of this preparation is less than 4.0; therefore, both drugs should remain stable.

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The Risk of Tracheal Aspiration of Surgically Produced Foreign Bodies

To the Editor:—A 49-yr-old woman who had undergone craniofacial resection of a fibrodysplastic ethmoid tumor 2 weeks earlier and reoperation for acute cerebral edema and decompression was returned to the operating room for bifrontal craniotomy and repair of a cerebrospinal fluid fistula under general anesthesia. The fistula repair included the placement of fat into the defect. The fat tissue was harvested from the patient's leg and served as a base of support for the fascial graft, which was then placed over the defect in the dura mater.

The course of the general anesthetic was uneventful. At the conclusion of surgery, secretions were suctioned from the posterior pharynx prior to reversal of neuromuscular blockade and tracheal extubation. Two pieces of yellow fat of approximately 2 cm × 2 cm each, were retrieved from the hypopharynx. This represented a portion of the fat that had been used to support the fascial graft in the dural defect. These two pieces of fat had migrated out of the cranium, through the surgical defect in the ethmoid sinuses, and into the posterior pharynx.

If the fat had not been discovered by suctioning at the time of extubation, or if it had migrated to the hypopharynx after extubation, pulmonary aspiration of the fat could have occurred.

In the event of partial airway obstruction, more time could be spent making the diagnosis of fat aspiration. However, the diagnosis would be hampered by difficulty detecting the fat on chest x-ray, because fat is so radiolucent and virtually invisible on x-ray. The radiologic diagnosis would likely be made by inference based on atelectasis with complete obstruction or air trapping, hyperinflation, and possibly mediastinal shift with partial obstruction. Failure to consider fat aspiration in the differential diagnosis of airway obstruction would also complicate and delay the institution of therapy.

This case is reported for the purpose of alerting the anesthesiologist to the danger of aspiration of any surgically produced foreign body (fat, bone, blood clots, or synthetic material). The differential diagnosis of unexplained hypoxemia and/or airway obstruction following craniofacial surgery should include aspiration. Based on our experience, we recommend routine laryngoscopy at the end of these types of procedures to rule out material in the pharynx that might be missed by blind suctioning.

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Hypoxia among the Experts

To the Editor:—Twice during the past year while serving as an expert witness for the defense, I have had to rebut the testimony of board-certified anesthesiologists who, while acting as experts for the plaintiff, asserted that an esophageal intubation must have occurred based solely on the "hard evidence" of a blood gas obtained during cardiopulmonary resuscitation (CPR): "It is my opinion that these blood gases, even if

TABLE 1. Blood Gas Values during CPR

	A	PA	A	PA	A*	CV*	A*	CV*
Time (min)†	2	2	5	6	3–20	3–20	3–20	3–20
Bicarbonate (mEq)	—	—	50	50	—	—	‡	‡
*p*H	7.10	6.99	7.60	7.23	7.36	7.01	7.27	7.07
P_{CO_2} (mmHg)	26	42	41	110	27.5	76.4	43.7	64.8
P_{O_2} (mmHg)	143	16	48	13	115.9	17.4	107.9	29.6

A = arterial; PA = pulmonary artery; CV = central venous.
* Average of values from five patients.
† Time blood gas drawn after CPR initiated.
‡ Bicarbonate 100–250 mmol had been administered.
Values in columns 2–5 from Falk *et al.*[1]; values in columns 6–9 from Androgue *et al.*[2]

they are venous, are not compatible with endotracheal intubation even in the presence of rudimentary CPR." "I can say with absolute certainty there was cessation of oxygen delivery into this woman's lungs." "You would find these blood gases in corpse blood taken at autopsy."

An example of a blood gas in question, drawn from a vessel in the groin, is *p*H 7.11, P_{CO_2} 68 mmHg, and P_{O_2} 17 mmHg. Apparently these experts were unaware of several studies that demonstrate these values to be consistent with a typical venous blood gas analysis obtained during CPR.[1,2] A comparison of simultaneously obtained arterial and venous (central venous or pulmonary artery) gases is presented in table 1. Venous blood gases obtained during CPR performed according to the current standards show profound hypoxemia and severe hypercarbia in the presence of a properly placed endotracheal tube and proper ventilation.

Anesthesiologists have a right and even a duty to serve as plaintiffs' experts. But our paramount responsibility is to be accurate, reasonable, and noninflammatory. Ignorance of the literature by the above-quoted experts made life miserable for two anesthesiologists who deserved a better fate.

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More about the Mechanisms of Diaphragm Displacement during Spontaneous Breathing

To the Editor:—As the topic of diaphragm movement has been extensively discussed in ANESTHESIOLOGY,[1,2] we wish to summarize some of our findings[3,4] and bring to the attention of ANESTHESIOLOGY readership the controversial issue of diaphragmatic shape/tension relationship. During spontaneous breathing the dependent part of the diaphragm in the supine human is displaced more than the nondependent regions in the craniocaudal direction.[1] The proposed mechanism for this observation is that the vertical hydrostatic gradient in abdominal pressure is not matched by the hydrostatic gradient in pleural pressure over the diaphragmatic surface. This may result in a vertical gradient in transdiaphragmatic pressure, which creates a more passive stretch in dependent diaphragm.[1] A larger displacement of dependent regions is attributed to the more optimal force/length and shape/tension relationships.[1] Both mechanisms were reiterated as important for diaphragm mechanics during spontaneous breathing until Kim *et al.*[5] reported that the shape changes were unimportant for diaphragm mechanics over the range of a normal tidal breath. Our data again give a significant functional importance to the diaphragm shape/tension properties as well as to the anatomic characteristics. Although there are substantial differences between the shape of the human (elliptical) and dogs (triangular) rib cage, we believe that valuable information can be deduced by studying the dog model.

By using a computer-based biplane videoroentegenographic technique, we determined diaphragm displacement, regional shortening, and shape changes during spontaneous breathing in supine and prone anesthetized dogs from the spatial position of surgically implanted markers in four diaphragm regions (fig. 1). This marker technique has been described elsewhere.[3,6] Figure 1 shows the actual diaphragm displacement in one dog in two planes during spontaneous breath (see details in fig. 1 legend). In the supine position, the costal–ventral (CoV) region is oriented nondependently; the costal–middle (CoM) region is oriented between dependent and nondependent regions; and the costal–dorsal (CoD) and crural (Cr) are dependent regions. In the supine position during spontaneous breathing, the dependent diaphragm (Cr, CoD, CoM) was displaced more in the craniocaudal axis than was the nondependent region (CoV) (table 1). This nonuniform craniocaudal displacement was not affected by the hydrostatic pressure change after the dogs were turned from supine to prone posture. In the prone posture, nondependent (Cr, CoD, CoM) regions displaced again more than the dependent (CoV) region. This is in accordance with Krayer *et al.*,[2] who stated that "the dominant influence on diaphragm motion may be some anatomic difference between the crural and costal diaphragm regions rather than the hydrostatic pressure gradient".

As a qualitative assessment of change in diaphragm shape we analyzed