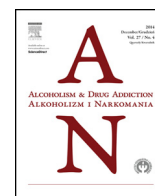


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List do redakcji/Letter to Editor

Irreversible brain damage caused by methamphetamine

Persisting structural brain lesions

*Nieodwracalne uszkodzenia mózgu spowodowane przez metamfetaminę
Utrzymujące się strukturalne uszkodzenia mózgu*Sebastian Moeller¹, Hagen B. Huttner¹, Tobias Struffert², Helge H. Müller^{3,*}¹ Friedrich-Alexander-University, Department of Neurology, Erlangen-Nuremberg, Germany² Friedrich-Alexander-University, Department of Neuroradiology, Erlangen-Nuremberg, Germany³ Medical Campus University, School of Medicine and Health Sciences, University Hospital, Karl-Jaspers-Klinik, Department of Psychiatry and Psychotherapy, Oldenburg, Germany

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ABSTRACT

Methamphetamine is an addictive scene substance usage of which is increasing rapidly. While methamphetamine often causes neuropsychiatric symptoms like anxiety, psychosis and hallucinations, reports of structural ongoing cerebral alterations are rare. We here report a case of this kind of damage caused through methamphetamine use.

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STRESZCZENIE

Metamfetamina jest substancja uzależniająca, której używanie gwałtownie wzrasta. Chociaż wiadomo, że metamfetamina często przyczynia się do powstawania objawów zaburzeń psychicznych, takich jak niepokój, omamy i psychozy, to doniesienia dotyczące strukturalnych zmian w mózgu należą do

Słowa kluczowe:

metamfetamina

MRI (obrazowanie metodą rezonansu magnetycznego)

strukturalne uszkodzenia mózgu

* Corresponding author at: Medical Campus University of Oldenburg, School of Medicine and Health Sciences, Psychiatry and Psychotherapy – University Hospital, Karl-Jaspers-Klinik, Hermann-Ehlers-Straße 7, D-26160 Bad Zwischenahn, Germany.

E-mail address: helge.mueller@kjk.de (H.H. Müller).

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rzadkości. W artykule przedstawiono przypadek uszkodzenia mózgu spowodowanego przez używanie metamfetaminy.

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Crystal meth is a powerfully addictive scene substance of rapidly increasing usage. There are an estimated 10 million users in the US and 35 million worldwide [1–3]. It is snorted, smoked, or injected, and quickly crosses the blood-brain barrier because of its lipophilic character. Crystal meth is more potent than amphetamine [2]. The drug stimulates dopamine, norepinephrine, and serotonin transporters on neuronal cell membranes. At higher concentrations, it crosses membranes independent of transporter binding. Clinically recognisable symptoms are the typical “meth mouth”, depression, anxiety, fatigue and an adrenergic withdrawal syndrome with tachycardia, hypertension, mydriasis, diaphoresis and psychomotor agitation. The most common psychiatric manifestation is a chronic psychosis [4–6].

We treated a formerly healthy 24-year-old male patient who presented a sudden onset of visual hallucinations, anxiety, delusions, paranoia, apraxia and tachycardia. At first, we assumed a diagnosis of encephalitis, but after taking the patient's history into consideration, we discovered that he had been methamphetamine (crystal meth) dependent for approximately 4 years. Urine drug screening confirmed the crystal meth use (3500 ng/ml). Other diagnostic work-up including CSF-analyses was completely unremarkable. The patient had no history of abusing other substances (verified *via* extended toxic-screening). MRI on admission revealed diffusely increased signal intensity of the white matter (Figure 1). The patient's symptoms and structural findings persisted over the course of the treatment period of

