



## Case Report

## Implementing traditional ayurveda treatment as a primary care management in a survivor of gas geyser syndrome – A case report

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## ABSTRACT

Domestically, gas geysers are used in developing countries like India to supply hot water in bathrooms. These are of low economic value, with no requirement of electricity and easy installation, hence they are high in demand. A female patient of 14 year visited to a private Ayurved clinic on 27/12/2021 with complaints of difficulty in dysgraphia, dyslexia, dysphonia and fall (sometimes) while walking on uneven and unknown pathway. Four years ago, the patient landed into a vegetative state and was bed ridden, her condition was further diagnosed as Gas Geyser Syndrome. Here an effort has been put forth to reveal the concept of ayurvedic management adopted in a survivor of Gas Geyser Syndrome which is found to be effective. In Ayurveda the symptoms of Acute Gas Geyser syndrome can be correlated with *Visha* (Toxins) and its *vishalakshana* (Toxicity symptoms) wherein *Murcha* (Unconsciousness) and *Sanyasa* (Stage of Coma) are seen. The long term side effects of Gas Geyser Syndrome can be correlated with *Vatavyadhi* (Neurological disorders) as the stages of the disease manifestation presents with more neurological deficits. Ayurvedic intervention with internal medications along with the panchakarma procedures in the treatment of Gas geyser syndrome exhibits encouraging results which were seen in improving her cognition, memory and essential skills like writing, verbal communication, thinking skills, use of technology in socializing with the community.

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## 1. Introduction

Poisonous gases are asphyxiants and dangerous as they displace the oxygen present in the environment. Inert gases like carbon monoxide, carbon disulphide, hydrogen cyanide are systemic asphyxiants or chemical asphyxiants which when inhaled in high concentration displace oxygen and combine with hemoglobin. Incomplete combustion of hydrocarbon fuels leads to emission of carbon monoxide gas. Poisoning of carbon monoxide occurs in poorly ventilated areas or rooms. Carbon Monoxide has an affinity to bind with hemoglobin forming carboxyhemoglobin, which reduces hemoglobin oxygen carrying capacity leading to hypoxia.

High levels of carbon monoxide (CO)  $\geq 250$  ppm causes respiratory distress, hyperventilation and still births [1].

CO is a hidden threat due to its characteristic features of being colourless and odourless. It has an affinity towards hemoglobin 230 to 270 times to that of oxygen. Carboxyhemoglobin (COHB) causes early neurologic depression and further leading to late neuroanatomical abnormalities with neurocognitive and affective deficits [2].

Various countries like United Kingdom, Canada, Australia, Hong Kong have their policies regarding installation of gas geysers. Indian states also have their guidelines for installation process. Mahanagar Gas Limited (MNG) has clearly specified that such Gas Geysers should not be installed in Bathroom. In developing countries, Gas geysers are used for heating water where Liquefied Petroleum Gas is the common fuel. This emits a range of toxic gases; one among them is CO [3]. Due to inhalation of CO, saturation of Oxygen in the blood reduces causing loss of consciousness. This is

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most commonly seen in closed bathrooms with lack of ventilation. These episodes have been documented as Toxic Encephalopathy [4].

Toxic Encephalopathy means brain dysfunction caused by toxic exposure [5]. A range of symptoms are presented which includes subclinical deficits to fatal disorders. Inhalation of high levels of CO may cause headache, chest pain, arrhythmias, weakness, dizziness, confusion and loss of consciousness [6]. Its prolonged exposure may lead to seizures and even death [7]. Late complications comprises chronic fatigue, impairment in memory and musculoskeletal functions [8].

The symptoms and long term complications seen as per the Gas Geyser Syndrome can be correlated with the *Visha lakshanas* specified in the Ayurvedic Literature. Ayurveda has explicitly explained the step wise patho-physiological changes occurring when the individual is exposed to a poison involving the *Raktadhatu*(~blood) and the *Tridoshas*(~three humours of the body) in the primary phase and finally involving all the *dhatus*(~7 constituents of the body) which hampers the normal functions of all the organs and causing serious effects on health which may even be fatal.

