EP – 02

Severe methaemoglobinaemia following exposure to motor vehicle exhaust gas – A case report

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Objective: We present a rare case of severe methaemoglobinaemia following inhalation of motor vehicle exhaust gas (MVEG) and describe the possible underlying mechanism.

Case Report: A 37 year-old previously healthy male was brought to our Emergency Department following an intentional exposure to MVEG. He drove a 2010 model petrol car for two hours and was found unconscious in his car with a hose leading from the tailpipe into its cabin. He was intubated and ventilated at scene and arrived to our hospital 45 minutes later. On examination, he had ashen grey skin, with SpO_2 85-88% on FiO_2 100%, heart rate 112 bpm and BP 118/72 mmHg. His systemic examination was unremarkable. ABG showed pH 7.33 (7.35-7.45), pO_2 299 mmHg (75-100), O_2 saturation 99.2% (95-100), methaemoglobin 28.8% (0-1.5), carboxyhaemoglobin 0.0% (0-1.5). Urine drug screen and Glucose-6-Phosphate-Dehydrogenase deficiency screening was negative. Within 30 minutes of methylene-blue 80 mg intravenously, SpO_2 improved to 100% and an hour later methaemoglobin was 1.3%. He was extubated on day 3 and recovery thereafter was uneventful. Exposure to MVEG can cause methaemoglobinaemia with or without carbon monoxide poisoning. Modern petrol cars have three-way catalytic converters, which simultaneously oxidize hydrocarbons and carbon monoxide to carbon dioxide and water and reduce oxides of nitrogen (NO_x) to inert nitrogen and oxygen. Nitric oxide is the main NOx, which directly or via intermediaries such as nitrates and peroxy-nitrites combines to haemoglobin to form methaemoglobin. The proportion of carbon monoxide to NO_x formed is dependent on the engine temperature, age and structure of the catalyst converter, fuel type, drive cycle and engine sub systems. Engine temperature above 400 ^oC and a higher air-fuel ratio help hydrocarbons and carbon monoxide to become fully oxidized which in turn can promote excess NO_x formation. Such processes would have resulted in high methaemoglobin but negative carboxyhaemoglobin levels in our patient.

Conclusion: Inhalation of MVEG remains a common method of suicide attempt. In such patients it is important to assess for methaemoglobin level during blood gas analysis.