

# Gas Geyser - A Preventable Cause of Carbon Monoxide Poisoning

R ANAND, R ANAND, A VERMA, P JAGMOHAN

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## INTRODUCTION

Carbon monoxide (CO) is a colourless, odorless toxic gas formed due to incomplete combustion. Epidemics of CO poisoning commonly occur during winter months. Sources include smoke from fires, misuse of non-electric cooking and heating devices burning fuel and snow obstructed exhaust system of motor vehicles (1). The clinical presentation is non-specific and may range from nausea, headache, dizziness, confusion to profound central nervous system dysfunction and even death (1,2). The diagnosis of CO poisoning is usually based on circumstantial evidence, however brain CT and MR imaging provide objective visual evidence of brain damage after exposure to toxic gas.

We are reporting MR findings in a case of CO poisoning due to exposure to gas geyser (heating device which runs on cooking gas).

## CASE REPORT

A 13 year old child was brought to hospital with history of having been found unconscious in the bathroom without any associated tonic-clonic movement, tongue bite or incontinence. Patient was not responding to verbal commands, pupils were semi-dilated and sluggishly reacting and there was abnormal dystonic posture of all four limbs. Patient regained consciousness after an hour, was irritable with excessive cry and complained of headache. His blood counts and metabolic profile was normal. MR imaging of brain revealed areas of altered signal intensity in bilateral globus pallidi. The globus pallidal lesions were bilaterally symmetrical, appeared mildly hypointense on T1 and hyperintense on T2 and FLAIR images. Other basal ganglia structures were normal in signal intensity.

Considering these findings as secondary to hypoxia , a

detailed evaluation of circumstances responsible for hypoxia was done. Family had recently installed a gas geyser in the bathroom. The child having locked the bathroom door, there was no outlet for combustion gases. Therefore because of passive ventilation and decreased oxygen child suffered hypoxia and fell unconscious. Patient improved on supportive therapy. He had mildly impaired cognitive function especially memory deficit but no motor deficit at the time of discharge. On follow up after 3 months child showed improvement in cognitive function.

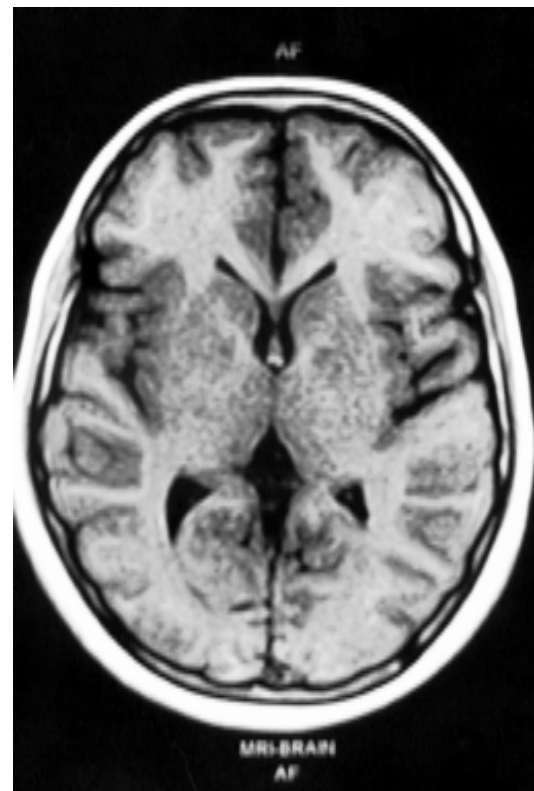


Fig 1. Axial T1-weighted MRI of brain at the level of basal ganglia showing hypointense lesions involving bilateral globus pallidi.

From the Department of Radiodiagnosis, Lady Hardinge Medical College & Department of Neurology, Jaipur Golden Hospital, New Delhi

Request for Reprints: Dr. Rama Anand, A-203, Meera Bagh, Outer Ring Road, New Delhi - 110087, India