The present status of the patient resembles with *Vatavyadhi* (~neurological disease) wherein patient is suffering with neurological deficits as a result of *srotovaigunya* (~dysfunction in channels of the body) and *doshamarmabhighata*(~trauma to the vital points of the body) caused as a sequelae of the acute condition of CO poisoning which can be correlated with the *Vatadi doshaprakopa lakshana* in the acute phase. Hence the treatment was planned on the principles of *Visha chikitsa* and *Vatavyadhi including Vatahara, Balya and Rasayan chikitsa*.

## 2. Case report

A female patient of 14 year visited to a private Ayurved clinic on 27/12/2021 with complaints of dysgraphia, dyslexia, dysphonia and fall (sometimes) while walking on uneven and unknown pathway. Four years ago, the patient was found unconscious and was lying down on the floor of the bathroom when noticed by the parents. Immediately the patient was shifted to nearby hospital for emergency care where later she was shifted to Intensive Care Unit (ICU) for further management. Investigations like Electrocardiogram (ECG), Computed Tomography (CT) brain was done and it was normal initially but after some days patient condition started getting deteriorating and hence Magnetic Resonance Imaging (MRI) brain was done which showed grey patches. The patient landed into vegetative state and was bed ridden which was further diagnosed as Gas Geyser Syndrome. The patient received Physiotherapy and Homeopathy treatments but due to less expected improvements her parents decided to take Ayurved treatment and approached the clinic.

## 3. Clinical findings on the day of examination

On examination, the patient was moderately built and nourished with all the vitals in normal status. Pallor, cyanosis, icterus, oedema, clubbing were not found. She had difficulty in speaking, reading and writing. Her recent memory was fine but she had some issues with her past memory, though as time passed she is trying to recollect it. Her speech was not fluent but comprehensive. She was not able to read or write as per her age. Her writing was not in proper spacing nor she could maintain proper length of the alphabets. Cranial nerve examination showed normal functions. Grade 4 out of 5 was observed in the tone and power of upper and lower extremities evaluated on Medical Research Council Scale. The sensory examination revealed normal sensation of temperature, touch and pain. *Dashavidha Parikshan* (~Tenfold examination) was

done suggesting *Kaphavata Prakriti* (~body constitution) *Madhyama Samhanana* (~compactness of the body), *Madhyama Sara* (~status of body tissues), *Avara Vyayam Shakti* (~ability to carry on physical activities), *Madhyama Abhyavara* and *Jaranashakti* (~status of food intake and digestion). *Raktavaha, Mansavaha and Sanjnyavaha Srotodushti* was observed (Vitiation in micro-channels related to hematological, muscular and neurological tissues). Examination of other *Srotasa* (~microchannels) revealed normal status.

## 4. Timeline

### 4.1. Disease correlation

The patient diagnosed with Gas Geyser Syndrome as per modern contemporary science. In Ayurveda the symptoms of Acute Gas Geyser syndrome can be correlated with *Visha* and its *vishalakshanas* like *murcha* and *sanyasa* were seen and the long term side effects of Gas Geyser Syndrome with *Vatavyadhi*, as the stages of the disease manifestation presents with more neurological deficits.

### 4.2. Etiopathogenesis (Samprapti) [9]

CO when considered as a *Visha* it enters the body with its *tikshna guna* and immediately vitiates the *rakta* and the *tridoshas* at their respective sites. After mixing with blood carboxyhemoglobin (COHb) it spreads rapidly as the simile stated as oil spreads in water. Further the vitiated *doshas* loose their normal functions and produces symptoms like seizures, cardiac events and syncopal episodes. If the *Visha* takes in the seat of *Vata* it expresses diseases related to *Vata* and *Kapha*, if in seat of *Pitta* diseases of *Pitta* and *Kapha* and if the *Visha* takes the seat in *Kaphasthana* diseases of *Kapha* and *Pitta* are predominantly seen. This further deranges the normalcy of the organs and their functions which finally hampers the health of the individual losing consciousness or even may lead to death (see [Tables 2 and 3](#)).

