A man with loss of consciousness

Dr Vivien Tsui

History

- M/36
- Brought to A&E on 24/7, 1pm
- Found burning charcoal at home when visited by girlfriend
- All windows closed
- Noted to be semiconscious
- Loss of consciousness of unknown duration
- Headache and dizziness, no chest pain

History

- No alcohol or substance use
- Depressive symptoms for 6 months
- Suicidal ideation for a few weeks
- Past health:
  - Hx of substance abuse, neuroleptic malignant syndrome

Physical examination

- BP 143/89 P 106
- SpO2 98% (100% O2 mask), RR 16/min
- Temp 37.4C
- GCS 15/15, pupils 3mm equal & reactive to light
- Chest clear, no respiratory distress
- HS dual no murmur, pulse regular, no edema
- Neurology: unremarkable

- CO-Oximetry: SpCO ~38%

Photos: www.masimo.com

Investigations

- i-STAT

37.0°C		
pH	7.405	
PCO2	5.06	kPa
PO2	1.8	kPa
BEecf	-1	mmol/L
HCO3	23.8	mmol/L
TCO2	25	mmol/L
sO2	17	%
Na	143	mmol/L
K	3.8	mmol/L
iCa	1.20	mmol/L
Hct	50	%PCV
Hb*	17.0	g/dL

*via Hct

CPB: No

13:37 24JUL14

- Urine ACON: negative
- CXR: clear

24-07-2014 15:25:22

ID

Name

Age

HR	: 113	BPM	
P Dur	: 116	ms	
PR int	: 161	ms	
QRS Dur	: 101	ms	
QT/QTC int	: 349/480	ms	
P/QRS/T axis	: 72/128/10	°	
RV5/SV1 amp	: 0.571/0.297	mV	
RV5+SV1 amp	: 0.868	mV	
RV6/SV2 amp	: 0.453/1.202	mV	

Diagnosis Information:
812: Sinus Tachycardia
711: Abnormal Q Wave(I)
204: Marked Right Axis Deviation
141: QT Interval Prolongation

Unconfirmed Report.

I aVR V1 V4

II aVL V2 V5

III aVF V3 V6

II

0.67~25Hz AC50 25mm/s 10mm/mV 4*2.5s+1r SE-1200Express V1.824 SEMIP V1.7

Collect Date :	24/07/14	**24/07/14**		
Collect Time :	13:39	**13:39**		
Request No. :	C7240583	**C7242590**		
Remark :	CO poisoning. CO poinsoning	CO poisoning. CO poinson...	Ref. Range	Units
Carboxy-Hb	41.0 H		0 - 3%	%
Oxy-Hb	28.4			%
O2 saturation	48.4 L		> 90	%
Troponin I		0.05	See Below	ng/mL

- WCC 19, liver/renal function normal, CK normal

F. OBSERVATION/VITAL SIGNS

Time	1322	1335	1350	1400	1420	1435	
T°(O/R/T) (°C)	37.4						
RR	16.	17	24	21	20	22	
SpO_2 (%)	96	98	98	99	100	99	
O_2 Used (%)	100	100	100	100	100	100	
~~SpCO~~ PETCO2 kPa	38	37	33	27.	28	16	

Progress

- Treated with 100% O2 mask
- Admitted to EMW
- COHb 41% (13:39) -> 4.9% (16:54)
- Persistent tachycardia, HR ~120 bpm
- No chest pain
- Trop I 0.05 -> 0.23
- Serial ECG: sinus tachycardia, no ischaemic changes

