

LATE ONSET

Ventilator Pneumonia

A pulmonary complication observed in some patients who have required assisted ventilation is best known as "ventilator pneumonia." This is the last pulmonary complication to appear, and becomes superimposed upon the existing pulmonary disorder. Ventilator pneumonia is caused by the inhalation of warm, moist air which encourages a rapid proliferation of transient bacteria originating in either the device or the patient's respiratory tract.

Each stroke of the ventilator may drive bacteria deep into the lungs. Since the phenomenon of antibiotic resistance is not uncommon in a patient who has already received several courses of antibiotics, treatment of ventilator pneumonia may be difficult. Serial sputum cultures help one to make an early diagnosis. Prophylactic measures should be employed to help prevent ventilator pneumonia, such as the clean maintenance of machine circuits together with aseptic care of the tracheostomy wound.¹⁴

Typically, the chest x-ray of a patient who has ventilator pneumonia shows a more localized pul-

monary infiltration (Fig. 1c) as compared to other respiratory syndromes. Physical examination reveals the classic signs of consolidation and fluid in small airways. Hypoxia is present; pulmonary function tests reveal abnormalities in ventilatory quotient, alveolar-capillary block, and perfused nonventilated lung tissue with physiologic shunting. It is at this advanced stage that the patient may also develop hematogenous pneumonia.

Hematogenous Pneumonia

Hematogenous pneumonia, which may develop at a late stage of any septic disorder, is seen on x-ray as a patchy, disseminated infiltrate. Commonly it follows massive burns, but may be associated with any septic, post-traumatic state. During the early stages of hematogenous pneumonia, the patient may present few significant physical findings because of the interstitial nature of the disease. This type of pneumonia is highly lethal; it responds—if at all—to therapy directed at both the pneumonia and the septic focus.⁷

Summary

Knowledge of the pathogenetic sequence and time of clinical appearance of the various pulmonary disorders described should help to clarify what has been a confusing group of post-traumatic problems; thus, it will lend specificity to treatment.

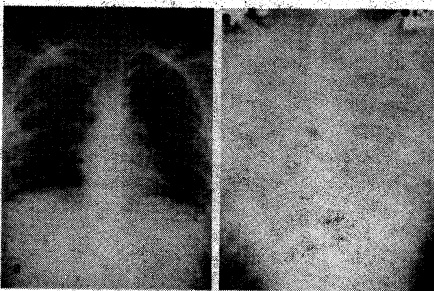


Fig. 6.—a. Chest x-ray of female patient six days after she fractured the pelvis and left femur during a fall related to a hypotensive episode. The lungs are essentially clear. **b.** Chest x-ray of the same patient 18 hours later shows a diffuse infiltration of both lungs. During this period she became severely hypoxic, but exhibited no signs of pulmonary disease on auscultation. Despite mechanical ventilation and a period of extracorporeal oxygenation with a membrane oxygenator, the patient died.

Related References: 1. Ambivagar M, Chalou J, Zargham I: Tracheobronchial cytologic changes following lower airway thermal injury. *J Trauma* 14:280, 1974. 2. Armstrong AJ, Kuenzig MC, Pettigrew LF: Lung lipase levels in normal rats with experimentally produced fat embolism. *Proc Soc Exp Biol Med* 124:959, 1967. 3. Brewer LA III, et al: The "wet lung" in war casualties. *Ann Surg* 123:343, 1946. 4. Cobb CA Jr, et al: Therapy of traumatic fat embolism with intravenous fluids and heparin. *Surg Forum* 9:751, 1959. 5. Cook WA: Monitoring pulmonary function. *Surg Clin North Am*, in press. 6. Cook WA, Webb WR: Pulmonary changes in hemorrhagic shock. *Surgery* 64:85, 1968. 7. Foley FD, Moncriel JA, Mason AD Jr: Pathology of the lung in fatally burned patients. *Ann Surg* 167:251, 1968. 8. Jenkins MT, et al: Congestive atelectasis: a complication of the intravenous infusion of fluids. *Ann Surg* 132:327, 1950. 9. Moore FD, et al: *Post-traumatic Pulmonary Insufficiency*. Philadelphia, WB Saunders, 1969. 10. Moritz AR, Henriques FC Jr, McLean R: The effect of inhaled heat on the air passages and lungs—an experimental investigation. *Ann J Pathol* 21:311, 1945. 11. Ozdemir IA, Webb WR, Wax SD: Effect of neural and humoral factors on pulmonary hemodynamics and microcirculation in pulmonary embolism. Presented to the American Association for Thoracic Surgery, April 1974. 12. Parker FB Jr, et al: The hemodynamics of experimental fat embolism and associated therapy. *Chest* 65:545, 1974. 13. Peters RM, et al: Objective indications for respiratory therapy in post-trauma and post-operative patients. *Am J Surg* 124:262, 1972. 14. Pierce AK, Sanford JP: Treatment and prevention of infections associated with inhalation therapy. *Mod Treat* 3:1171, 1968. 15. Eisenman B, Ashbaugh DG (eds): Pulmonary effects of nonthoracic trauma. *J Trauma* (special issue) 9:625, 1968.