heparin postoperatively until Coumadin therapy can be reinstituted.

In summary, we report a case of a perioperative pulmonary embolism secondary to undiagnosed protein C deficiency and resulting in cardiac arrest. Because protein C deficiency does not cause abnormalities in the routine screening coagulation tests (*e.g.*, prothrombin time, partial thromboplastin time, and bleeding time) the anesthesiologist must maintain a high index of suspicion for patients who report either a personal or family history of thromboembolic disease at a young age.

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Complication from a Nasopharyngeal Airway in a Patient with a Basilar Skull Fracture

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Airway management in patients with craniofacial trauma presents the anesthesiologist with several complex problems. Not only are these patients often in acute respiratory distress, but also disruption of normal anatomic relationships in the head and neck can make placement of artificial airways, laryngoscopy, and tracheal intubation both technically difficult and hazardous. Because these patients may be at risk for increased intracranial pressure, increased arterial carbon dioxide or decreased arterial oxygen tensions may prove devastating. Despite the urgency of the situation, time must be taken to assess injury to the soft tissues and skeletal structures of the head and neck in order to avoid further injury. We present a case in which insertion of a nasopharyngeal airway in a patient with head and neck injury may have contributed to further damage to the central nervous system.

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Key words: Complications. Equipment: nasopharyngeal airway. Surgery, neurosurgical: basilar skull fracture.

Case Report

A 46-yr-old woman was involved in a motor vehicle accident. The patient sustained multiple injuries, which included a depressed frontoparietal skull fracture with exposure and herniation of the underlying cerebral cortex, bilateral LeForte III fractures of the facial skeleton, a basilar skull fracture, and suspected fracture of the spinous processes of C5 and C6. The patient also presented with multiple scalp and facial lacerations, marked facial edema, and contusions of the right frontal and temporal lobes.

The patient was transported to the local medical facility, where she was found to be unresponsive to commands but spontaneously moving all four extremities. Shortly after arrival, she developed respiratory distress, and a no. 30 Bardex nasopharyngeal airway was inserted. The patient then was transferred to our medical facility, where she was noted to be in severe respiratory distress. After rapid-sequence induc-

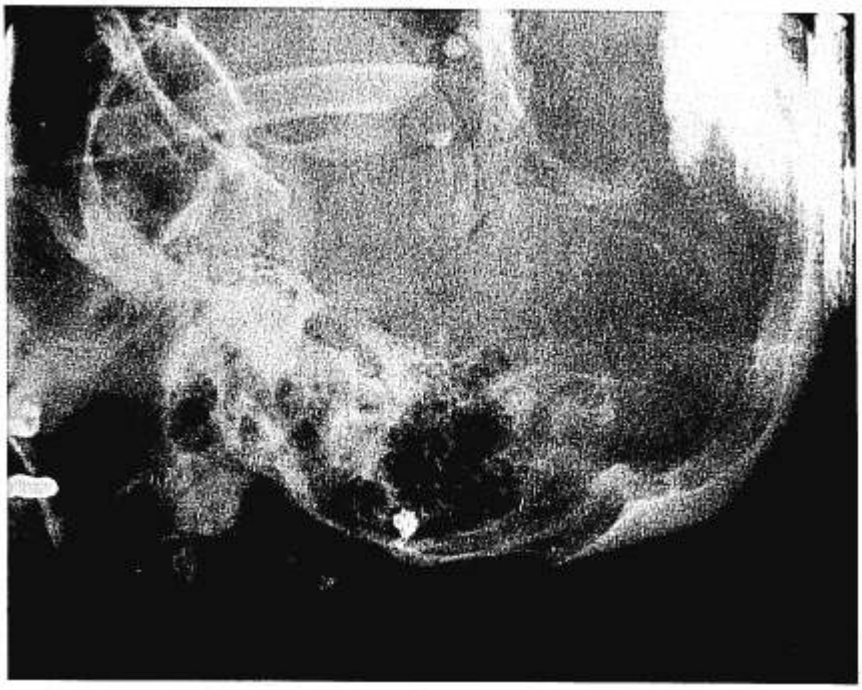

FIG. 1. Lateral skull x-ray of patient with basilar skull fracture, demonstrating perforation of the cribiform plate and entrance of nasopharyngeal airway into anterior cranial fossa.

tion with thiopental and vecuronium, direct laryngoscopy was performed, and the trachea was successfully intubated.

