

Analysis of the factors influencing headache and backache following lumbar puncture

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= Abstract =

Purpose : This study aimed to examine the factors influencing the appearance of headache and backache following diagnostic lumbar puncture in children, focusing on the need for strict bed rest after lumbar puncture.

Methods : We studied 70 two-fifteen-year-old pediatric patients who underwent diagnostic lumbar puncture from July 2005 to July 2007 at Konkuk University Hospital. We divided them into two groups. Patients in the first group (n=24) were allowed free mobility and patients in the second group (n=46) were to have strict bed rest for four hours after puncture. Data were analyzed by age, sex, number of puncture attempts, cell counts and pressure in the cerebrospinal fluid (CSF), duration of bed rest, and occurrence of headache and backache.

Results : The rate of complications was not significantly related to sex, age, presence of enterovirus, CSF pressure, or postural headache. The occurrence of headache was significantly correlated with white blood cell (WBC) count in CSF ($P=0.043$). Symptom frequency did not differ significantly between the groups. Backache was significantly related to the frequency of puncture attempts ($P=0.046$).

Conclusion : Strict bed rest following diagnostic lumbar puncture in children does not influence headaches and backaches. These are respectively related to the WBC count on the CSF profile and the frequency of attempts. Therefore, after lumbar puncture, absolute bed rest is not necessary and patients are more comfortable with free mobility. (*Korean J Pediatr* 2008;51:856-860)

Key Words : Bed rest, Lumbar puncture, Postspinal tap headache

Introduction

Patients are usually required to have bed rest for some hours after diagnostic spinal tap, because it is believed to help prevent postspinal tap headache. However, our clinical experience suggests that absolute bed rest after spinal tap is not helpful in reducing the risk of postspinal tap headache, at least in children.

Headache after spinal tap, first described by August Bier in 1898¹⁾, is a frequent problem that characteristically begins or worsens within minutes of the subject standing up after spinal tap but improves upon lying down²⁾. Nonpositional headache or backache and other symptoms are also reported

after spinal tap²⁾.

After spinal tap, many adults develop complaints such as headache or backache. Post-lumbar puncture complaints are believed to be rare in children and adolescents, but their exact incidence is unclear because there is a paucity of data derived from general pediatric patients³⁾.

Because headache following spinal tap has long been attributed to early mobilization, in several countries, strict bed rest, ranging from a few hours to 24 hours, is often used to prevent headache²⁾. An Austrian survey reported that 48% of the country's neurological services require 24 hours of bed rest after spinal tap. In Sweden, the average duration of bed rest is less than 3 hours. However, there is no evidence that longer bed rest after lumbar puncture is better than immediate mobilization or short bed rest in reducing the incidence of headache⁴⁾. Although a few reports have addressed the effect of prophylactic bed rest on post-lumbar puncture complaints in adults, studies in children and adolescents are lacking²⁾.

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We undertook this study to confirm our clinical impression that strict bed rest after spinal tap is not helpful in reducing the occurrence of headache after this procedure. We compared the rates of complications between pediatric patients allowed to move freely and those given strict bed rest after spinal tap and tried to identify the factors that might cause complaints.

Materials and Methods

From July 2005 to July 2007, we enrolled 70 patients aged 2 to 15 years who received a diagnostic spinal tap for the evaluation of meningitis at Konkuk University Hospital. Twenty-four patients were allowed free mobility and 46 patients were required to have strict bed rest for 4 hours after lumbar puncture. Patient data were collected and classified according to age, sex, number of puncture attempts, pleocytosis in the CSF, duration of strict bed rest, and the occurrence of headache and backache.

For all lumbar punctures, the cannula was inserted using the classic cutting Quincke bevel. The midlumbar vertebrae were identified and a 22-gauge spinal needle was inserted after infiltration of the skin and subcutaneous tissues parallel to the dural fibers with 0.5 mL 2% lidocaine hydrochloride. The volume of removed CSF ranged from 6 to 12 mL.

For the first 4 days after puncture treatment, the appearance of headache, back pain, headache combined with back pain, back pain combined with leg pain, or postural headache was reported.

The independent variables were age, sex, need for repeated puncture attempts, CSF pressure, pleocytosis, enterovirus detected with polymerase chain reaction (PCR), and free mobility or strict bed rest. The dependent variables were headache, back pain, headache combined with back pain, back pain combined with leg pain, and postural headache. Postural headache was defined according to the International Headache Society as headache that occurs or worsens within 15 minutes of assuming the upright position and that disappears or improves within 30 minutes of resuming the recumbent position.

The data were analyzed using SPSS version 12.0. Correlations among variables were evaluated using the chi-square test. A *P* value<0.05 was considered significant.

Results

The average age did not differ significantly between groups: 6.9 years in the free mobility group and 7.0 years in the strict bed rest group (Table 1). The ratio of girls to boys did not differ significantly between groups. The free mobility group comprised 7 girls and 17 boys (ratio 1:2.3) and the strict bed rest group comprised 17 girls and 29 boys (ratio 1:1.7).

