

Flash Fire in a Reducing Valve

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Despite the utmost precautions, handling compressed gas cylinders carries the risk of fire, explosion and personal injury. The following report describes a fire in a multistage reducing valve on an H tank of oxygen.

REPORT OF INCIDENT

A corpsman was instructed to set up an H tank of medical oxygen outside one of the recovery rooms at Brooke General Hospital. He obtained a full tank and appropriate reducing valve from Central Supply. As he related the story, the corpsman first "cracked" the tank without difficulty, and then attached the re-

ducing valve with the aid of a wrench. No obvious oil or grease deposits were present on the valve. After making certain that the valve was on tightly and that the O₂-flow-rate knob was turned off at the valve, he opened the tank. There was a loud noise and flame suddenly shot out from the rear of the valve (see illustration) spattering tiny fragments of metal over the corpsman's forearms. Fortunately, his face was away from the path of the fragments; otherwise, he might have been severely injured. A physician standing nearby turned off the tank and the fire extinguished itself immediately. The corpsman was treated for minor burns and made an uneventful recovery.

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The oxygen cylinder and valve were impounded and the tank contents were analyzed for possible flammable contaminants by infrared spectrometry, mass spectrometry, magnetometry, and electrolytic hygrometry at the USAF Environmental Health Laboratory, Kelly

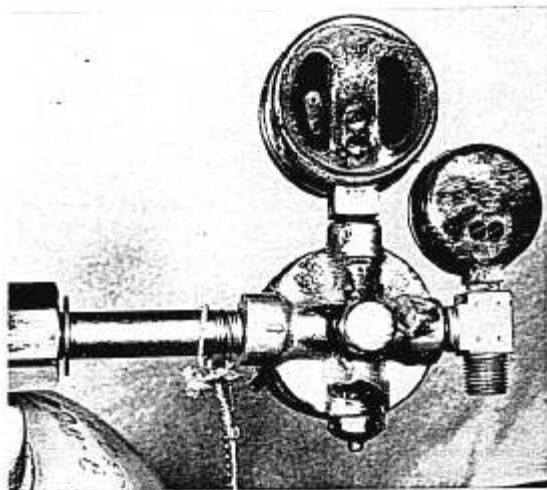


FIG. 1. Reducing valve, showing areas of rupture.

Air Force Base, Texas. Analysis revealed 99.7 per cent oxygen, plus trace amounts of methane, acetylene, and halogenated compounds well within the prescribed limits set for medical oxygen. Because of these normal findings, the fire was attributed to grease, oil, or particulate matter in the reducing valve which had gone undetected.

DISCUSSION

A compressed gas cylinder and its attached reducing valve form an adiabatic system in which heat is neither lost to nor gained from the surrounding environment. When the main cylinder valve of a full oxygen tank at 2,000 psi, like the one described here, is opened, the gas flows into the delivery tube between the main cylinder valve and the diaphragm of the pressure gauge. In this small space almost instantaneous recompression of the gas takes

place and the pressure rises from atmospheric to 2,000 psi in less than a second. This small time interval does not allow dissipation of the heat resulting from this recompression, and the temperature within the tube rises abruptly. In fact, temperatures as high as 1,000 C have been recorded in reducing valves under these circumstances. Thus, particles of dust, grease, and other flammable substances, if present in the tubing, could ignite. This is probably what happened in the case we are reporting, even though such valves are never knowingly oiled or greased. On the basis of this experience, we recommend that whenever an individual opens the main valve of a compressed gas cylinder, he position his face and trunk well away from the valve assembly for 5-10 seconds to allow for pressure equilibration, so as to avoid direct impact from an explosion in the unlikely event that one occurs.

Obstetrics and Pediatrics

NEONATAL MORBIDITY FOLLOWING PARACERVICAL BLOCKS

Eight hundred and forty-five paracervical blocks were administered to patients in labor, and fetal heart tones were monitored frequently following the blocks. Fetal heart rate changes were found after 30 per cent of the blocks; primiparity, prematurity, and pre-existing fetal distress were associated with increased incidences of these changes. The incidences of neonatal depression at one and five minutes of age were significantly increased in those infants who had developed fetal heart rate changes following paracervical block. Paracervical blocks not followed by fetal heart rate changes had a normal incidence of neonatal depression. No method for reliably predicting or preventing these fetal heart rate changes in any given patient was discovered. (Shnider, S. M., and others: *Paracervical Block Anesthesia in Obstetrics, I. Fetal Complications and Neonatal Morbidity*, *Amer. J. Obstet. Gynec.* 107: 619 (June) 1970.)

FETAL BRADYCARDIA AFTER PARACERVICAL BLOCK Sampling of blood from the fetal scalp and gas chromatographic analysis were used to determine fetal and maternal blood mepivacaine concentrations and acid-base changes following paracervical blocks in 17 patients. Fetal acidosis was found in the seven fetuses who developed bradycardia. In most cases of fetal bradycardia, fetal blood mepivacaine concentrations were higher than peak maternal arterial blood levels; this suggests that mepivacaine reaches the fetus by a route more direct than maternal systemic absorption. The proximity of the paracervical injection site to blood vessels supplying the placenta might facilitate direct uptake of the anesthetic from the site of injection to the intervillous space of the placenta. (Asling, J. H., and others: *Paracervical Block Anesthesia in Obstetrics, 2. Etiology of Fetal Bradycardia Following Paracervical Block Anesthesia*, *Amer. J. Obstet. Gynec.* 107: 626 (June) 1970.)