

Postlumbar Puncture Headache in Pediatric Oncology Patients

PAULA M. BOLDER, M.D.*

In adults the incidence of postlumbar puncture headache (PLPHA) increases with decreasing age.¹⁻³ Therefore, the risk of this complication should be especially high in children. Surprisingly, pediatricians claim that children rarely develop PLPHA.^{4,5} Reports of spinal anesthesia in children also mention a negligible risk of PLPHA.^{6,7} However, these assertions are apparently based only on anecdotal information or retrospective chart review.

At the Royal Manchester Children's Hospital, pediatric oncology patients routinely receive general anesthesia for lumbar puncture.⁸ The incidence of PLPHA in these patients was prospectively determined.

MATERIALS AND METHODS

The subjects were 26 children, aged 3-17 yr, referred to the Pediatric Oncology Department. They required lumbar puncture for initial diagnosis, treatment follow-up, or administration of chemotherapeutic agents. Twenty-two children had acute lymphoblastic leukemia; the others had acute myelocytic leukemia or non-Hodgkin's lymphoma.

The investigation was explained to the parents in the presence of their children; all agreed to participate. At the initial interview, baseline data were obtained regarding the nature of the child's usual headaches, if any, and whether the child had experienced headaches after previous lumbar punctures. The presence of CNS leukemia was ascertained by chart review and discussion with the pediatric oncologist.

The parents were asked to fill out a questionnaire daily for 5 days, starting on the day of the lumbar puncture. They were instructed to observe and question their child as to the presence of a headache, whether it was postural,

and whether there was associated nausea, vomiting, sleepiness, or neck pain. A stamped, addressed envelope was provided so that the form could be returned by mail. A reminder was mailed to the parents 24 h after the procedure to ensure that all forms were returned.

All procedures were performed before noon, the children having fasted since the preceding midnight. Neither premedication nor iv fluids were given. Anesthesia was induced with iv methohexital 3 mg · kg⁻¹ (through a butterfly needle) and was maintained with mask inhalation of nitrous oxide 70% in oxygen with enflurane 1-3%. Lumbar puncture was accomplished using a 20-gauge needle, with the child in the left lateral position. Less than 2 ml of cerebrospinal fluid (CSF) was removed for diagnostic purposes.

Intrathecal drugs, if required, consisted of either methotrexate alone or a triple regimen of methotrexate, cytosine arabinoside, and hydrocortisone. The lumbar punctures often were followed by bone marrow aspiration and the iv administration of vincristine or L-asparaginase.

The children usually were discharged within 2 h of the procedure. They were not advised to lie supine nor to refrain from their usual activities in any way.

The data were evaluated by the two-tailed Fisher exact test.⁹

RESULTS

Anesthesia was required for less than 10 min in all cases, and there were no anesthetic complications. Lumbar puncture was accomplished on the first attempt, except in one instance when a second attempt was required. This occurred in a child who did not develop a subsequent headache.

Parents of 22 of the 26 children returned the questionnaires. Because many of the children were studied repeatedly, data regarding 36 lumbar punctures were obtained.

Only headaches that were postural in nature were counted as PLPHA. Three children gave a history suggestive of prior PLPHAs; two of these had PLPHAs during the study period. PLPHAs occurred significantly more often in children who were 13 years of age and older than in those who were less than 13 (table 1). These headaches usually were mild and lasted less than 48 h. However, one 14-yr-old boy had a PLPHA that lasted 72 h, while a 17-yr-old girl had a severe PLPHA that lasted

* Assistant Professor. Department of Anesthesiology, New York University Medical Center, 550 First Avenue, New York, NY 10016.

Received from the Department of Anesthesiology, New York University Medical Center, 550 First Avenue, New York, New York 10016. Accepted for publication July 31, 1986. Presented in part at the 60th Congress of the International Anesthesia Research Society, Las Vegas, March 1986.

Based on clinical work performed by Dr. Bolder as Lecturer in the Department of Anaesthesia, Victoria University of Manchester, Manchester, United Kingdom.

Address reprint requests to Dr. Bolder.

Key words: Anesthesia techniques: spinal. Complications: headache.

5 days. She was the only patient who complained of neck pain following lumbar puncture.

Clinical features of the patients are presented in table 2, which again compares patients under 13 years with those aged 13 and over. The two groups did not differ significantly in the incidence of CNS leukemia, intrathecal or systemic chemotherapeutic regimen, prior history of frequent headaches, or development of nonpostural headaches during the study period.

DISCUSSION

These data indicate that PLPHA commonly occurs in children aged 13 yr and over, an age that coincides with the beginning of adolescence. PLPHA appears to be rare in younger children: only one mild case was observed among the 17 children under the age of 13 yr.