In the free mobility group, 4 patients (16.7%) reported headache, 3 patients (12.5%) reported headache combined with backache, and 3 patients (12.5%) reported backache combined with leg pain. In the strict bed rest group, 9 pa-

Table 1. Frequency of Complications after Lumbar Puncture in Relation to Sex, Age, Strict Bed Rest, Cell Count in CSF, Pressure, PCR Enterovirus, and Puncture Attempts

	Number	Sx	H	PH	B	H+B	B+L
Sex							
Male	46	26	10	4	4	6	3
Female	24	11	3	0	2	4	2
<i>P</i> value		0.395	0.345	0.137	0.959	0.681	0.780
Age (year)							
<10	55	27	9	4	6	4	4
≥10	15	10	4	0	0	6	0
<i>P</i> value		0.227	0.363	0.282	0.181	0.001	0.226
Strict bed rest							
No	24	10	4	0	0	3	3
Yes (4 hours)	46	27	9	4	6	7	2
<i>P</i> value		0.175	0.767	0.137	0.064	0.758	0.209
Cell count in CSF (/L)							
<10	14	7	0	1	1	4	1
≥10	56	29	13	2	5	6	3
<i>P</i> value		0.855	0.043	0.566	0.817	0.094	0.809
CSF pressure (cmH ₂ O)							
<8	5	0	0	0	0	0	0
≥8	19	7	2	3	-	1	1
<i>P</i> value		0.107	0.449	0.342	-	0.600	0.600
PCR Enterovirus							
No	55	28	9	3	6	7	3
Yes	15	9	4	1	0	3	2
<i>P</i> value		0.532	0.363	0.858	0.181	0.476	0.294
Puncture attempts(times)							
1	63	33	13	4	4	8	5
≥2	7	4	0	0	2	2	0
<i>P</i> value		0.811	0.183	0.492	0.046	0.255	0.439

Abbreviations : Sx symptoms; H, Headache; PH, postural headache; B, back pain; L, leg pain; H+B; headache and back pain; B+L. back pain and leg pain

tients (19.6%) reported headache, 4 patients (8.7%) reported postural headache, 6 patients (13%) reported backache, 7 patients (15.2%) reported headache combined with backache, and 2 patients (4.3%) reported backache combined with leg pain.

The rate of complications did not differ significantly in relation to sex, age, enterovirus identified with PCR, CSF pressure, or postural headache. The occurrence of headaches was significantly correlated with the WBC count in the CSF ($P=0.043$). The frequency of symptoms did not differ significantly between the free mobility and strict bed rest groups. Backache was significantly correlated with the frequency of puncture attempts ($P=0.046$).

1. Sex

Of the 70 young patients, 46 were boys and 24 were girls. Their average age was 7.0 years. Twenty-six boys (56.5%) and 11 girls (45.8%) reported symptoms after receiving the diagnostic lumbar puncture. More boys reported post-lumbar puncture complaints, including headache, postural headache, backache, headache combined with backache, and backache combined with leg pain, although this trend was not significant.

2. Age

Of the 70 patients, 55 were younger than 10 years of age and 15 were 10 years or older. The occurrence of symptoms after the diagnostic lumbar puncture did not differ significantly between these age groups. Twenty-seven (49.1%) of the younger patients and 10 (66.7%) of the older patients reported symptoms. Only headache combined with backache occurred more frequently in the older age group ($P=0.001$).

3. Strict bed rest

The rate of complaints after spinal tapping did not differ significantly between groups. In the free mobility group, 10 (41.7%) patients developed complaints after spinal tap. In the strict bed rest group, 27 (58.7%) reported complaints after spinal tap.

4. WBC count

The average WBC count was 135.3/L. Fourteen of the 70 children had a WBC count $<10/L$, and 56 had a count $\geq 10/L$. Seven (50%) children with low WBC count and 29 (52.7%) children with high WBC count had post-lumbar puncture complaints. Only the occurrence of headache was

significantly correlated with WBC count ($P=0.043$).

5. CSF pressure

Only 24 of the 70 children were tested to measure CSF pressure. Many children cried and moved, making it difficult to measure CSF pressure we excluded the pressures measured when children were moving or crying. CSF pressure was not significantly related to the occurrence of symptoms. CSF pressure was not measured in any child who complained of back pain, and we could not assess any relationship between these variables.

6. PCR enterovirus

Fifty-five children tested negative for PCR enterovirus and 15 tested positive. The occurrence of symptoms did not differ significantly between these groups. Twenty-eight (50.9%) of the enterovirus-negative children had symptoms after the diagnostic spinal tap, and 9 (60.0%) of the 15 enterovirus-positive children had symptoms.

7. Number of puncture attempts

One puncture was attempted in 63 of the 70 children, and 2 or more punctures were attempted in 7 children. The occurrence of symptoms was not significantly related to the number of puncture attempts. In the group given only 1 puncture attempt, 33 (52.4%) developed post-lumbar puncture complaints. In the children experiencing more puncture attempts, 4 of 7 (57.1%) reported symptoms. Only back pain was significantly related to the number of puncture attempts ($P=0.046$).