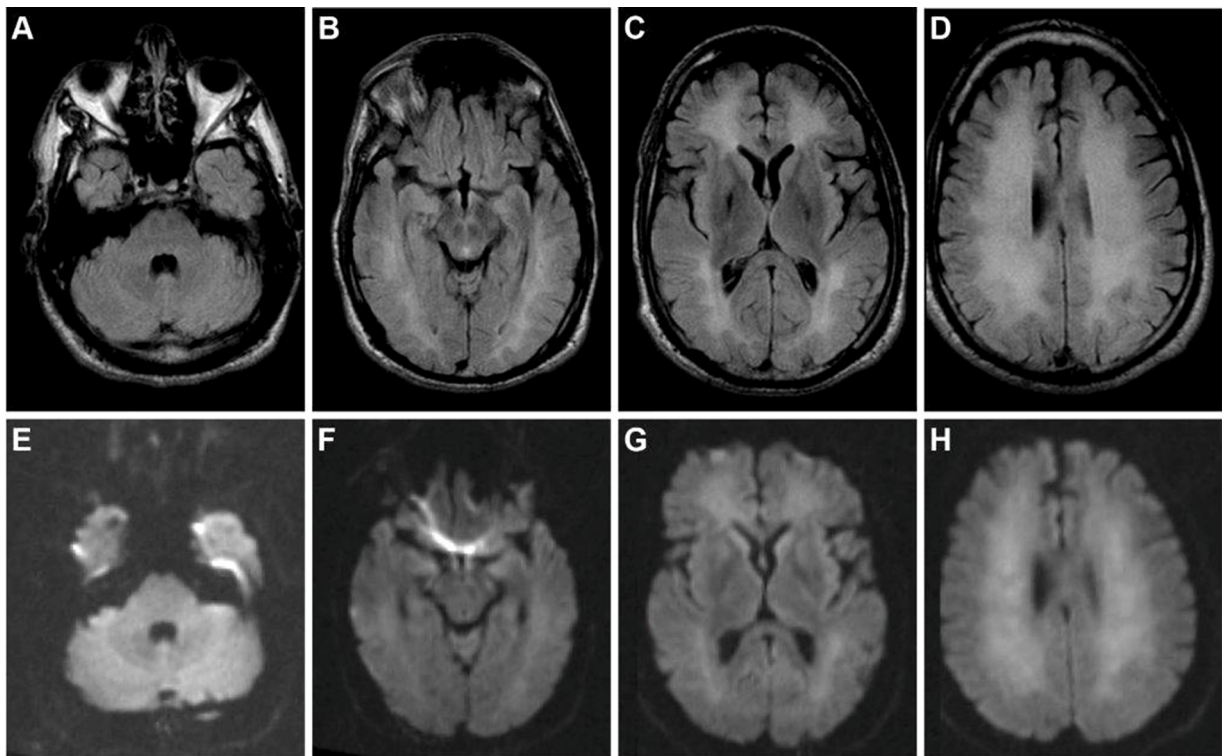


Fig. 1. Diffuse white matter alterations. Example of typical imaging findings: in FLAIR imaging (Fluid attenuated inversion recovery, upper row) increased signal intensity of the white matter with extensive involvement of the temporal, frontal/parietal and occipital lobe is present. The cortex, basal ganglia, brain stem, and cerebellum are not involved. After contrast injection pathologic uptake is not present (not shown). Diffusion weighted imaging (DWI, lower row) shows high signal intensity at a b -value of 1000 of the white matter as on corresponding apparent diffusion coefficient (ADC, not shown) maps

ten weeks and within a follow-up examination after 7 months.

Research reports ongoing structural brain alterations with extensive white matter changes in all lobes are rare and the few examinations suppose crystal meth to mainly affect the cortex, and hippocampal, thalamic and hypothalamic structures. Previous research suggested correlations of crystal meth exposure and striatal volume [7–9]. However, our patient presented diffuse white matter injury. The cortex, basal ganglia, brain stem, and cerebellum were not affected.

The finding emphasises crystal meth as a substance capable of causing the remaining cerebral damage not only within intoxication or during withdrawal. Because of those permanent severe brain damages, additional systematic examinations in crystal meth dependent users are recommended.

Because crystal meth use has increased dramatically worldwide [10], treating physicians should be aware of the impressive brain alterations that can be seen on imaging, like those reported here.

Authors' contributions/Wkład autorów

All authors were directly involved in the care of the patient. S. Moeller and H.H. Müller wrote the manuscript. H.B. Huttner reviewed and revised the manuscript. T. Struffert gave expert opinion on the radiology findings. H.H. Müller was the physician principally responsible for the care of the patient. He also reviewed and revised the manuscript.

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Conflict of interest/Konflikt interesów

None declared.

Financial support/Finansowanie

None declared.

Ethics/Etyka

The work described in this article has been carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) on medical research involving human subjects; EU Directive (210/63/EU) on protection of animals use of scientific purposes; Uniform Requirements for manuscripts submitted to biomedical journals; the ethical principles defined in the Farmington Consensus of 1997.

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