Progress

- Transferred to medicine
- Remained asymptomatic

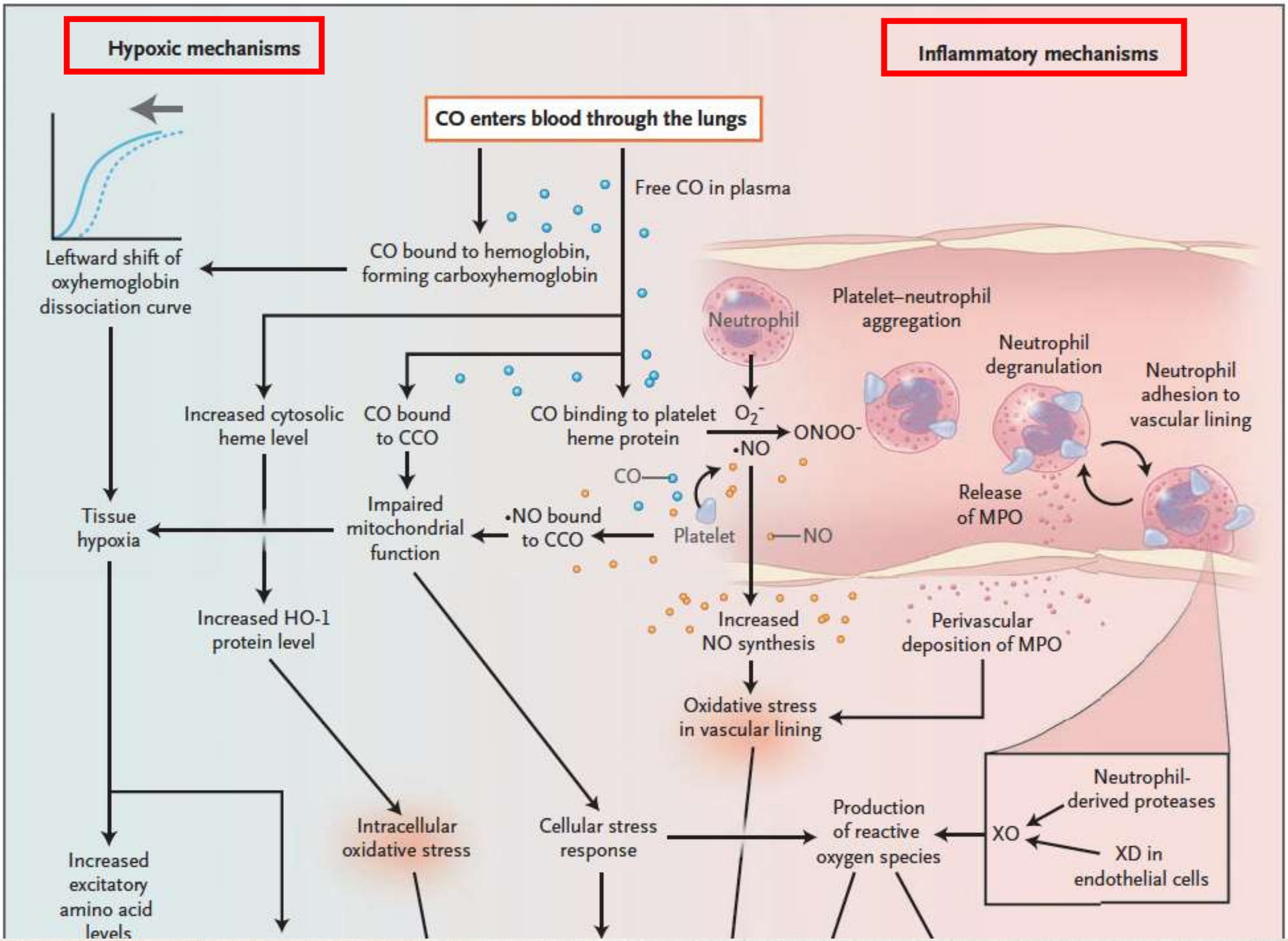
Time	24/7 13:39	24/7 16:54	25/7 08:46	26/7 09:24
Trop I	0.05	0.23	0.14	0.05