Examination of the initial lateral skull radiograph and computed tomography (CT) scan of the head obtained upon arrival in our emergency room revealed that the previously placed nasopharyngeal airway had entered the anterior cranial fossa (figs. 1 and 2). After removal of the nasopharyngeal airway, the patient underwent surgical debridement and repair of craniofacial fractures and lacerations under general anesthesia. The patient's vital signs were stable in the postoperative period but she did not regain consciousness.

DISCUSSION

Patients with craniofacial trauma may also sustain fracture to the base of the skull. Because fracture of the cribriform plate creates a path directly into the anterior cranial fossa *via* the nasal cavity, placement of a foreign body through the nares blindly into the nasopharynx is contraindicated. Others have reported entrance of nasogastric

FIG. 2. CT scan (anterior–posterior view). Arrow indicates nasopharyngeal airway in anterior cranial fossa.

tubes into the cranium of patients with craniofacial trauma.[1,2]

Anesthesiologists frequently are called upon to manage the airway of the patient with craniofacial trauma because of impairment of airway protection, of oxygenation, of ventilation, or of all of these. It is rare that a CT scan of the head is available to rule out the presence of a basilar skull fracture when the anesthesiologist's assistance is initially requested. Although the incidence of basilar skull fracture in patients with craniofacial trauma presumably is low, failure to recognize the potential risk associated with instrumenting the nasal passage and nasopharynx can produce additional trauma to the central nervous system, as demonstrated by this case. In a patient with a known or suspected basilar skull fracture who develops respiratory distress, use of a nasopharyngeal airway or nasotracheal intubation should be avoided.

If an airway is all that is needed to relieve upper airway obstruction, careful placement of an oropharyngeal airway should avoid damage to central nervous system tissue. If the patient requires tracheal intubation, orotracheal intubation with minimal manipulation of head and neck structures can be performed. If one is unable to perform orotracheal intubation, an emergency tracheostomy should be performed in order to gain control of the airway. Removal of a nasal airway that has been placed in the anterior cranial fossa may result in uncontrollable hemorrhage from intracranial or extracranial vessels. Should an anesthesiologist encounter a situation in which a foreign body has been placed in the anterior cranial fossa through the nasal cavity, the object should be left in place and removed in a controlled fashion in the operating room in order to facilitate surgical intervention in the case of uncontrolled hemorrhage.

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Axillary Block for Vascular Insufficiency after Repair of Radial Club Hands in an Infant

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Vascular insufficiency may occur after a variety of surgical procedures and has been described after repair of congenital radial club hand.[1] Treatment of vascular insufficiency by use of sympathectomy has recently been reported in the pediatric population.[2–5] We describe successful use of bilateral axillary blocks to relieve acute vascular insufficiency in a 7-month-old infant after surgical repair of radial club hands.

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Key words: Anatomy: brachial plexus. Anesthesia: pediatric; orthopedic. Anesthetic techniques: regional; axillary. Equipment: nerve stimulators. Sympathetic nervous system: blockade.

Case Report

A 7-month-old infant weighing 8.3 kg was admitted for bilateral centralization procedures on radial club hands. Past medical history was positive only for a small ventricular septal defect. After oral preanesthetic medication with meperidine and pentobarbital, anesthesia was induced with halothane, nitrous oxide, and oxygen and maintained with halothane in oxygen. The anesthetic course was uneventful, as was surgery on the right hand. A dressing and splint were applied and upper extremity tourniquet pressure released. The index finger reperfused, but even after 10 min all other fingers remained blanched. The dressing was loosened, but perfusion did not improve. When the fingers remained blanched for an additional 15 min, we elected to perform sympathectomy by axillary block of the brachial plexus.

The axillary area was draped and the skin pierced with a 20-G needle. A 24-G, insulated, short-level needle (Braun 48945012, Burron, Inc., Bethlehem, PA) then was inserted. This needle was used with a surgical nerve stimulator (WR Medical Electronic, Co., St. Paul, MN) at an initial setting of 2 stimuli/s and a starting current of 2.5 mA. At these settings, direct muscle stimulation was performed to verify proper grounding and function of equipment. The current was then decreased to 1.5 mA, and the plexus sheath was entered. Brisk distal motor activity confirmed proper placement of the needle tip. Current was decreased to less than 0.8 mA with continued distal motor response. After negative aspiration, 5 ml 0.25% bupivacaine was injected. Within a few minutes, some perfusion was noted in the ischemic digits, and within 10 min normal color and capillary refill had been reestablished.