Case Report Section

Fatal Air Embolism in Therapeutic Pneumoperitoneum

SANTO GALANTI, M.D. and ROBERT J. ATWELL, M.D.
Columbus, Ohio

Introduction of air into the peritoneal cavity by means of needle puncture is an old procedure. It has been used for local treatment of tuberculous peritonitis as early as 1893, as a diagnostic procedure since 1902 and for the treatment of pulmonary tuberculosis since 1933.

The safety and simplicity of pneumoperitoneum have made it a widely utilized procedure in the treatment of pulmonary tuberculosis, however, ill effects from pneumoperitoneum have been witnessed. Among the complications to be considered are perforation of an abdominal viscus, peritoneal effusion and air embolism. With the increasing use of pneumoperitoneum, air embolism, the most serious of these complications, has occurred more frequently as indicated by recent reports. Of 127 cases of air embolism reported in the medical literature, 74 have been fatal. The incidence of air embolism during pneumoperitoneum therapy is probably higher than indicated by these reports.

The purpose of this paper is to report in detail one fatal case of air embolism which was observed at the Ohio Tuberculosis Hospital. During preparation of this report, six additional unreported cases were cited by personal communications from reputable sources. These six additional cases were also fatal, but details of these are not complete enough to warrant extensive presentation.

Case Report

On July 8, 1953, a 32 year old white female was admitted to the Ohio Tuberculosis Hospital. Admission chest roentgenograms revealed a moderately advanced tuberculous process, with nodular infiltration and a cavity in the partially retracted right upper lobe. Three gastric cultures were positive for Mycobacterium tuberculosis. Two months after admission, pregnancy of four months duration was discovered. She was started on streptomycin (1 gram twice weekly) and sodium para-aminosalicylic acid (12 grams daily). Pneumoperitoneum was instituted on July 15, 1953, and continued with 800 to 850 cc. of air given at weekly intervals, with the maintenance of a pressure of +6 to +11 cm. water. It was felt that pneumoperitoneum should be continued until the sixth month of pregnancy, then discontinued. The chest x-ray film made on August 27, 1953 showed some clearing in the nodular infiltration of the right upper lobe.

On September 16, 1953, fluoroscopy revealed both hemidiaphragms to be at the level of the ninth posterior ribs bilaterally on inspiration. Using a closed system with three-way stopcock and syringe, an 18-gauge needle was inserted 6 cm. to the left and 2 cm. above the umbilicus (at 10:40 A.M.). Aspiration of the syringe revealed a free air space, and the manometer registered +5 cm. water. Seven hundred cc. of air was given slowly and without incident, when suddenly the patient showed evidence of collapse. The needle was promptly withdrawn. She was immediately placed in Trendelenburg position and oxygen was started. The pulse was rapid and thready, and blood pressure unobtainable. She was given cardiac stimulants and maintained in the head-down position.

At 11:05 A.M. the absence of pulse was noted and she was immediately taken to surgery, where anterior thoracotomy was performed at 11:08 A.M. The heart was

Ohio Tuberculosis Hospital, Ohio State University Health Center.
massaged until vermicular contractions could be seen. At this time the pericardium was opened. Air was seen in the coronary vein and was aspirated. An 18-gauge needle was inserted into the right ventricle and 40 to 45 cc. of air was obtained. At 12:15 P.M. pneumoperitoneum was aspirated through an 18-gauge needle inserted into the left upper quadrant of the abdomen. Cardiac massage was carried on for a period of about four hours, but despite all efforts, she expired at 3:20 P.M.

Autopsy revealed extensive hematoma in the left posterior rectal sheath, air in the retroperitoneal space, many air bubbles in the inferior vena cava and the right ventricle. There was active, chronic, nodular fibrocaseous tuberculosis of the right upper lobe. The uterus was enlarged to the size of a four to five months gestation and contained a 26 cm. female fetus within a normal amniotic sac. There was no evidence of trauma to the pelvic organs.

Discussion

Air embolism, as it is usually encountered in pneumoperitoneum, occurs as a result of the entrance of massive quantities of air into a systemic vein from which it is transported to the right heart and produces acute obstruction to the blood flow through the lungs. Although the needle may be introduced properly, and all precautions taken to be certain that the needle point is free in the peritoneal cavity, air may still escape and enter the circulation through some undisclosed route. In many of the cases reported in the literature, the exact route of the air could not be determined definitely. The possibility of the needle entering a fair sized vein and the air being injected directly into the venous circulation should not occur if proper care is taken. It may be possible, however, for a vein to be injured by the passage of the needle so that when a sufficient pressure has been established within the abdomen, air may dissect along the needle tract and thus gain entrance to the vessel. This possibility was considered likely in the present case, as hemorrhage was found in the abdominal wall. The needle might have been accidentally withdrawn and the air injected directly into the abdominal wall tissues. Puncture of an abdominal viscus was not observed in the present case.

REFERENCES

14 Klassen, K. F.: Personal communication, 1953.
15 Prior, J. A.: Personal communication, 1953.