- Transferred to psychiatry

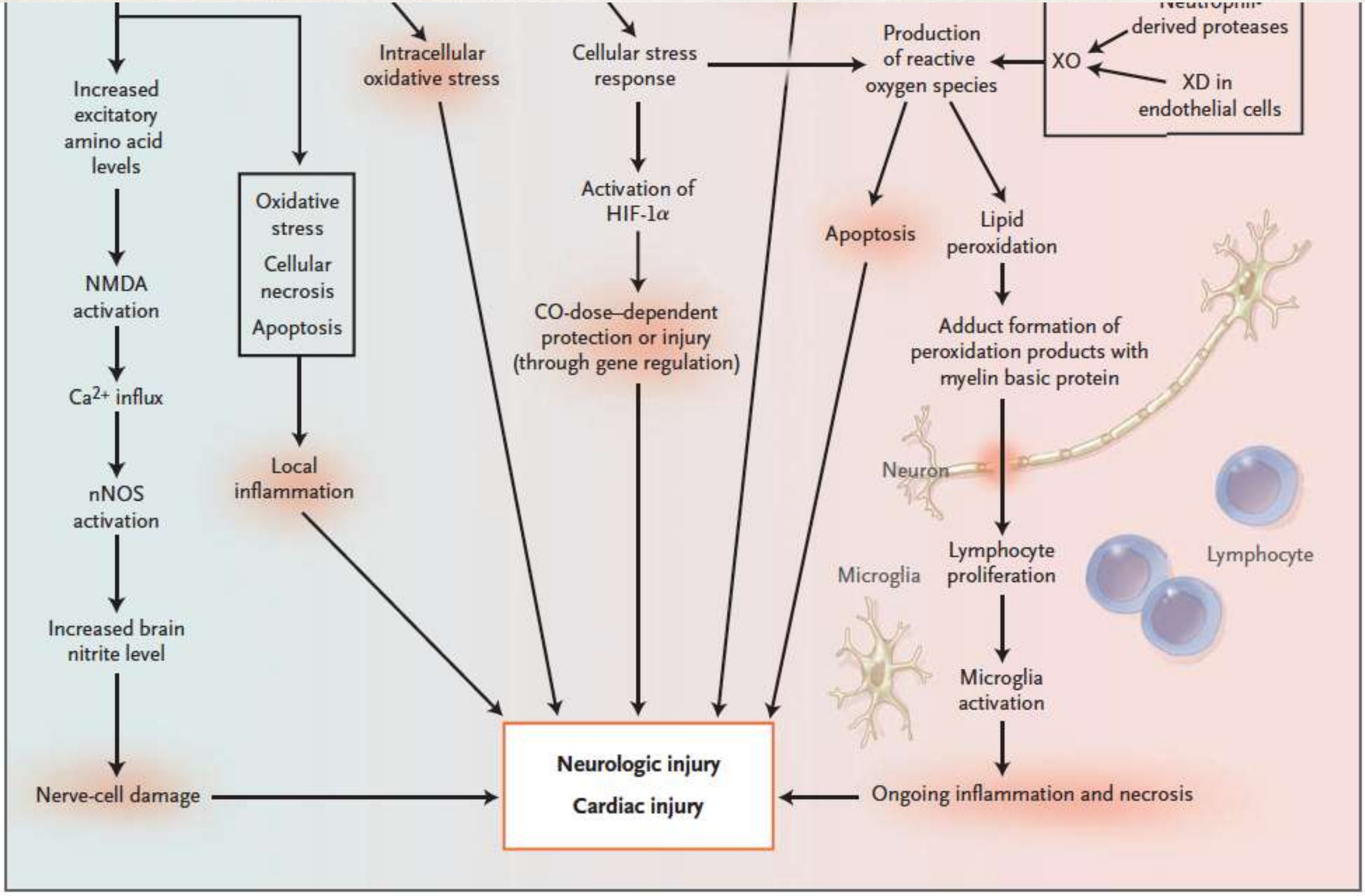
Background

- Source
  - Incomplete combustion of fossil fuels
    - charcoal burning, fire, engine exhaust, home heating, stoves…
    - enclosed spaces

- CO affinity for Hb ~250 times that of O2
- COHb in normal 1-2%, smokers 5-10%
- Fetal COHb 10-15% higher than maternal level



N Engl J Med 2009;360:1217-25.