These findings could be explained by postulating that younger children simply will not articulate headache complaints. However, the pediatric literature contains many articles that contradict this hypothesis.^{5,10} Headache is one of the most common symptoms evaluated by pediatricians. Moreover, children suffer from the major varieties of headache experienced by adults, including traction, muscle tension, and migraine.

In most previous investigations, PLPHA has been evaluated by daily interviews, rather than an initial interview with subsequent questionnaires. There may be less motivation to answer a form truthfully and carefully; thus information so obtained may be less accurate than interview data. However, inconsistencies in the interviewer's nonverbal communication from day to day introduce a possible source of error not present in questionnaires. The use of a questionnaire is accepted methodology in headache research.¹¹

Psychosomatic factors often have been invoked to explain PLPHA. During the initial interview with the children and their parents, an element of suggestion may have been provided that acted selectively on the adolescents, thus falsely elevating their rate of PLPHA. However, the headaches in these patients certainly exemplified classic PLPHA: they were highly postural and resulted

TABLE 2. Number of Patients with Certain Clinical Characteristics

	Ages 3-12 (yr)	Ages 13-17 (yr)
CNS disease	7	2
Intrathecal MTX	5	2
Intrathecal triple regimen*	5	2
Intravenous chemotherapy	15	5
Chronic headaches	4	1
Nonpostural headaches after LP	4	0

MTX = methotrexate.

* Triple regimen of methotrexate, cytosine arabinose, and hydrocortisone.

in behavioral changes, *e.g.*, the child preferred to lie flat in bed.

In their classic 1954 study, Dripps and Vandam examined the effect of bias, introduced by suggestion, on the incidence of PLPHA.¹² They administered spinal anesthesia to anesthetized patients who were not informed that this procedure would be done. The percentage of these patients that developed PLPHAs was the same as in patients who received spinal anesthesia alone. This study, in conjunction with other evidence (such as the efficacy of epidural blood patch) has largely dispelled the notion that PLPHA is psychogenic in etiology.

Dripps and Vandam reported a 16% incidence of headache after administering spinal anesthesia with a 20-gauge needle, in marked contrast to the 78% incidence of PLPHA in adolescents in this study. What could account for this discrepancy? Tourtellotte *et al.*¹³ pointed out that headache uniformly occurs at a much lower rate after spinal anesthesia than after diagnostic lumbar puncture. This difference cannot be solely attributed to preexisting headaches in patients undergoing diagnostic lumbar punctures, because lumbar puncture in normal volunteers produces a comparably high rate of headache. In most studies, headaches complicate diagnostic lumbar punctures in around 30% of patients, if a 20-gauge needle is used. However, several studies have reported headache rates after diagnostic lumbar puncture with a 20-gauge needle that are as high as 55%.¹⁴ † Perhaps the study of a sample population with a larger number of adolescents would lead to a PLPHA rate closer to the 30-50% previously reported.

In technical descriptions of lumbar puncture, pediatricians often advocate the routine use of 20-gauge needles.^{15,16} All lumbar punctures in this investigation were performed by pediatricians who used 20-gauge needles,

TABLE 1. Incidence of PLPHA

	Ages 3-12 (yr)	Ages 13-17 (yr)
No. of patients	17	5
Average age (yr)*	7.7 ± 2.6	15.2 ± 1.8
No. of LPs	27	9
No. of PLPHAs	1	7†

LP = lumbar puncture; PLPHA = postlumbar puncture headache.
* Mean ± SD.

† Significantly different by the two-tailed Fisher exact test.

† Cook MJ: Should patients be ambulatory after lumbar puncture? Observations on the frequency, cause and prevention of postlumbar puncture reactions. *Journal of Michigan Medical Society* 46:930-933, 1947.

according to their usual practice. These large needles facilitate successful lumbar puncture, an especially important consideration when aspirating CSF for diagnostic purposes, injecting intrathecal chemotherapy, or measuring CSF pressure.

The response of pediatric oncology patients to lumbar puncture could be affected by their disease or its treatment. Thus, there is a potential disadvantage in using this particular study group. However, no differences were identified between the adolescents and the younger children that could explain the different rates of PLPHA. Among the conditions examined were the use of intrathecal steroids and chemotherapy. Intrathecal steroids have been advocated as prophylaxis for PLPHA,[‡] but in a later study¹ no prophylactic effect was noted. Intrathecal chemotherapy can cause headaches, but such headaches would not be postural in nature. A recent study of general anesthesia in pediatric oncology patients found no headaches in the immediate recovery period after enflurane anesthesia.¹⁷

Studying pediatric oncology patients has advantages, because these patients usually are ambulatory and have relatively uniform diagnoses. Is there any evidence to suggest that the age-group dependence of PLPHA in these oncology patients would be found in other children? Vereanu described a series of 18,059 spinal anesthetics in children.⁷ Although the data were retrospective, he claimed to have observed not a single postspinal headache in children under the age of 11 yr.

