

## Occupational Exposure to Toluene Presenting as Acute Ischemic Stroke: A Case Report

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### Abstract

**Background:** Toluene as a chemical is a major component of organic industrial solvents that is known to cause neurotoxicity. Chronic toluene exposure can result in a wide array of neurological manifestations. Toluene induced strokes are sparsely described in literature.

**Case presentation:** The case is of a 32 years old female working in a chemical industry who presented with acute focal neurological deficit and was exposed to vapours of toluene.

**Conclusion:** Occupational exposure to toluene, a volatile toxin can result in cerebral infarction and thus adequate safety measures should be taken to prevent exposure and damage to the nervous system.

**Keywords:** Toluene, stroke, occupational exposure

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### Background:

Toluene exposure is common in industries as well as in young as a recreational agent especially in the western world. The mechanism of vivid presentations of central and peripheral nervous system injury from toluene is not well established. This solvent like many others is highly lipid soluble and distributed in lipid rich regions in the brain. These observations support the notion that

myelin which contains 70% of the lipid is targeted for damage. A number of complications of solvent abuse have been reported in the past in literature like hypokalaemia periodic paralysis<sup>1</sup>, cerebellar degeneration<sup>2</sup>, permanent brain damage<sup>3</sup>, peripheral neuropathy<sup>4,5</sup>. Reports of cerebral ischemic stroke following toluene exposure has been described exiguously in the literature.

## Case Report

A 32 years old female was admitted to our hospital as a case of sudden onset left sided weakness for 3 days. she had no history of Hypertension, Diabetes Mellitus, Smoking, recreational substance use, abortions, oral contraceptive pill use. she was working in a chemical glue factory for 3 months in which toluene was used and she was getting exposed to the vapours. On examination patient had left hemiparesis and an extensor plantar response on the left. cardiac auscultation revealed no murmurs and carotid examination revealed no bruits. MRI brain revealed an acute-infarct in right MCA territory with few chronic ischemic foci/ lacunar infarcts in bilateral frontoparietal deep white matter, right lentiform nucleus. Echo revealed normal LV systolic function (LVEF 60%), normal heart valves and no mural thrombosis. Carotid Doppler showed normal flow pattern in carotid and vertebral arteries bilaterally. A72 hr holter study was performed and it was normal. Other investigations including Haemoglobin, white cell count, packed cell volume, RPR, ESR, biochemical profile, platelet count, fasting lipids, thyroid profile, ECG, radiograph of chest was normal. A hyper coagulable work up for APLA syndrome was normal. HIV and HbsAg serologies were negative. HBAIC was 4.42. Serum homocysteine level was 9.56 (5.46-16.2). Her serum ANA and thrombophilia profile was normal. Her serum toluene level was found to be 15 mg/dl and levels above 2.5 mg/dl correlate with toxicity and concentration above 50mg/dl are probably fatal. In view of absence of traditional stroke risk factors and a normal stroke work up, and a high serum toluene level with occupational exposure, Possibility of Stroke due to toluene toxicity was considered.

## Discussion

The precise mechanism of cerebral infarction by which toluene cause cerebral infarction

remains unclear. Ischemic strokes most likely in toluene abusers is suggested due to vasospasm caused by sensitization of vessel receptors to circulating catecholamines[6]. An immune aetiology has been suggested for heroin<sup>7</sup> and vascular spasm has been implicated in the etiology of stroke after LSD abuse<sup>8</sup>. Toluene is found in gasoline, acrylic paints, varnishes, lacuers, paint thinners, adhesives, glues, rubber cement, airplane glue and shoe polish. Toxicity can occur from unintentional or deliberate inhalation of fumes, ingestion or transdermal absorption. Slang names for inhalation include 'Huffing' or 'bagging'. Organic solvents can produce encephalopathy, cerebellar degeneration, Strokes including CVT, optic and cranial neuropathies, Parkinsonism and peripheral neuropathy. Clinical, neuropsychological and MRI studies in toluene abuser's have shown specific damage to white matter and a consistent neurological and neurobehavioral impairment. It can also cause teratogenicity and features similar to fetal alcohol syndrome.

## Conclusion

Organic solvents like toluene have emerged as a potent neurotoxin and can cause stroke and a wide array of neurological manifestations. It is a preventable cause of neurotoxicity. There is an urgent need for development of effective preventive measures by employers to protect the health of workers exposed to hazardous agents in the workplace. Promoting education is essential to curtailing inhalant abuse.

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