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Neurologic & Cardiac

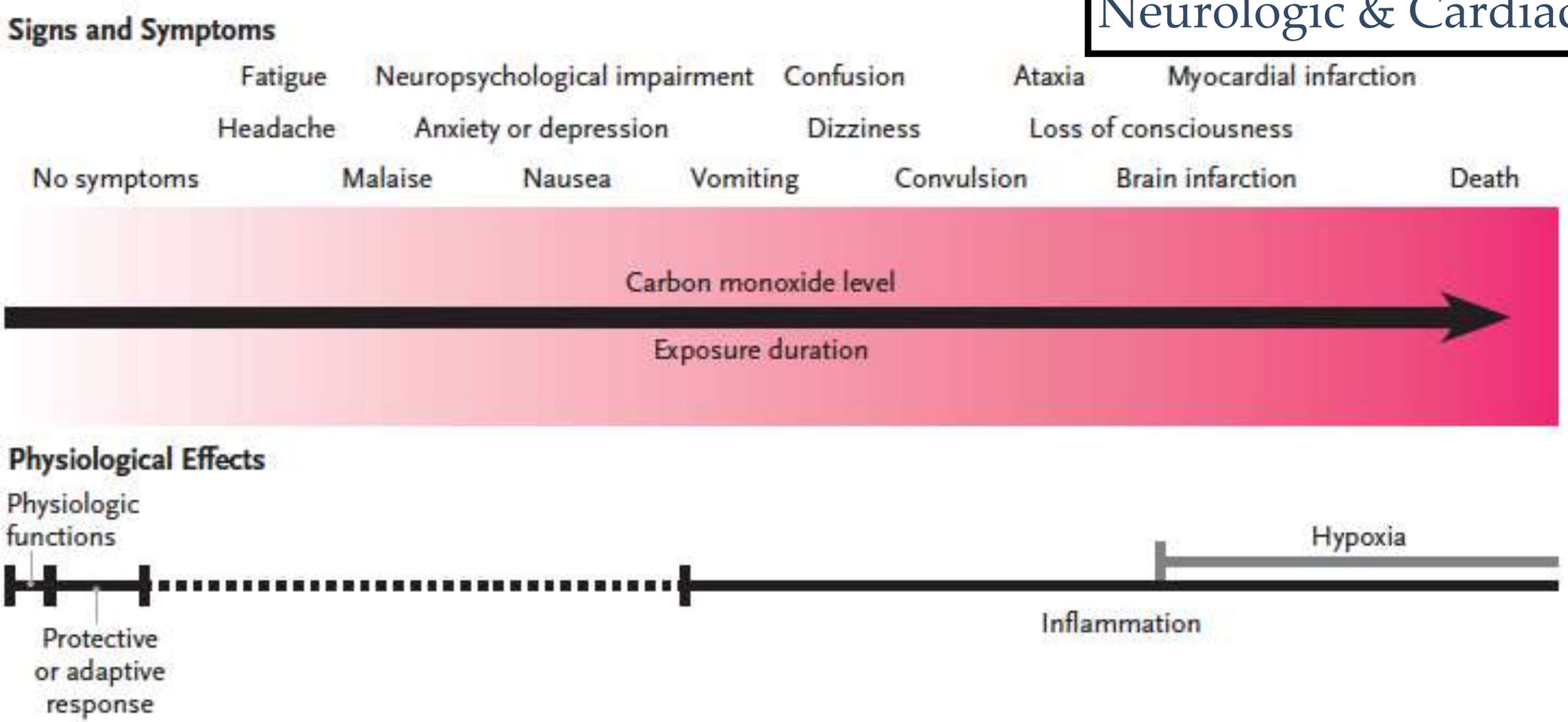

Figure 1. Spectrum of Symptoms and Effects of Exposure to Carbon Monoxide, According to the Level and Duration of Exposure.

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- Other systems: respiratory, renal, MSK, eye, skin
- Delayed neurological sequelae

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Carbon Monoxide Poisoning

Cardiovascular Manifestations of Moderate to Severe Carbon Monoxide Poisoning

Daniel Satran, MD,* Christopher R. Henry, BS,† Cheryl Adkinson, MD,‡ Caren I. Nicholson, RN,‡ Yiscah Bracha, MS,‡ Timothy D. Henry, MD†

Minneapolis, Minnesota

OBJECTIVES We describe the cardiovascular manifestations of carbon monoxide (CO) poisoning.

BACKGROUND Carbon monoxide poisoning is a common cause of toxicologic morbidity and mortality. Although the neurologic sequelae of CO poisoning have been well described, the cardiovascular consequences are limited to isolated case reports.

