Case Report

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Recreational Exposure of Liquified Petroleum Gas: Case report and Review of the Literature

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Abstract

Introduction: LPG, a combination of aliphatic hydrocarbon gases, is utilized as a source of fuel for cooking appliances and vehicles. LPG mainly comprises butane (80%) and propane (20%), which are combustible gases, along with small concentrations of propylene and butylene. Mercaptans are included in the mixture to enable easy detection of any gas leakage due to their unpleasant smell. Because propane gas is heavier than air, it tends to settle at floor level. Due to the non-specific and diverse nature of its signs and symptoms, the timely and accurate diagnosis of LPG poisoning remains challenging. Due to easy access to LPG, there has been an increase incidence of its use for suicidal purposes and abuse. The current case report focuses on the effects of the abuse potential of LPG and its toxic effects.

Case Report: In this case report, four individuals of same family (19 yrs, 23 yrs, 24 yrs, 25 yrs old brothers) who have abused LPG for recreational purpose under alcoholic intoxication and subsequently, of four of them three individuals showed acute toxic myocarditis with ECG changes and elevated cardiac biomarkers, hypoxia, neurological manifestations such as generalized weakness, unconsciousness. The fourth person was brought dead to casualty and it was determined that approximately 22% of the people who used inhalants died during their first use. Sudden deaths are usually caused by abuse of butane, propane, or butane/propane mixture and it is due to cardiac arrhythmia.

Conclusion: The gas mixture of propane butane is among the most lethal inhalant substances. The substance abuse is increasing especially in adolescents and young adults. The public population must be educated about dangers of this gas abuse and its bad outcomes and should be recommended to stay away from it.

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Key Messages: The gas mixture of propane-butane is among the most lethal inhalant substances. The public population must be educated about dangers of this gas abuse and its bad outcomes and should be recommended to stay away from it.

INTRODUCTION

LPG, a combination of aliphatic hydrocarbon gases, is utilized as a source of fuel for cooking appliances and vehicles. It is recognized as an "green fuel" for internal combustion engines, as it lessens exhaust emissions. This fuel is extensively employed in both commercial and domestic settings, as well as in automobiles. LPG mainly comprises butane (80%) and propane (20%), which are combustible gases, along with small concentrations of propylene and butylene.[1] Mercaptans are included in the mixture to enable easy detection of any gas leakage due to their unpleasant smell. LPG is distributed in pressurized cylinders. Because propane gas is heavier than air, it tends to settle at floor level. Due to the non-specific and diverse nature of its signs and symptoms, the timely and accurate diagnosis of LPG poisoning remains challenging. Due to easy access to LPG, there has been an increase incidence of its use for suicidal purposes and abuse. The current case series focuses on the effects of the abuse potential of LPG and its toxic effects.

CASE REPORT

Four individuals from same family were brought to casualty by the attenders with alleged history of finding the patients in the unconscious state in their room following liquefied petroleum gas leakage with the flame switched off which was done intentionally under the influence of alcohol. The duration of exposure was about one night two days.

Case1: A 19 yrs old male, at the time of presentation, he was in drowsy state but responding to painful stimulus and his vitals were as follows: heart rate – 121bpm, blood pressure was not recordable on sphygmomanometer, respiratory rate – 35cpm, saturation 89% with oxygen supplementation 15 lit/min with face mask. Examination of respiratory system revealed bilateral diffuse crackle and other systemic findings was normal. Patient was started on Inj. Noradrenaline 20 micrograms/min. On investigations, CBC within normal limits except WBC counts elevated – 15.46th/mm3, RFT (urea – 59 mg/dl, S Cr – 1.3 mg/dl, S Na – 140mEq/l, S K – 4.6 mEq/L and LFT (SGOT – 459U/L, SGPT – 82U/L). ABG revealed hypoxia, metabolic acidosis with compensatory respiratory alkalosis done on oxygen supplementation 15 lit/min with face mask.

On Day 2, of admission he developed bradycardia with heart rate 52 bpm and Blood pressure – 100/60mmHg with vasopressor support, with 95% saturation with oxygen supplementation 5 lit/min with face mask. SOB profile shows Troponin positive and elevated CKMB, MYO, BNP and 2 DECHO showed LVEF–55%, mild TR, PR and trivial MR, AR and bradycardia during study (52bpm) and ECG showed bradycardia without any significant ST T changes. The patient was treated symptomatically and on medical management T. Aspirin 75mg (0-0-0-1) and Inj. Enoxaparin 40mg/0.4ml (1-0-0-1).

On Day 4, he is off vasopressors supports with heart rate 76 bpm, blood pressure 100/70 mm Hg, maintaining 100% saturation in room air and the patient was discharged on day 5 as the repeat investigations were within normal limits.

Case 2: 24 yrs old male, at the time of presentation, he was in drowsy state but responding to painful stimulus and his vitals were as follows: pulse rate - 119 bpm, blood pressure – 110/70mm of Hg, respiratory rate – 30cpm, saturation 90% with oxygen supplementation 5 lit/min with face mask. Examination of respiratory system revealed bilateral diffuse crackle and other systemic findings was normal. On investigations, CBC within normal limits except WBC counts elevated – 20.41th/mm 3, RFT (urea – 52 mg/dl, S Cr – 2.1 mg/dl, S Na – 143mEq/l, S K – 4.7 mEq/L and LFT (SGOT – 264U/L, SGPT – 88U/L). ABG revealed hypoxia, metabolic acidosis with compensatory respiratory alkalosis done on oxygen supplementation 10 lit/min with face mask.

