

# The experience of London Hyperbaric Medicine at Whipps Cross University Hospital in the acute treatment of Carbon Monoxide poisoning

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## RIASSUNTO

**Il trattamento con ossigeno iperbarico a 2,8 ATA dei pazienti con grave intossicazione acuta da CO è efficace e consente una completa risoluzione dei sintomi nell'84% dei pazienti. Quindi i pazienti affetti da grave intossicazione da CO dovrebbero essere trattati con OTI per prevenire l'insorgenza della sindrome neurologica secondaria post-intervallare. È da ricordare che una iniziale immediata risoluzione dei sintomi non esclude necessariamente l'insorgenza dei sintomi neurologici a lungo termine.**

In the United Kingdom more than 50 people die from accidental carbon monoxide poisoning every year, and 200 people are seriously injured according to the National Health Service's, NHS direct. Our hyperbaric centre is located in east London and is one of 3 centres in London, the biggest and with the highest amount of emergencies related to carbon monoxide poisoning.

We conducted a retrospective audit on all patients assessed at our unit for treatment of CO poisoning over a 3 year period between December 2004 and October 2007.

Presenting signs and symptoms were noted, as well as first recorded COHb levels. Time to first HbO treatment, dosage and frequency of treatments prescribed were assessed. The outcome studied was whether there was resolution of symptoms, as well as the presence of delayed neuropsychological sequelae.

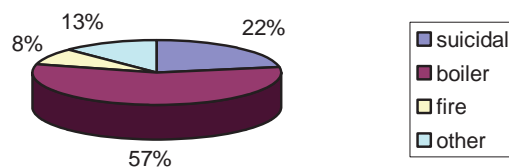
*Indirizzo per la richiesta di estratti:*  
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In the time period mentioned above we have treated 73 patients that had suffered acute carbon monoxide poisoning. One of the treated patients did not comply with our inclusion criteria for hyperbaric oxygen treatment, so I excluded her from the audit.

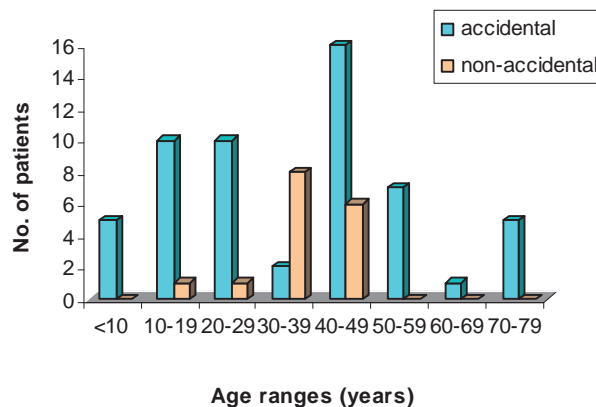
In the last 3 years we have treated, 43 male and 29 female patients. The median age is 38 years.

The source of poisoning was a malfunctioning gas boiler in over 50% of the cases. (see graph).

source of Co poisoning



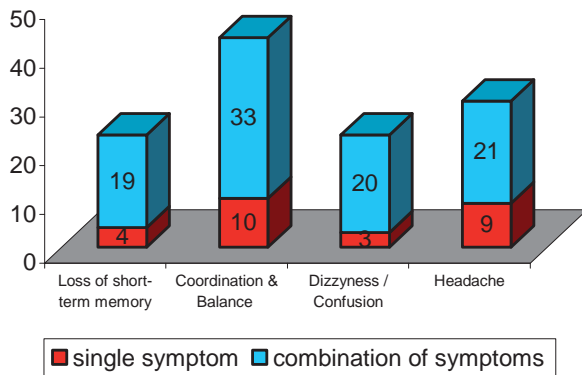
Accidental vs. Non-Accidental



### ■ Presenting Signs and Symptoms

Median COHb levels were 25.5% with a range from (8%-43%). Neurological symptoms included loss of consciousness, dizziness, drowsiness, unsteadiness, and headache. Three patients had seizures from which only one was a known epileptic. The most common neurological sign was balance disorder, with 43 patients presenting with this sign. 52 (72%) patients had loss of consciousness at scene. Other signs included: positive Romberg, abnormal gait, abnormal heel to toe walk and abnormal coordination. Impairment of cognitive function was reflected by short term memory loss in 23 (32%) of the patients. One patient was not included in the neurological assessment because she was suffering with Korsakoff syndrome.

Neurological Signs and Symptoms

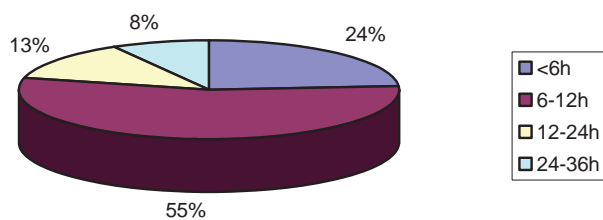


Of the 72 patients treated only 53 had an ECG in the clinical notes. From these 12 (17%) had signs of ischemia in the ECG.

### Time to first HbO treatment

Of the 72 patients treated (or where treatment was attempted) only 70 will be considered in the analysis. 17(24%) received the first session within 6 hours after removal from the source, 39 patients (55%) were treated within 12 hours from the end of exposure.