METHODS We reviewed the cardiovascular manifestations of 230 consecutive patients treated for moderate to severe CO poisoning in the hyperbaric oxygen chamber at Hennepin County Medical Center (HCMC), a regional center for treatment of CO poisoning.

RESULTS The mean age was 47.2 years with 72% men. Ischemic electrocardiogram (ECG) changes were present in 30% of patients, whereas only 16% had a normal ECG. Cardiac biomarkers (creatine kinase-MB fraction or troponin I) were elevated in 35% of patients. In-hospital mortality was 5%.

CONCLUSIONS Cardiovascular sequelae of CO poisoning are frequent, with myocardial injury assessed by biomarkers or ECG in 37% of patients. Patients admitted to the hospital with CO poisoning should have a baseline ECG and serial cardiac biomarkers. (J Am Coll Cardiol 2005;45: 1513–6) © 2005 by the American College of Cardiology Foundation

Patients with persistent LV dysfunction, underlying CAD, or risk factors for CAD may benefit from further evaluation e.g. angiography/revascularization

Management

- Remove from exposure
- Supportive
- 100% O2 mask
- COHb level, blood gas
- Assess neurology
- ECG, cardiac markers
- Consider hyperbaric oxygen

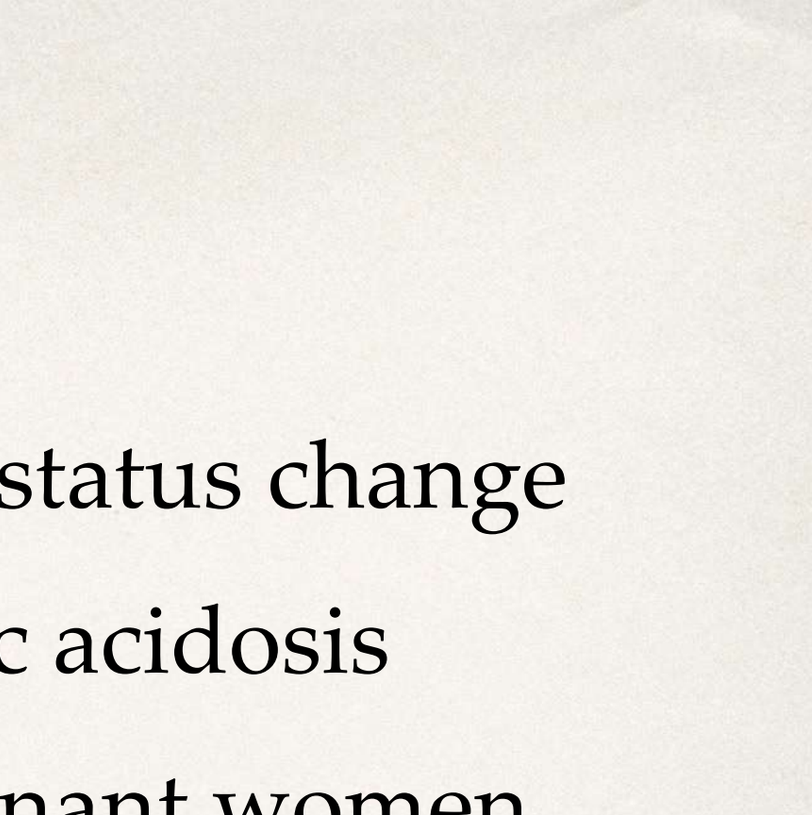
Hyperbaric oxygen therapy

- Mechanism
  - ↓ half life of COHb
  - displaces CO
  - ↑ O2 content, ↑ O2 delivery
  - ↓ oxidative stress & inflammation

O2	COHb Half-life
Room air	4 hous
100% O2 at 1 ATM	90 mins
100% O2 at 3 ATM	30 mins

- Indications
  - End-organ damage
    - LOC, neurologic deficit, mental status change
    - Myocardial ischaemia, metabolic acidosis
  - COHb level >25%; or >15% in pregnant women

- Evidence conflicting
  - Cochrane review:
    - HBO cannot be routinely recommended



HBO CHAMBER

Photo: HKCEM EM Express July 2012

Discussion

- Use of hyperbaric oxygen in this patient?
- Management of his raised troponin?