On Day 2, of admission he developed bradycardia with heart rate 54 bpm and blood pressure – 110/60 mm of Hg, 98% saturation with oxygen supplementation 5 lit/min. SOB profile shows Troponin positive and elevated CKMB, MYO, BNP, DDIM and 2 DECHO showed LVEF – 55%, grade 1 TR, mild PAH (RVSP – 30mm Hg), mildly dilated RA & RV, mild PR and trivial MR, AR and bradycardia during study (52 bpm) and ECG showed bradycardia without any significant ST T changes. The patient was treated symptomatically and on medical management T. Aspirin 75mg (0-0-0-1) and Inj. Enoxaparin 40mg/0.4ml (1-0-0-1) and the patient was discharged on day 5 as the repeat investigations were within normal limits.

Case 3: 23 yrs old male, he was in drowsy state but responding to painful stimulus and his vitals were as follows: pulse rate – 114 bpm, blood pressure – 90/60mm Hg, respiratory rate – 30cpm, saturation 95% with oxygen supplementation 5 lit/min with face mask. Examination of respiratory system revealed bilateral diffuse crackle and other systemic findings was normal. On investigations, CBC within normal limits except WBC counts

elevated – 24.50, RFT (urea – 60 mg/dl, S Cr – 1.5 mg/dl, S Na – 141mEq/l, S K – 5.1 mEq/L and LFT (SGOT – 612U/L, SGPT – 71U/L). NIV support has started in view of hypoxia and drop in saturation. ABG shows hypoxia, metabolic acidosis with compensatory respiratory alkalosis on NIV support with 100% FiO2, on systemic examination CVS and PA examination were normal.

On day 2, patient got intubated in view of hypoxia on room air, tachypnea not resolving on NIV support. SOB profile shows Troponin positive and elevated CKMB, MYO, DDIM and 2 DECHO showed LVEF – 60%, grade 1 TR, mild PAH (RVSP – 30mm Hg), trivial MR, AR, TR, PR. ECG showed sinus tachycardia without any significant ST T changes. The patient was treated symptomatically and on medical management T. Aspirin 75mg (0-0-0-1) and Inj. Enoxaparin 40mg/0.4ml (1-0-0-1).

On day 4, after repeating investigations and assessing the patient clinically, extubation done and the patient was discharged on day 6 as the repeat investigations were within normal limits.

Case 4: 25 yrs old male, who also had a history of similar and simultaneous exposure to LPG, was brought dead to the hospital.

Table 1: Details of Vitals of 4 patients

	Hypoxia	**Cardiac arrhythmias**	**SpO2**	**NIV support**	**Intubation**	**CNS manifestations (unconscious state)**	**Cardiac biomarkers (Trop I)**	**ABG**
Patient 1	present	bradycardia	89%	-	-	+	+	pH – 7.27, pCO2– 28, pO2 – 68, SaO2 – 93, HCO3 – 15, base deficit – (-10) on oxygen supplementation 15lit/min with face mask.
Patient 2	present	bradycardia	94%	-	-	+	+	pH – 7.33, pCO2 – 27, pO2 – 75, SaO2 – 94, HCO3 – 14, base deficit – (-10) on oxygen supplementation 10 lit/min with face mask.
Patient 3	present	tachycardia	88%	+	+	+	+	pH – 7.32, pCO2 – 22, pO2 –228, SaO2– 99, HCO3 – 11, base deficit – (-14) on NIV support with 100% FiO2
Patient 4	brought dead							

DISCUSSION

This case report presents case series of four patients exposed to LPG (97.8% propane, 1.5% isobutane, 0.1% n-butane, 0.2% propylene, and 0.4% other gases) for recreational purpose.[2] Intentional and accidental inhalations of LPG with the main gas contents of propane and isobutane have increased in recent times. It is also highly lipophilic which eases its crossing of the brain and cardiac tissue. Clinical manifestations include local irritation to nose, eyes and pharynx, chronic inhalational abuse causes headache, dyspnea, dizziness, hypoxia, loss of consciousness, cardiomyopathy, acute toxic myocarditis, arrhythmias, myocardial infarction, dementia, brain stem disorder, ataxia bradykinesia, dystonia, convulsions, dysarthria, hematological abnormalities like aplastic anemia, renal toxicity like nephritis, tubular necrosis.[3] Sudden death can occur even on the first experience of abuse.

In this case report of four patients, three patients showed features of acute toxic myocarditis which is diagnosed based on ECG changes, elevated cardiac biomarkers and the treatment is generally

supportive management. The fourth patient was brought dead. It was determined that approximately 22% of the people who used inhalants died during their first use. Sudden deaths are usually caused by abuse of butane, propane, or butane/propane mixture and it is due to cardiac arrhythmia.

CONCLUSION

The gas mixture of propane butane is among the most lethal inhalant substances. The substance abuse is increasing especially in adolescents and young adults. Prolonged LPG inhalation can lead to serious outcomes ranging from cardiac arrhythmias to cardiac arrest and neurological outcomes. The general public must be educated about dangers of this gas abuse and its bad outcomes and should be recommended to stay away from it.

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