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Subdural Hematomas after Lumbar Dural Puncture

JERRY D. EDELMAN, M.D.,* AND DANIEL W. WINGARD, M.D.†

Cerebral hemorrhage and subdural hematomas are rare complications of lumbar dural puncture.[1–3] Post-lumbar-puncture cephalgia is common, especially in obstetric patients after puncture has been done with a large-bore needle.[4,5] Abouleish[6] reported the use of epidural blood patch for post-lumbar-puncture cephalgia of 32–180 days' duration in three obstetrical patients. This case also involved prolonged post-lumbar-puncture cephalgia, which was treated with an epidural blood patch but had a fatal outcome.

REPORT OF A CASE

A healthy, 22-year-old, black woman, gravida 5-0-0-4, was admitted in active labor. A lumbar epidural block, using a 16-guage Tuohy needle, was attempted, and a "wet tap" resulted. The technique was converted to a continuous subarachnoid block, and delivery proceeded without further incident. On the second postpartum day, the patient complained of a throbbing headache in both frontal and temporal areas, which was relieved by lying down, by analgesics, and by increased oral fluid intake. She felt enough better on the third postpartum day to be discharged from the hospital. She was not seen again until she came to the emergency room a month later, complaining of a persistent, throbbing, frontal headache, relieved somewhat by propoxyphene. It was made worse by standing or sitting and relieved somewhat by lying down. The headache was severe enough that the patient had anorexia, insomnia, and was unable to care for her baby. There was no interval history of trauma. Diazepam and relaxation exercises were prescribed. The patient was seen repeatedly for the next eight days in either the emergency room or the neurology clinic, still complaining of the headache, but the results of neurologic examinations were always normal. On the thirty-eighth postpartum day, a blood patch was performed to rule out post-lumbar-puncture cephalgia. It was planned that if no improvement occurred in 24 hours, the patient would be admitted and other causes of the headache sought.

No improvement occurred, and on the thirty-ninth postpartum day the patient was admitted and scheduled for an EMI scan on the following day. She obtained some pain relief that day with a placebo injection of sterile water. At 1900 on the day of admission, no focal sign was present, and funduscopic examination showed no abnormality. At 0240, on the fortieth postpartum day, the patient was found apneic and pulseless, with dilated fixed pupils. Cardiopulmonary resuscitation was carried out successfully, but brain death occurred; mechanical ventilation was discontinued 36 hours later, and the patient died.

Pathologic examination revealed no evidence of bruising or hemorrhage of the scalp to indicate trauma. When the skull was reflected, the dura was found to be under tension, and bilateral subdural hematomas were present over the lateral frontal, temporal, and parietal regions. Bilateral chronic subdural hematomas were described. The 10 × 16-cm clot over the right hemisphere was liquefied and had a well-organized membrane 3 mm thick attached to the dura. The smaller (5 × 10 cm) clot on the left had only a thin portion in the subdural space. There was definite evidence of medullary compression by the cerebellum.

When the lumbar dural sac was transilluminated under the dissecting microscope, dural openings were not found. There were several clots adherent to the dura in the lumbar area, with many clots in the sacral area. The clots were described as being adherent to the dura "like a vulcanizing rubber patch."

DISCUSSION

Post-lumbar-puncture cephalgia may develop in any case where a patient has had a dural puncture, but is more likely in the gravid patient.[4] It is perhaps not generally appreciated that there may be a considerable interval between the onset of the headaches and the patient's request for medical help.[6]

Our patient had symptoms fairly typical of cephalgia induced by dural puncture with a large-bore needle. When she sought treatment thirty days after the block, she was considered a candidate for an epidural blood patch. When this therapy failed, she was admitted for more extensive neurologic investigations. The repeatedly negative results of neurologic examinations seemed to indicate that the patient was not in immediate, life-threatening danger, so an EMI scan was scheduled for the day after admission, but respiratory arrest occurred before this was done.

There appears to be a direct correlation between the size of the needle used for the puncture and the incidence of cephalgia.[4,5] The most likely explanation for the post-lumbar-puncture cephalgia was first proposed by Bier[7] in 1899 and later confirmed by others[8] as being leakage from the dural rent. Reduction of cerebrospinal fluid volume and pressure leads to traction of blood vessels and other pain-sensitive structures that anchor the brain to the cranium, with a caudad displacement of the brain stem.[9] With enough traction on dural vessels, tearing can occur, leading to subdural hematomas.‡ This appears to

* Assistant Professor.
† Professor and Chairman.

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Address reprint requests to Dr. Edelman.

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have been the mechanism of injury in this case, where no predisposing factor such as trauma or a bleeding disorder was present.

In conclusion, subdural hematoma and other neurologic abnormalities[10] should be suspected in the atypical case of post-lumbar-puncture cephalgia, especially in an obstetric patient.

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Continuous Positive Airway Pressure in Hemidiaphragmatic Paralysis

JAMES L. ROBOTHAM, M.D., BRADLEY E. CHIPPS, M.D., DENNIS W. SHERMETA, M.D.

We have observed that infants and children with unilateral phrenic-nerve injury in respiratory distress are often able to maintain adequate ventilation while breathing spontaneously with continuous positive airway pressure (CPAP). The most common causes of phrenic injuries in children are brachial plexus injuries incurred at birth[1] and iatrogenic injuries incurred with retraction of the pericardium during cardiac surgical procedures.[2,3] Unilateral diaphragmatic paralysis in adults impairs ventilatory function but usually does not lead to significant embarrassment.[4] In infants and children, severe respiratory compromise can result. The opportunity to study a 6-month-old child with chronic respiratory distress due to unilateral diaphragmatic paralysis has allowed us to examine the pathophysiology of this problem and the therapeutic role of CPAP.

Report of a Case

The patient was a 6-month-old male infant, product of a complicated midforceps delivery, after which low Apgar scores had necessitated intubation of the trachea and mechanical ventilation. Physical examination showed right facial paralysis and hemiplegia. Initial roentgenograms showed symmetrically small lung volumes. Later, persistent elevation of the right hemidiaphragm was found. Although neurologic examination demonstrated gradual improvement, the patient was unable to be completely weaned from mechanical ventilation. He was transferred at the age of 6 months to Johns Hopkins Hospital. At that time, without ventilatory assistance, he rapidly became hypoxic and hypercapnic (arterial blood P_{O_2} 32 torr and P_{CO_2} 50 torr with $F_{I_{O_2}}$ .21). His breathing was labored, with predominantly left-sided chest movement and retractions in the left seventh and eighth intercostal spaces. Movement was diminished and breath sounds were decreased over the right hemithorax. Abdominal muscle tone, assessed by palpation, increased with expiration and decreased with inspiration. Paradoxical abdominal respiratory motion was not observed.

With transcutaneous phrenic-nerve stimulation, the diaphragmatic electromyogram was normal on the left but absent on the right. Cinefluoroscopy showed increased excursions of the left

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Address reprint requests to Dr. Robotham: Department of Pediatrics, University of Texas Health Science Center, 7703 Floyd Curl Drive, San Antonio, Texas 78284.

Abbreviations

P_{aw}	= airway pressure
P_{gas}	= gastric pressure
P_{es}	= esophageal pressure
P_{di}	= transdiaphragmatic pressure ($P_{gas} - P_{es}$)
ΔP_{di}	= difference between peak inspiratory and expiratory P_{di}s
P_{tp}	= transpulmonary pressure ($P_{aw} - P_{es}$)
C_{dyn}	= dynamic compliance of the lung
R_L	= pulmonary resistance
CPAP	= continuous positive airway pressure
IPPB	= intermittent positive-pressure breathing