### 4.3. Treatment plan

The treatment was emphasized more on recovery and rehabilitation. The general principles of management of *Vatavyadhi* as well as *Medhya* (brain tonics), *Balya* (improving strength) and *Rasayan* (Rejuvenative) *chikitsa* (treatment) was adopted. *Sarvanga Snehana* (~oil massage of full body), *Sarvanga Swedana* with *Shalishashtika Pinda* (~fomentation), *Matra Basti* (~medicated oil enema), *Prati-marsha Nasya* (~instillation of medicated oil in nostrils), *Shirodhara* (slowly and steadily dripping of medicated decoction on the forehead) were incorporated along with internal Ayurvedic medications. Details of treatment protocol are summarized in [Table 1](#).

### 4.4. Outcome measures

Superficial and Deep tendon reflexes were observed normal. There were no involuntary movements. She no abnormal gait was observed, her sensory neuron system were normal in which she was able to appreciate pain, touch, and temperature.

## 5. Discussion

In the present case study, the patient who suffered of CO poisoning which was diagnosed as Gas Geyser Syndrome was made on basis of history, exclusion to other causes, response to supportive treatment and MRI evidence. Investigations such as CT scan, Arterial Blood Gases (ABGs), MRI, ECG, Electroencephalograph (EEG) were done in order to overlook neurological sequel or any organ injury. The source of Carbon Monoxide poisoning was gas

**Table 1**  
Disease pathway and treatment outcomes:

Year	Events and management details
18/11/2017	Patient went into the bathroom but even after 35–40 min she didn't come outside so parents started calling her but she didn't give reply and at last parents broke the door. She was found unconscious and was lying down on the floor of bathroom. Then immediately she was shifted to nearby hospital for emergency management.
21/11/2017	CT brain was done which was normal but MRI brain (3 TESLA) was suggestive of Posterior Reversible Encephalopathy Syndrome(PRES) with restricted diffusion
21/11/2017	As per the history and clinical findings the patient was diagnosed with Gas Geyser Syndrome.
09/12/2017	The patient was discharged from hospital to home with no ambulation.
10/12/2017	Parents consulted to Physiotherapist and started her Physiotherapy along with oral Allopathy and Homeopathy medications.
22/12/2017	The patient started walking with the help of splints.
04/01/2018	The patient started speaking again for first time after the incidence and responded to verbal commands. Then later started with Occupational therapy and improvement was seen within some months in her academics. Now she was able to type, read alphabets on computer. Seeing her improvement she was introduced for remedial teaching classes.
27/12/2021	For expecting better and faster improvement parents approached the private Ayurved clinic with the complaints of Dyslexia, Dysphonia, Dysgraphia. Her speech was not fluent but comprehensive. She was not able to read or write as per her age. Her writing was not in proper spacing nor could she maintain proper length of the alphabets. Cranial nerve examination showed normal functions. Grade 4 out of 5 was observed in the tone and power of upper and lower extremities evaluated on Medical Research Council Scale. The sensory examination revealed normal sensation of temperature, touch and pain.
27/12/2021	Oral Ayurvedic medications started – 1. <i>Brahmiprash</i> 5 gram (gm) thrice a day 2. <i>Swamla</i> 10gm at early morning 3. Capsule <i>Triphala</i> 500 microgram (mg) at night with luke warm water Panchakarma (five procedures) – A. <i>Nasya</i> with <i>Panchendriyavardhan Taila</i> (oil) 3 drops in each nostril was advised for 30 days daily at evening.
28/01/2022	On first follow up, oral medicines 1–3 were continued 4. <i>Saraswat Churna</i> 1gm + <i>Laxmivilas Rasa</i> 125mg(in powder form) was administered with 5gm of <i>Kalyanak Ghrit</i> (ghee) Panchakarma – B. <i>Sarvang Snehana</i> with luke warm <i>Mahanarayan Taila</i> for 15–20 min. C. <i>Sarvang Swedan</i> with <i>Shalishastik Pindasweda</i> ( <i>Bala</i> + <i>Ashwagandha</i> ) D. <i>Matra Basti</i> 60ml with <i>Mahanarayan Taila</i> for 15 days E. <i>Nasya</i> with <i>Panchendriyavardhan Taila</i> and <i>Ksheerbala taila</i> 3 drops in each nostril on alternate days at evening.
25/3/2022	On second follow up, 2 and 4 was continued 5. <i>Syrup Shankhapushpi</i> 10 milliliter (ml) twice a day 6. <i>Sukhsarak Vati</i> (tablet) 500mg at night with luke warm water Panchakarma – Continue with A,B and D F. <i>Shirodhara</i> with <i>Jatamansi</i> and <i>Brahmi kashay</i> (decoction) for 20 min daily once for 15 days
25/03/2022	Patient was able to connect lots of new words, speak logically and developed verbal communication. Her handwriting improved with proper spacing between alphabets.