Purtock *et al.* speculated that the lower CSF pressure of children protects them from prolonged CSF leakage through the dural puncture site and hence, from PLPHA.[§] This theory also could account for the low incidence of PLPHA in the aged, since Nickel *et al.*[¶] found that CSF pressure declines after the age of 50 yr. However, the measured differences were so small as to be of questionable significance. Thus, these data cannot totally explain the varying incidence of PLPHA with age.

Hormonal changes with aging could also underlie the differential susceptibility to PLPHA. Hormones are believed to be important in the pathogenesis of migraine headache, and patients who suffer from migraine headache seem to be predisposed to PLPHA.² Similarly, hor-

monal factors may explain the special vulnerability of obstetric patients to PLPHA. Perhaps research on migraine headaches will further elucidate the etiology of PLPHAs.

After a long hiatus of neglect, there has been a recent resurgence of interest in pediatric spinal anesthesia.¹⁸ The low incidence of PLPHA in patients under the age of 13 yr may encourage the revival of this technique. However, a heightened awareness of the risk of PLPHA may be required if spinal anesthesia is used in adolescents.

The author thanks Dr. E. A. Shaw and Dr. P. M. Morris-Jones for allowing her to study their patients.

REFERENCES

1. Benzon HT, Linde HW, Molloy RE, Brunner EA: Postdural puncture headache in patients with chronic pain. *Anesth Analg* 59:772-774, 1980
2. Kaukinen S, Kaukinen L, Kannisto K, Kataja M: The prevention of headache following spinal anaesthesia. *Ann Chir Gynaecol* 70:107-111, 1981
3. Spielman FJ: Post-lumbar puncture headache. *Headache* 22:280-283, 1982
4. Fernbach DJ: Headache after lumbar puncture (letter). *Lancet* 2: 529, 1981
5. Kohler BF: Headaches in children. *Ergeb Inn Med Kinderheilkd* 53:37-71, 1984
6. Berkowitz S, Greene BA: Spinal anesthesia in children: Report based on 350 patients under 13 years of age. *ANESTHESIOLOGY* 12:376-387, 1951
7. Vereanu D: Spinalni anestezie v pediatricke chirurgii. *Cas Lek Cesk* 101:1206-1209, 1962
8. Evans DIK, Morris-Jones PM, Morris P, Shaw EA: Outpatient anaesthesia for a children's leukaemia clinic (letter). *Lancet* 1: 751, 1971
9. Zar JH: *Biostatistical Analysis*, 2nd ed. Englewood Cliffs, Prentice-Hall, 1984, pp 390-395
10. Shinnar S, D'Souza BJ: The diagnosis and management of headaches in childhood. *Pediatr Clin North Am* 29:79-94, 1982
11. Thompson JK, Collins FL: Reliability of headache questionnaire data. *Headache* 19:97-101, 1979
12. Dripps RD, Vandam LD: Long-term follow-up of patients who received 10,098 spinal anesthetics. *JAMA* 156:1486-1491, 1954
13. Tourtellotte WW, Haerer AF, Heller GL, Somers JE: Post-Lumbar Puncture Headaches. Springfield, Charles C. Thomas, 1964 pp 7-9
14. Gallagher E, Campbell CGH: Lumbar-puncture headache. Its prevention and treatment. *Lancet* 2:678-679, 1954
15. Plaut TF: Lumbar puncture in children: Its value and risk. *Clin Pediatr* 7:130-133, 1968
16. Menachof LW: Lumbar puncture in infants and young children. *J Fam Pract* 4:369-372, 1977
17. Fisher DM, Robinson S, Brett CM, Perin G, Gregory GA: Comparison of enflurane, halothane, and isoflurane for diagnostic and therapeutic procedures in children with malignancies. *ANESTHESIOLOGY* 63:647-650, 1985
18. Harnik EV, Hoy GR, Potoicchio S, Stewart DR, Siegelman RE: Spinal anesthesia in premature infants recovering from respiratory distress syndrome. *ANESTHESIOLOGY* 64:95-99, 1986

‡ Kulick SA: The clinical use of intrathecal methylprednisolone acetate following lumbar puncture. *Journal of Mount Sinai Hospital NY* 32:75-78, 1965.

§ Purtock RV, Buhl JL, Abram SE: Epidural blood patch in a nine-year-old boy. *Regional Anesthesia* 9:154-155, 1984.

¶ Nickel B, Krause H, Neumann J: Zur Frage des am sitzenden Patienten gemessenen lumbalen Liquordrucks. *Deutsch Gesundh* 24: 1558-1561, 1969.