B₁₂.

One year later, the patient has still permanent amnesia for the period of his TGA. Otherwise, he is doing well and has not suffered from a recurrence.

DISCUSSION

This article is about the first reported case of TGA following a WBC session to the best of our knowledge. Naturally, it does not prove that WBC caused it. However, as cold exposition is a supposed trigger of TGA,^{10 11} the suspicion that WBC actually caused it is high. According to the vascular hypothesis of TGA, we suggest that extreme cold exposition could trigger a Valsalva manoeuvre or directly constrict cerebral vessels as cold perfusion does.¹⁵

As mentioned above, there is a lack in the literature of well-conducted studies investigating the possible adverse events of WBC. Moreover, the benefits of such a physical therapy are not well proven. Consequently, before WBC could be medically recommended, studies in order to identify all the possible benefits and side effects of such a procedure should be conducted.

Patient's perspective

I would like to highlight, that at that time I had a lot of stress at work and this could potentially have contributed to my transient global amnesia. Since that event I have not practiced WBC because my wife and I are a bit anxious about doing it again, which is a bit unfortunate because WBC was a relief on the shoulder pain I suffer from.

Learning points

- ▶ To the best of our knowledge, this case report describes the first transient global amnesia case following a session of whole-body cryotherapy (WBC).
- ▶ WBC could potentially result in transient global amnesia, as cold seems to be a risk factor for this.
- ▶ We highlight the lack of studies investigating the possible adverse effects as well as the insufficient evidence regarding the benefits of WBC.
- ▶ As safety and benefits of WBC are not well documented by the literature, this procedure should not be medically recommended at the moment.

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Contributors JC met the patient, collected the data and wrote the paper under the supervision of two of his chiefs, DG and ACL. Both of them corrected and improved the paper itself.

Competing interests None declared.

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