Discussion

After spinal tap, many adults develop headache or backache. Complaints after spinal tap are believed to be rare in children and adolescents. Our study is the first to consider the frequency of headache and backache after diagnostic lumbar puncture in a general pediatric group since that of Plaut in 1968³⁾. Positional post-lumbar puncture headache begins or worsens within minutes of standing up and improves or disappears on lying down. Positional post-lumbar puncture headache is experienced by about one-third of adult patients⁵⁾, and the frequency is higher in young adults aged 20 to 40 years^{6, 7)}.

The literature reports complaints after spinal tapping in children as young as 2 years. Plaut observed headache in

only 3% of his general pediatric patients³⁾. The incidence of backache after diagnostic lumbar puncture is given as 22–45%. In most, but not all, studies that differentiated between adolescents older than 10 to 12 years and younger children, older children reported significantly more pain-related complaints than younger children did. However, we found no significant difference in the rate of complaints after spinal tapping between children younger and older than 10 years. Friedrich observed that, in patients 10 years of age and older, girls report headaches significantly more often than boys³⁾. Our result shows no significant difference in the frequency of headache between boys and girls or by age.

Hormone-related differences in the consistency of the connective tissue have been postulated as a reason for the sex difference in the frequency of post-lumbar puncture headache³⁾. Headache after spinal tap caused by persistent leakage of CSF through the puncture-induced dural rent. This may cause direct traction on intracranial pain-sensing structures and intracranial venodilation, which may activate nociceptors⁵⁾.

The larger gauge needles, which cause greater leakage of CSF, are associated with a higher rate of headache or backache after spinal tap³⁾. Other studies have not shown a clear advantage to using either an atraumatic puncture needle or a smaller gauge puncture cannula. We used a 22-gauge Quincke cannula to perform the diagnostic puncture in all patients, and our data do not contribute to the debate about the cannula diameter. Thinner needles, as used for spinal anesthesia, are associated with a significantly slower rate of flow and can be problematic in pediatric settings⁸⁾.

In children with viral meningitis, preexisting symptoms improve after lumbar puncture⁹⁾. Friedrich observed a higher rate of new or worsening headache after puncture in patients with elevated cell count in the CSF³⁾. Our results confirm this finding.

Puncturing the dura mater with the cannula bevel oriented laterally instead of cranially is believed to displace the dura fibers rather than cut through them. This technique is associated with a lower rate of post-lumbar puncture complaints in adults. Adults report symptoms more frequently after repeated puncture attempts or aspiration of a large volume of CSF¹⁰⁾. Few pediatric data have been published about cannula orientation. We found that the occurrence of backache was significantly related to the number of puncture attempts. However, we could not determine whether the volume of CSF aspirated is related to the appearance of

symptoms. The immobilization of the spine, loss of supportive muscular tone, and stretching of ligaments and joint capsules are important factors influencing backache after puncture¹¹⁾.

A previous study showed no significant difference in the development of post-lumbar puncture headache between 4-hour and 24-hour recumbency⁴⁾. In addition, the incidence of headache did not differ significantly between patients who were ambulant immediately after lumbar puncture compared with those confined to bed for 24 hours.

요 약

요추 천자 후 발생하는 두통 및 요통에 영향을 주는 요인의 분석

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목적 : 소아에서 진단 목적으로 척수액 검사를 시행한 환아에서 요추 천자 후 발생하는 두통과 요통에 영향을 주는 요인들을 조사하고, 특히 소아에서 불편을 호소하는 요추 천자 후 절대안정이 필요한가를 알아보기 위해 본 연구를 하였다.

방법 : 2005년 7월부터 2007년 7월까지 건국대학교병원 소아청소년과에 뇌수막염 진단을 위해 요추 천자를 시행한 2세부터 15세의 환아 70명을 대상으로 하였다. 저자들은 그들을 2개의 집단으로 나누었다. 요추 천자 후 절대 안정을 하지 않은 집단은 24명 이었고 절대 안정을 4시간 동안 시행한 집단은 46명 이었다. 요추 천자 후 발생하는 두통, 요통과 같은 합병증이 나이, 성별, 요추 천자 횟수, 척수액내의 백혈구 세포수 및 압력, PCR enterovirus, 절대 안정여부와 상관 관계가 있는지 분석하였다.

결과 : 요추 천자 후 발생하는 두통, 요통과 같은 합병증은 나이, 성별, 척수액 압력, 장 바이러스와는 통계학적인 의미가 없었다. 두통은 척수액내의 백혈구 세포수가 높을수록 통계학적인 의미가 있었다($P=0.043$). 증상의 빈도는 두 집단 간에 큰 의미는 없었다. 요통의 발생 횟수는 요추 천자 횟수가 많을수록 통계학적으로 의미 있게 증가하였다($P=0.046$).

결론 : 척수액내의 백혈구수와 요추 천자 횟수는 천자 후에 발생하는 두통과 요통에 영향을 주는 인자로 생각된다. 요추 천자 후 예방적으로 시행되는 절대 안정은 천자 후에 발생하는 두통 및 요통의 발생 빈도에 영향을 주지 않기 때문에 시행할 필요가 없다고 생각한다.

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