Time to First HBO

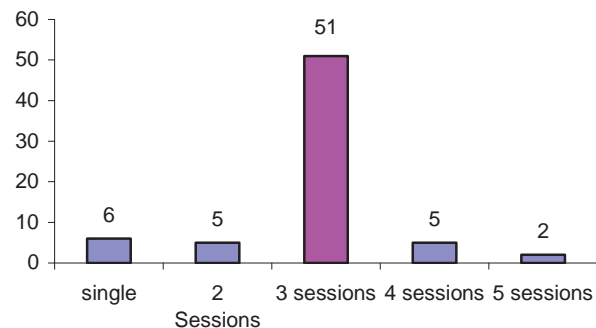


### ■ Frequency and Dosage of Treatment

The department follows a protocol where all patients who require treatment are treated with HBO therapy (at 2.8 ATA) for a total of 3 sessions within 48 hours from arrival to the chamber, or until no further improvement of symptoms can be achieved.

Of the 71 patients, 3 patients (4%) had their treatment aborted (2 were unable to equalize their ears and one smoke inhalation with hypertension developed pulmonary oedema and had to be intubated after surfacing) 6 patients (8%) were treated with only 1 session of HBO, 5 patients (7%) had 2 sessions, 51 patients (71%) had 3 sessions, 5 (7%) had 4 sessions and 2 patients had 5 sessions (3%). These were all consecutive sessions. Two patients had more sessions after 10 days and 4 months respectively and these are not taken into consideration in the above data.

number of HBO sessions



From the 58 patients that received 3 or more treatments only 4 (6.9%) completed the 3 treatments within 24 hours from the end of exposure, 32 patients (55%) were treated within 36 hours, 12 patients within 48 hours and 10 patients (17.2%) completed their treatment after 48 hours.

### ■ Outcome

A total of 69 patients were treated. Only 68 will be considered in the analysis as one patient was suffering with Korsakoff and was difficult to assess. Complete resolution of symptoms was achieved in 57 patients (84%). 11 patients (16%) had neurological sequelae of which 2 patients had a positive Romberg only.

Our department has a policy of following up all the patients treated in our chamber after one month. Unfortunately though only 30 patients (42%) presented themselves to the one month follow up. Of these 7 had neurological sequelae. Two complained of episodes of dizziness, two had headaches and dizziness (both retreated

one 10 days later and one 4 months later and recovered), two had impaired short term memory and one had a positive Romberg. Of the patients with neurological residua one was treated about 20h hours after the end of exposure and did not receive a lot of oxygen after the exposure. The patient with persistent short term memory loss was suffering with dyspraxia prior to the incident and had the first treatment more than 24h after the incident because he was in intensive care. The other 4 patients with neurological residua at the end of treatment did not present to the follow up. From the 11 patients with neurological sequelae 6 (55%) had a Carboxyhaemoglobin level in excess of 30% at presentation.

## ■ Discussion

The mainstay of treatment for patients with acute CO poisoning traditionally has been with the administration of 100% normobaric oxygen. However, HBO is used to treat patients with signs of severe poisoning, such as loss of consciousness.

It has been found that repeated HBO treatments are associated with better outcome than if just a single treatment was prescribed (1). Also, the maximal benefit from HBO therapy occurs in those treated with the least delay after exposure (2), with Thom et al advocating treatment within 6 hours of exposure (3).

## ■ Conclusions

Treatment of patients with acute, severe CO poisoning with HBO<sub>2</sub> therapy at 2.8 ATA is effective in achieving a complete resolution of symptoms in 84% of patients.

Therefore, patients presenting with severe CO poisoning should be treated with HBO to prevent long-term sequelae from developing. Lastly, initial complete resolution of symptoms does not necessarily exclude the development of delayed neurological symptoms.

Regarding our experience the audit showed that:

1. there is a need to follow-up a higher percentage of patients to determine the efficacy of treatment (i.e. the prevention of delayed neuropsychological symptoms);
2. The aim should be to start the first hyperbaric treatment within 6 hours from the end of exposure;
3. All members of the family should be tested if they had been exposed to avoid delay in treatment.

## ■ References

- 1) Gorman DF, Clayton D, Gilligan JE et al. A longitudinal study of 100 consecutive admissions for carbon monoxide poisoning to the Royal Adelaide Hospital. *Anaesth Intens* 1992;20:311-316.
- 2) Goulon MA, Barios M, Rapin M et al. Intoxication oxy carbonee et anoxie aigue par inhalation de gaz de charbon et d'hydrocarbures. *Ann Med Interne (Paris)* 1969;120:335-439. English translation: *J Hyperbaric Med* 1986;1:23-41 (Carbon monoxide poisoning and acute anoxia due to inhalation of coal gas and hydrocarbons: 302 cases, 273 treated by hyperbaric oxygen at 2 ata).
- 3) Thom SR, Taber RL, Mendiguren II et al. Delayed neuropsychological sequelae following carbon monoxide poisoning and its prophylaxis by treatment with hyperbaric oxygen. *Ann Emerg Med* 1995;25:474-480.