geyser. Gas Geyser Syndrome has long lasting or even life threatening after effects. These effects can range from headache, dizziness, confusion visual impairment, epilepsy, parkinson's disease, cerebral oedema, syncope, lethal arrhythmia, seizures, memory loss and coma [10].

Haldane suggested Hyperbaric Oxygen (HBO) therapy for CO poisoning in 1890s & was first used clinically in 1960s [11]. It decreases Central Nervous System injuries and mortality [12] Though along with oxygen treatment other life saving and symptomatic treatment is necessary to be given in acute stage of the disease.

In Ayurveda as per the causes, signs and symptoms we correlated it with *Visha* and its *vishalakshana* as CO is a poisonous gas which can cause serious health hazards or even death in its intoxication. *Vishaja murcha* and *sanyasa* can be correlated as per the stages of the disease progression in acute phase: wherein allopathic management is necessary to save life with proper elevation of cellular oxygen levels.

**The rationale of treatment** - In Ayurveda, the treatment was focused on the lines of *Vatavyadhi* in which the present condition of the patient occurred as a sequelae of Gas Geyser Syndrome considering the ill effects of poisonous gas intoxication (*visha*) causing *srotodushti* and *khavaigunya* leading to *shiromarmabhighata*.

Ayurveda can play a better role in the later stage for improving the quality of life. Medicines and Panchakarma therapy having *Vatashamak*, *Medhya*, *Balya* and *Rasayana* properties play a significant role in neuropsychological diseases thus improving the neurological and cognitive deficits in the patient.

The probable mode of action of the treatment is as follows-

- *Brahmiprash* syrup works as a Brain tonic having *Brahmi* (*Bacopa monniera*) and *Vacha* (*Acorus calamus*) which improves memory, concentration with intelligence. It improves grasping power and reduces mental fatigue.
- *Swamla Chyavanprash* fortified with *Suvarna* (gold), *Rajata* (Silver) *bhasma* (ash) which acts on all *saptadhatu*s and helps improving immunity.
- Capsule *Triphala* and *Sukhsarak vati* was given as a laxative that can combat constipation. It regulates the smooth bowel movements.
- *Saraswat Churna* usually used in all nervous system disorders. It improves memory and concentration. Also functions good in delayed developmental milestones, disorders of speech and language problems. *Kalyanaka Ghrita* is used to improve higher mental functions which was given with *Laxmivilas* rasa for balancing the *Vatadosha* and works as a *Rasayana*.
- *Shankhapushpi* Syrup with main ingredient as *Shankhapushpi* (*Convolvulus prostrates*) improves memory and concentration. Acts as a Brain Tonic relieving stress and anxiety [13].

#### 5.1. Panchakarma procedures

- *Nasya* with *Panchendriyavardhan taila* and *Ksheerbala taila* strengthens the sensory organs, improves memory and nervous system. *Nasya* drug enters the brain through *Shringataka Marma*

**Table 2**Probable Pathogenesis of CO gas intoxication in comparison with concept of *Visha* further leading to *Vatavyadhi*.