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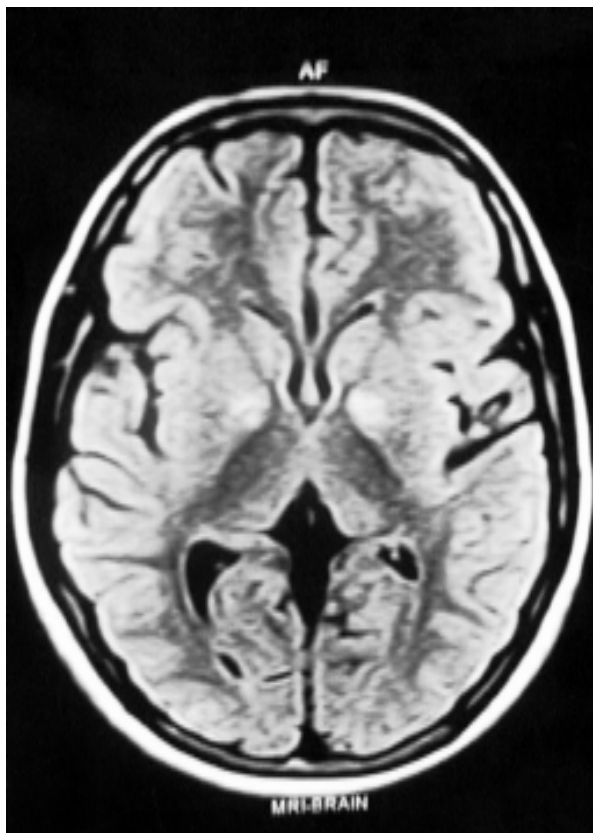
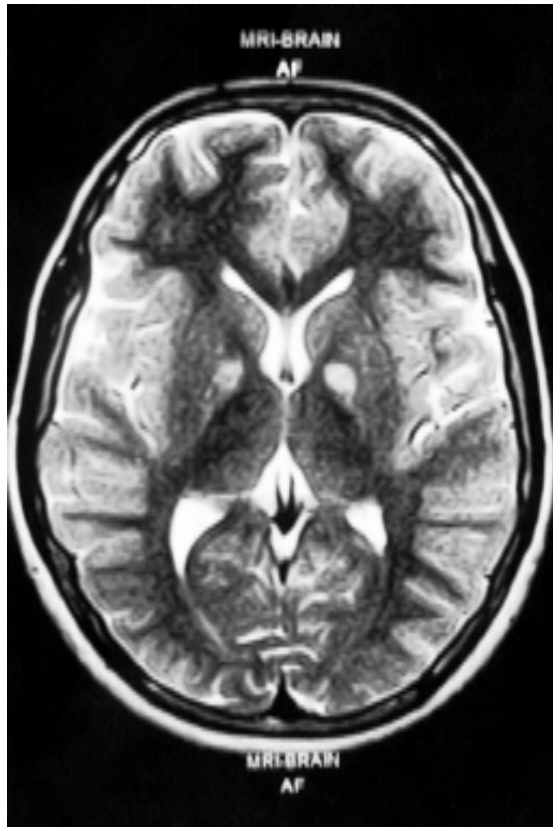


Fig 2 a,b. Symmetrical hyperintense lesions in bilateral globus pallidus seen on a)axial T2-weighted MRI, b)axial FLAIR image of brain.

## DISCUSSION

Affinity of CO binding with haemoglobin (Hb) is 200-230 times that of oxygen with the result relatively minute concentration of CO in environment can result in toxicity.

Possible mechanism of toxicity include (a) decrease in oxygen carrying capacity of blood (b) alteration in dissociation characteristic of oxyHb further decreasing oxygen delivery to tissues (c) decrease in cellular respiration by binding with cytochromes (d) binding to myoglobin causing myocardial and skeletal muscle dysfunction resulting in impaired tissue perfusion (1).

Characteristically the most common abnormality seen on MR imaging of brain is bilateral necrosis of globus pallidus typically showing low T1 and high T2 signal as seen in the present case too. Haemorrhage has also been reported within these lesions (2,3).

Abnormalities of other basal ganglia structures, cerebral white matter, hippocampus, cerebral cortex and cerebellum have also been reported (2,4,5). Donnell et al in a study of 19 consecutive patients with CO poisoning found involvement of cerebral white matter as the second commonest site (n=6) after globus pallidus (n=11). The predilection for the globus pallidus may relate to hypotensive effect of CO poisoning in the watershed territory of the arterial supply. Lesions within deep white matter have been reported as being indicator of poor prognosis compared to those in the globus pallidus. Cerebral edema may occur early and presages poor outcome ie. death or severe permanent damage (3,4).

The present case highlights the importance of MRI in diagnosing the hypoxic changes. MRI scores over CT not only in better demonstration of lesions especially in hippocampus and white matter but also has been found useful in determination of overdose and prognosis. It is suggested that cross ventilation be ensured in order to prevent such mishaps in future when any combustible device (like gas geyser) is used in a closed environment. Gas geyser being cheaper is becoming a popular mode of heating water especially in suburban areas of our country.

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