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Case Report / Olgu Sunumu

Sudden Appearance of Water in Flowmeter During Air/Oxygen and Sevoflurane Anaesthesia

Hava/Oksijen ve Sevoran Anestezisi Sırasında Flowmetrede Ani Su Görülmesi

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Abstract / Özet

Endotracheal intubation was performed, and a water bubbling sound was heard from the anaesthesia device immediately after the release of gases to administer the O_2-air-sevoflurane mixture. The total flowmeter on the anaesthesia device was then found to be filled with water. The breakdown of the dryer in the medical air compressor system was determined as the source of the problem, since a greasy fluid mixture was released from the air-wall outlets in all rooms. Consequently, the anaesthesia team should keep in mind that problems as seen in the current case might emerge and should be alert.

Endotrakeal entübasyon sonrası anestezi idamesinde %50 O_2-%50 hava-%2 sevofluran karışımını uygulamak amacıyla gazların açılmasından hemen sonra anestezi cihazından su fokurtusuna benzer ses gelmeye başladı. Anestezi cihazı üzerindeki total flowmetrenin sıvı ile dolu olduğu gördük. Bütün odalarda hava duvar çıkışlarından yağlı bir sıvı karışımının gelmesi sebebiyle yapılan araştırmada sorunun medikal hava kompresör sistemindeki kurutucunun arızasından kaynaklandığı tespit edildi. Sonuç olarak olgumuzdaki gibi arızaların da olabileceği düşünülmeli ve anestezi ekibi uyanık olmalı.

Key Words: Medical air, flowmeter, anaesthesia device, equipment failure, patient safety

Anahtar Kelimeler: Medikal hava, flowmetre, anestezi cihazı, ekipman yetersizliği, hasta güvenliği

Introduction

Oxygen and air combinations are commonly used medical gases in general anaesthesia. The main component of these gases before arriving in the anaesthesia device includes gas resources and transport systems (1). Today, modern anaesthesia devices have been equipped with alarm systems against any breakdown in the gas supply. However, problems with the medical gas system and anaesthesia device are observed, although rarely. One of the methods of obtaining medical air is to supply the surrounding air into the anaesthesia device at a certain pressure using a medical compressor. The air exiting the compressor arrives in the dryer after passing through the anterior filter for particles and water. Dried air is released into the system after passing through the filters. Moist, greasy, and particle-containing air might enter the system due to a breakdown in the pressured air system. In that case, severe complications might develop in the anaesthetised patient (2-4). The objective of the current study was to present, with authorisation of the local training planning council, an anaesthesia problem involving liquid flow into the total flowmeter of the anaesthesia device due to a breakdown in the pressured air compressor during anaesthesia administration in an operating room of the Dr. Abdurrahman Yurtaslan Oncology Training and Research Hospital.

Case Presentation

A 40 year-old male patient whose American Society of Anesthesiologists (ASA) physical condition II was perpared for repair of septum deviation. All anaesthesia equipment and the anaesthesia device (DragerFabius GS Premium) were checked prior the administration of anaesthesia. No problems were determined in the anaesthesia device during the automatic control process. A routine monitoring process was performed after admitting the patient to the operating room. Two mg kg^{-1} propofol, 1 μg kg^{-1} fentanyl, 1 mg kg^{-1} lidocaine and 0.6 mg kg^{-1} rocuronium were administered for the induction of general anaesthesia. Endotracheal intubation was performed, and a water bubbling sound was heard from the anaesthesia device immediately after the release of gases to administer the 50% O_2-50% air-2% sevoflurane mixture. The patient was detached from the device due to the possible breakdown of the device, and ventilation was maintained with balon-valve system. The

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anaesthesia device, pipeline source of central medical gases and wall outlet were checked, and the total flowmeter on the anaesthesia device was then found to be filled with water. Water-retaining traps and filters on the respiratory circuit were checked, and water was noticed on the flowmeter. No water was detected in the respiratory circuit. A spare anaesthesia device was brought into the operating room, and anaesthesia was maintained with 50% O_2-50% N_2O-2% sevoflurane using the O_2 and nitrous oxide cylinders on the device. Postoperatively, the patient awoke from anaesthesia problem-free and was taken to the anaesthesia care unit. No respiratory or haemodynamic problems were observed, and the patient was transferred to the ward 2 hours later. Pipeline sources of central medical gases in the remaining three operating rooms in connection with the same medical air system and wall outlets were checked, and a greasy fluid release was noted in all air-wall outlets. No problem regarding the air system was noticed in the other operating rooms, because regional anaesthesia was being administered at that time.

The breakdown of the dryer in the medical air compressor system was determined as the source of the problem, since a greasy fluid mixture was released from the air-wall outlets in all rooms. A microbiological examination was performed by obtaining a sample of this fluid, and no microorganisms were detected. Air calibration could not be performed during the control of the anaesthesia device by the technical team, and the device was sent for maintenance and repair services.

Discussion

The correct and problem-free use of the medical gas system is an important component of a safe anaesthesia administration. Regular maintenance of a medical gas system should minimise complications regarding equipment inadequacy and failure. Cooper, Newbower and Kitz determined in their study that critical errors associated with equipment constitute 11% of cases, whereas human errors constitute 70% of the cases (5). Kusumaphanyo, Charuluxananan, Sriramatr, Pulnitiporn and Sriraj reported in their study that events associated with equipment inadequacy and failure were seen in 17.4% of the cases and recommended routine equipment controls, pre-use controls and strict conformity to guidelines in order to minimise these errors (6). Additionally, the anaesthesia team should have adequate knowledge of these systems. Often, mortal complications in anaesthesia practice arise from the malfunctioning or incorrect design of the oxygen system (1). Okuyama, Nakamura and Kemmotsu presented a case report demonstrating reduced air flow during anaesthesia caused by moisture due to a breakdown in the air compressor system (7). In his case report, Hay determined liquid leakage in to a device operating with air used in orthopaedic surgery and associated the problem with the device. However, the authors determined moisture in the air control flowmeter in the controls performed the same day before general anaesthesia was administered and found that the real cause of the problem was a breakdown in the medical air source (8). Haas, Lebas, Le Jeunne, Lowenstein, Durand and Hugues reported in their case series that greasy aspiration might cause pseudo-infectious lung disease and life-threatening complications (4). Inhalation of the greasy liquid could also have caused mortal respiratory complications in the current case; however, rapid detachment of the patient from the device upon notice of an abnormal sound, in addition to the water traps and water-bacteria-holding filter on the respiratory circuit, prevented fluid flow to the patient and any respiratory complications. The researchers believe that mortal complications might arise when an abnormal sound from the total flowmeter of the device goes unnoticed and the fluid reaches the lungs. The problem in the current case was found to originate from a breakdown of the dryer in the air compressor system. This problem was detected by observing the liquid in the total flowmeter; however, the flow can not be observed in most modern anaesthesia devices with a digital flowmeter. Therefore, the problem can go unnoticed in the case of the use of a device with a digital flowmeter. Hence, gas flow system control mechanisms should be present to determine such breakdowns and prevent reach of the fluid to the device.

Conclusion

Consequently, the anaesthesia team should keep in mind that problems as seen in the current case might emerge and should be alert. Additionally, the researchers believe that device breakdown and severe patient complications might be prevented with mechanisms to determine the emergence of moisture and fluid in the central medical gas system integrated with the anaesthesia device immediately after the wall outlet.

Informed Consent: Written informed consent was obtained from patient who participated in this case.

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