Carbon Monoxide action as <i>Visha</i> [9]	Action of Carbon Monoxide in Body
Carbon Monoxide when inhaled	Carbon Monoxide binds to Haemoglobin forming Carboxyhemoglobin (COHb)
↓	↓
<i>Ruksha</i> (~dry) <i>Guna</i> (properties) aggravates <i>Vatadosha</i>	Reduction in Oxygen saturation in all the body tissues causing hypoxia, tissue damage along with inflammatory changes
↓	↓
Vitiation of <i>Rakta</i> (~blood) and <i>Pitta</i> due to <i>Tikshna</i> (~sharp), <i>Ushna</i> (~hot) <i>Guna</i> of Carbon Monoxide	Increases capillary leakage and oedema
↓	↓
<i>Tikshna</i> , <i>Sukshma</i> (~subtle) <i>guna</i> overwhelms the mind and leads to unconsciousness and dissolute the <i>marmas</i> (~vital points)	High levels of Carbon Monoxide leads to peripheral vasodilatation, arrhythmias and myocardial depression
↓	↓
<i>Sukshma Guna</i> penetrates and circulates in all the <i>srotas</i>	Carbon Monoxide inhalation leads to Toxic Encephalopathy and further can cause brain tissue damage leading to neurological and cognition deficits.
↓	
<i>Aashukari</i> (~operating quickly) and <i>Vyavayi guna</i> (~pervasiveness) of the poisonous gas (Carbon Monoxide) spreads rapidly throughout the Body.	
↓	
<i>Vikasi guna</i> (~breaks bonding between dhatus and loosens them) vitiates <i>Dhatus</i> , <i>doshas</i> and <i>malas</i> (~waste products of body).	
↓	
<i>Vishada</i> (~Non-viscid) <i>guna</i> keeps the <i>visha</i> circulating and <i>Laghu</i> (~light in nature) and <i>avipaki</i> (~indigestible) <i>guna</i> of <i>visha</i> worsens the condition	
↓	
<i>Vishakta lakshanas</i> (~toxicity symptoms) and <i>Vatadi doshaprakopa lakshanas</i> in Patient	
↓	
<i>Shiromarmabhighata</i> (~injury to Brain) and <i>Srotovaigunya</i> (~vitiation in micro channels)	
↓	
<i>Vatavyadhi</i>	

**Table 3**

Assessment of power &amp; reflexes.

Assessment	Right Side		Left Side	
	Before Treatment	After Treatment	Before Treatment	After Treatment
<b>Muscle Power</b>				
Upper Limb	3/5	4/5	4/5	4/5
Lower Limb	4/5	4/5	3/5	4/5
<b>Handgrip</b>	Normal		Normal	
<b>Reflexes</b>				
Biceps	++		++	
Triceps	++		++	
Knee	++		++	
Ankle	++		++	

(vital point) which is a congruence of the nerve fibers for smell, taste, speech, vision and hearing sensations [14].

- *Sarvanga Snehan* and *Svedan* – It improves circulation of blood and removes toxins from the tissues. It also relieves mental and physical fatigue. It also reduces stiffness of muscles and joints.

Overall improves the well being of the patient. Oil massage with *Mahanarayan taila* gives a additional value to treat neurological disorders. *Sarvanga svedana* with *Shasti Shalipindasveda* is a kind of *Snigdha Swedana* and has the property of *Brimhana* (~provides strength and nutrition to muscles and bones).

- *Matra Basti* with *Mahanarayan Taila* is used as a *sneha basti* to regulate the *Vatadosha* and give nourishment to the body and healing the neurological diseases.
- *Shirodhara* with *Jatamansi* and *Brahmi Kashaya* helps relaxing and soothing the mind and body.

## 6. Conclusion

Ayurvedic intervention with internal medications along with the panchakarma procedures in the treatment of Gas geyser syndrome exhibits encouraging results which were seen in improving her cognition, memory and essential skills like writing, verbal communication, thinking skills, use of technology in socializing with the community.

