

## ■ CASE REPORTS

Anesthesiology  
1997; 87:1239  
© 1997 American Society of Anesthesiologists, Inc.  
Lippincott-Raven Publishers

### Unexpected Postoperative Respiratory Failure Due to Diaphragmatic Paralysis

Marc Licker, M.D.,\* Alexandre Schweizer, M.D.,† Laurent Höhn, M.D.,† François Clergue M.D.‡

THE mechanisms of acute postoperative respiratory failure are usually related to incomplete recovery from anesthesia, aspiration, chronically impaired respiratory function, fluid overload, or sepsis. We report a case of unexpected postoperative respiratory distress resulting from diaphragmatic paralysis.

#### Case Report

A 75-yr-old woman with a history of coronary artery bypass surgery 15 yr earlier was scheduled for a right-sided carotid endarterectomy. Moderate dyspnea on exertion was noted (grade 2); decreased breath sounds were heard over the left hemithorax, and the standard chest radiograph showed a raised left hemidiaphragm that, according to her general practitioner, was attributed to a large hiatal hernia. Results of cardiac investigations, including an electrocardiograph, a Holter recording, and a thallium scintigraphy, were all negative. After a 75-min uneventful surgical procedure during balanced anesthesia (fentanyl, 100 µg; isoflurane, 0.5–1.5%; and vecuronium, 6 mg), she was extubated in the operating room and appeared well oriented with no signs of neurologic deficits and with adequate gas exchange. During the next 6 h, there was a progressive increase in respiratory rate (from 16 to 30 breaths/min) and in arterial CO<sub>2</sub> pressure (from 6.5 to 10 kPa). Although no new radiologic lung abnormalities were found, signs of respiratory fatigue with rapid shallow breathing, hypoxemia, and confusion indicated the need for ventilatory support. The patient was weaned from the ventilator after 8 h, and chest physiotherapy with voluntary deep breathing was continued thereafter. Three days later, the diagnosis of left phrenic nerve paralysis was strongly suggested during fluoroscopic examination by the demonstration of paradoxical motion of the elevated left hemidiaphragm on sniffing. Subsequently, the patient underwent surgical plication of the left hemidiaphragm, which resulted in marked physiologic

improvement as demonstrated by increases in static lung volumes (from 0.75 l to 1.3 l in forced expiratory volume in 1 s), in arterial PO<sub>2</sub> (from 8.8 kPa to 9.7 kPa), and in exercise capacity (from 220 m to 310 m at the 6-min walk test).

#### Discussion

This case illustrates the importance of the preoperative anesthetic evaluation. Reviewing the patient's medical history, the cause of diaphragmatic paralysis was likely attributed to cold nerve injury at the time of cardiac surgery.<sup>1</sup> Direct operative trauma of the right phrenic nerve at the time of the endarterectomy could also be incriminated as an additional factor causing the early postoperative respiratory failure. Diaphragmatic paralysis is a common complication of cardiac surgery; the incidence, estimated by radiologic or neurophysiologic techniques, varies from less than 10% to 73%.<sup>2</sup> Deep inspiration and sniffing during fluoroscopic or echographic examination are simple and noninvasive tests that may rule out diaphragmatic abnormalities (hernia, eventration, and paralysis). In particular, paradoxical elevation of an already raised hemidiaphragm is highly suggestive of phrenic nerve paralysis, and the diagnosis can be ultimately confirmed with neurophysiologic techniques.

Anesthesiologists should be aware of the risk of respiratory failure after uncomplicated surgical procedures in patients with diaphragmatic paralysis, and surgical plication appears as a safe and effective procedure that should be planned in those patients.<sup>3</sup>

\* Staff Anesthesiologist.

† Clinical Fellow, Division of Anesthesiology.

‡ Professor and Chair, Division of Anesthesiology.

Received from the Division of Anesthesiology, University Hospital, Geneva, Switzerland. Submitted for publication April 15, 1997. Accepted for publication April 24, 1997.

Address reprint requests to Dr. Licker: Division of Anesthesiology, Department of Anesthesiology, Pharmacology, and Surgical Intensive Care, University Hospital of Geneva, Geneva 14, CH-1211, Switzerland.

Key words: Complications. Respiratory physiology.

#### References

1. Curtis JJ, Nawarawong W, Walls JT: Elevated hemidiaphragm after cardiac operations: Incidence prognosis and relationship to the use of topical ice slush. *Ann Thorac Surg* 1989; 48:764–8
2. Estenne M, Yernault J, De Smet J, De Troyer A: Phrenic and diaphragmatic function after coronary artery bypass. *Thorax* 1985; 40:293–9
3. Graham DR, D. Kaplan, CC Evans, Hind CRK, RJ Donnelly: Diaphragmatic plication for unilateral diaphragmatic paralysis: A 10-year experience. *Ann Thorac Surg* 1990; 49:248–52