

Case Report

Bilateral Total Optic Atrophy Due to Transdermal Methanol Intoxication

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ABSTRACT

In this case report, we document a 54-year-old woman with total bilateral optic nerve atrophy after local application of methanol containing spirit. Almost all the reported cases of methanol intoxication in the literature are caused by oral ingestion. In this rare case, we present transdermal absorption of methanol that may cause irreversible blindness in addition to intracerebral lesions.

Key words: Methanol Intoxication, Optic Atrophy, Transdermal Absorption

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INTRODUCTION

Methanol poisoning causes neurological sequelae of variable severity including cerebral and intraventricular hemorrhage, cerebellar necrosis, diffuse cerebral edema, bilateral subcortical white matter necrosis, and optic neuropathy.¹⁻⁴ Ingestion of even small amount of methanol can cause vision loss in a few hours.² Although the mechanism of optic nerve atrophy in methanol poisoning is unknown, it is thought to be caused by progressive demyelination of nerve fibers due to myelinotoxic effect of methanol or its formic acid metabolite. Bilateral putaminal necrosis and subcortical white matter lesions are the most common neuroimaging findings in patients with methanol intoxication.⁴

Almost all the previous cases of methanol poisoning are due to its oral ingestion, but patients related with its transdermal absorption have been rarely reported.^{1,2} In this case report, we have a rare case with total bilateral optic atrophy due to acute transdermal methanol intoxication. We document the possibility that even skin contact with methanol containing solvents (i.e., spirit) can be very dangerous and cause irreversible blindness.

CASE REPORT

A 54-year-old woman was seen for progressive vision loss for the last 2 months. Her past medical history, 2 months ago, said she had pain in her feet for which she wrapped them with methylated spirit-soaked materials for 6-7 h in order to get relief from pain. She had nausea, vomiting, and unconsciousness after 2 days and was diagnosed with methanol intoxication. On neurological examination, she was comatose with dilated pupils with an absent light reflex. The Glasgow Coma Scale score was 6. After treatment in the intensive care unit for 6 days she was discharged from the hospital with progressive vision loss.

On ophthalmic examination, there was no light perception and no light reflex in both eyes. According to gonioscopy, the anterior chamber was deep, no new vessels were observed in the iris or angles and all quadrants of the angle were open bilaterally. Intraocular pressure was 15 mmHg in the right eye and 16 mmHg in the left eye by Goldmann's applanation tonometry. There was no sign of uveitis on slit-lamp examination. Nystagmus was not present on the optokinetic nystagmus test. Fundoscopy disclosed bilateral total optic atrophy

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[Figure 1]. Neurological examination was unremarkable. Computed tomography revealed symmetrical putaminal necrosis and generalized cortical atrophy [Figure 2]. She had no signs or symptoms of intoxication except for total bilateral optic atrophy during the 4-month follow-up period.

DISCUSSION

Methanol is rapidly absorbed after oral ingestion and becomes oxidized in the liver to formaldehyde and formic acid. Formic acid is toxic to the central nervous system and controls cytochrome oxidase and interferes with adenosine triphosphate (ATP) production from mitochondria. Therefore, it causes histologic hypoxia which induces axonal cell death.⁵ Secondly, the retinal ganglionic cells are destroyed with the degeneration of their axonal regions by formic acid. Further, it also interferes with transfer of cell signals, causing visual loss by damaging myelin selectively in the retrobulbar area.⁶

Methanol poisoning can be life-threatening and cause blindness. Early ocular symptoms include photophobia, blurred vision, and painful eye movements. The fundoscopic examination in the acute period reveals hyperemia of the optic disk, nerve fiber edema at the disk borders and the peripapillary retina, and dilation of the retinal veins. Decrease in visual acuity, visual field defects such as central, centrocecal and peripheral scotomas, disturbances of pupillary reactions and color vision may occur as well.⁷ The acute period may end in complete recovery or in some cases (as this one), optic atrophy may develop.⁷

Although there are many reports of methanol poisoning due to oral ingestion, reports of transdermal absorption are rare. Avella *et al.*¹ have reported a case that had committed suicide jumping from second floor. She was found dead with number of injuries, lying nude in partially evaporated methanol. Therefore,

the cause of death was determined as blunt impact trauma and transdermal methanol poisoning. Soysal *et al.*² reported a patient with coma and metabolic acidosis following transdermal methanol intoxication. The patient suffered from headache, and used spirit to massage her head several times. The metabolic acidosis got resolved, whereas the neurological status did not improve and she died on the 4th day of hospitalization. The patients in these reports were dead and there was no information regarding their vision and optic disk examination. On the other hand, our patient was alive but had total bilateral optic atrophy and vision loss due to transdermal methanol intoxication. We believe that even transdermal application of methanol can cause either death or optic atrophy.

Methylated spirits are a cheap solvent used as cleaning agents. It is denaturated alcohol containing 10% methanol. Plants containing methanol have been part of folklore and are being used in the treatment of rheumatoid arthritis, edema, throat pain, and postpartum abdominal pain in China due to its analgesic and anti-inflammatory effects.⁸ Similarly, local application of methylated spirit is traditionally used for pain relief in some rural regions in Turkey, where people prepare spirit containing materials to wrap their joints or extremities. However, although methanol is known to cause intoxication, complications of these practices are not well known. The duration of application, the size and properties of exposed skin, and the individual variability of the skin may affect transdermal absorption of methanol.⁹ In our patient, application of spirit to feet for about 7 h duration caused intoxication after 2 days and resulted in total bilateral optic atrophy within 2 months.

In summary, presenting this rare case, we would like to imply that even transdermal application of methanol may cause intoxication in some individuals. Accordingly, awareness should be provided for patients and physicians alike especially in such areas where methanol is utilized more than estimated.



Figure 1: Fundus photographs of right (R) and left (L) eyes of a patient with transdermal methanol intoxication demonstrating bilateral optic atrophy

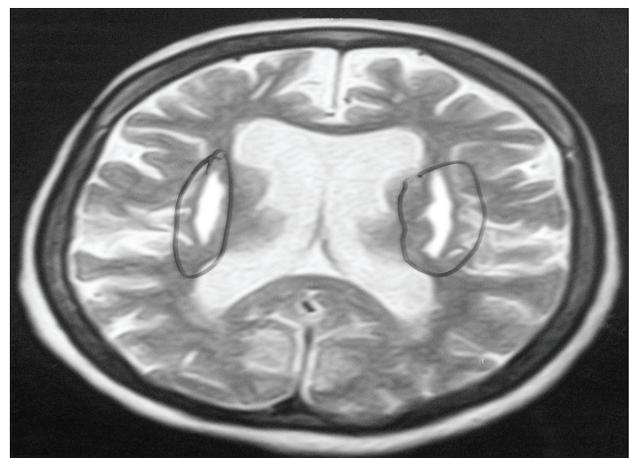


Figure 2: Magnetic resonance imaging of a patient with transdermal methanol intoxication. Bilateral symmetric putaminal necrosis and generalized cortical atrophy are seen which is typical of methanol intoxication

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