Considering the hidden threat of CO poisoning our secondary aim through this article is to raise alertness in people about gas geyser induced poisoning which may lead to many neurological & cognitive defects. We also desire to highlight the significance of strict implementation of Gas Geyser usage and installation laws. The gas geyser is connected to an Liquified Petroleum Gas (LPG) cylinder and the gas inside is a combination of Butane and Propane. Usually in normal conditions on combustion it produces Carbon Dioxide and water ( $\text{CO}_2 + \text{H}_2\text{O}$ ), but when in a congested bathroom, with less oxygen supply, it results in release of CO. Frequent alterations in the temperature of geyser can lead to incomplete combustion and emitting poisonous gases like CO, nitrogen oxides (Nitric Oxide & Nitrogen Dioxide). Such poisoning generally occurs in winters due to cold atmosphere and usage of geyser is quite common. Many people are not aware of these poisoning and hence the condition can easily go undiagnosed and can be fatal or can have deteriorating neurological defects.

There is a lack of evidence for cases been reported on this condition with Ayurveda, its correlation and management. The results of the ayurvedic management in this case seems promising, although considering the economic status and the financial burden on the family the diagnostic tests like MRI and CT scan after the treatment of three months could not be done which is the shortcoming of this case study article.

## Author contributions

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## Conflicts of interest

The authors declare no conflict of interest.

## References

- [1] Rumbeiha Wilson K, Oehma Frederick W. Encyclopedia of toxicology —. 2nd ed. 2005.
- [2] Sean Kincaid M, Sharar Sam R, Hudson Leonard D. Critical care Medicine; Toxic gas , fume and smoke inhalation. 3<sup>rd</sup> ed. 2008. <https://www.sciencedirect.com>.
- [3] Correia P, Agrawal C, Ranjan R. Gas geyser syndrome: an important preventable cause of disabling neurological events [serial online] Ann Indian Acad Neurol 2013;16:245–8 [cited 2022 Oct 29], <https://www.annalsofian.org/text.asp?2013/16/2/245/112482>.
- [4] Mehta Anish, Mahale Rohan, John Aju Abraham, Abbas Masoom Mirza, Javali Mahendra, Acharya Purushottam, et al. Odorless inhalant toxic encephalopathy in developing countries household: gas geyser syndrome. J Neurosci Rural Pract 2016 Apr;7(2):228–31. –Jun.
- [5] Kim Yangho, Kim Jae Woo. Toxic Encephalopathy, Saf Health Work v 2012 Dec;3(4):243–56.
- [6] Mehta SR, Das S, Singh SK. Carbon monoxide poisoning. Med J Armed Forces India 2007;63:362–5.
- [7] Ely EW, Moorehead B, Haponik EF. Warehouse worker's headache: emergency evaluation and management of 30 patients with carbon monoxide poisoning. Am J Med 1995;98:145–55.
- [8] Quinn Davin K, McGahee Shunda M, Politte Laura C, Duncan Gina N, Cusin Cristina, Hopwood Christopher J, et al. Complications of carbon monoxide poisoning: a case discussion and review of the literature. Prim Care Companion J Clin Psychiatry 2009;11(2):74–9. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2707118/>.
- [9] page no.565 Sushrut Samhita Dalham tika, Kalpasathan 2/19-20. Varanasi: Chaukhamba Sanskrit Sansthan; Reprint 2009.
- [10] Correia Pamela, Agrawal Chandrashekhar, Ranjan Rajiv. Gas geyser syndrome: an important preventable cause of disabling neurological events. Ann Indian Acad Neurol Jun 2013;16(2). Apr.
- [11] Smith G. The treatment of carbon monoxide poisoning with oxygen at two atmospheres absolute. Ann Occup Hyg 1962;5:259–63. Back to cited text no. 10 [PUBMED].
- [12] Weaver LK, Hopkins RO, Chan KJ, Churchill S, Elliott CG, Clemmer TP, et al. Hyperbaric oxygen for acute carbon monoxide poisoning. N Engl J Med 2002;347:1057–67.
- [13] <https://sppharma.co.in/product/shankh-pushpi-syrup-pack-of-2/> last accessed on 16/February/2023 at 11.22am.
- [14] Bohra Mohita, Sharma KK. Role of Ksheerabala taila Nasya and ksheerdhooma in the management of ardita: a review. Ayurpharm Int J Ayur Alli Sci 2015;4(No. 3):54–9.