



Risk factors for post lumbar puncture headache

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ABSTRACT

Background: Lumbar puncture (LP) is complicated by headache in about one-third of patients. The aim of the study was to evaluate potential risk factors for post-LP headache.

Methods: 144 Patients undergoing diagnostic LP at a tertiary medical center completed questionnaires on fear of the procedure, pre-existing headache, and post-LP headache. Data on patient demographics, operator experience, and other procedure-related parameters were collected from hospital files.

Results: The post-LP headache group ($n = 37$, 27.6%) was characterized by a significantly younger age and higher proportion of women relative to the no-headache group ($n = 97$); body mass index was similar. Both groups had similar levels of fear of the procedure and there was no correlation between intensity of patients' anxiety to the procedure and its occurrence. Patients with high opening pressure had higher levels of post-LP headache (28.6% vs. 18% $p = 0.078$) and a history of headaches was significantly more prevalent in the post-LP-headache group (66.6% vs. 38.1%, $p = 0.003$).

Conclusions: Fear of the procedure does not predispose to occurrence of post-LP headache while a history of headache and elevated intracranial pressure does. These findings may be related to the possible pathophysiology of the condition, namely a change in compliance and pressure gradients with resultant venous distention.

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1. Introduction

Lumbar puncture (LP) is a common diagnostic, therapeutic, and anesthetic procedure. It is complicated by headache in about one-third of patients [1]. Post-LP headache is typically postural and may be accompanied by nausea, vomiting, tinnitus, and hearing impairment. It usually lasts for a couple of days, is dull or throbbing and varies in severity from mild to severe enough to immobilize the patient and to require therapy [2,3]. The post-LP headache is presumed to be caused by leakage of cerebrospinal fluid (CSF) through the dural puncture site, which reduces intracranial pressure and leads to traction on pain-sensitive intracranial structures with consequent venous distension [4].

Several demographic factors have been associated with post-LP headache, namely young age and female sex. Some studies reported that young women with a low body mass index (BMI) had the highest risk of post-LP headache [2,5,6], whereas others found no effect of BMI [7]. Procedural measures that might be effective in reducing the occurrence of headache include use of a small-sized needle,

reinsertion of the guide before needle withdrawal, and directing the bevel perpendicular to the dura [2,8,9]. Among the factors found to have no significant effect on post-LP headache are volume of the spinal fluid removed, bed rest (or not) after LP, patient position during the procedure (supine or sitting), opening pressure, and CSF constituents [1,10,11]. However, data on the possible effect of patient anxiety before the procedure [12–14] and operator experience is not available [2]. In addition, few studies have examined the role of pre-existing headache(s). One study found that patients who had a history of chronic or recurrent headaches were three times as likely to acquire a post-LP headache than patients who did not [15]. Another, identified a history of recent headache (within seven days) as a risk factor for post-LP headache [2].

The aim of the present study was to look for risk factors that predispose to the development of post-LP headache. Besides parameters that were already examined we focused on two that were not addressed before: level of anxiety before the LP procedure and the impact of operator experience.

2. Methods

Patients admitted to the Department of Neurology of a tertiary medical center and underwent a diagnostic LP between January

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2008 and January 2010 were asked to complete a questionnaire before and after the LP. All the procedures were performed using traumatic type (Quinke needle) (Becton Dickinson S. A. S Augustin del Guadalix. Madrid. Spain). The patient was in lying or sitting position. The procedure was performed in a midline approach, at the L4–L5 intervertebral space level.

The pretest questionnaire included items on history of headache episodes before the acute illness for which they were admitted, presence of headache during the current acute illness, and the characteristics of the headache(s) (if present): quality, location, severity (rated on a scale from 1 to 10), and postural nature (worse when standing up or lying down), and associated symptoms (nausea, vomiting, tinnitus). In addition, participants were asked to rate their fear of the LP test on a scale from 0 (no fear) to 10 (extreme fear). The post-LP questionnaire included items on the presence of headache at 6 and 24 h after LP, location of the headache (when present), quality and severity of the headache (rated as in the pretest questionnaire), postural nature of the headache, and associated symptoms (as in the pretest questionnaire). Data on patient characteristics (age, sex, height, weight) were collected from the medical files, and body mass index (BMI) was calculated (weight (kg)/(height (m))² [2]. Procedure-related data, including indications for the test, needle size (22G or 20G), opening pressure, number of punctures, data on the years of experience of each of the operators who performed the test (recorded for the study as more or less than 1 year) were obtained. CSF content (cells, glucose, protein), were collected from hospital records. Although the whole questionnaire was not validated, pain and fear intensity was evaluated using VAS score. Other parts of the questionnaire included questions regarding the clinical characteristics of post-LP headache.

Post-LP headache was defined according to the International Headache Society (IHS) [16] as a headache of intensity >3 that occurred within to 24 h after the procedure and improved with rest. In patients with a pre-LP headache, any headache after LP was considered procedure-related if it differed in quality or location from the pre-LP headache. The study was approved by the local ethical committee, and all participants signed a written informed consent form.

2.1. Statistical analysis

Means and standard deviations were calculated for continuous variables and differences between patients with and without post-LP headache were analyzed by two-sample *t*-tests. For binary and nominal variables, proportions were calculated, and *p* values were computed using Pearson chi-square test (for variables with more than 5 observations per group) or Fisher exact test (for variables with less than 5 observations in one or both groups). Comparison between percentages of post LP headache in the various neurological disorders was done using Pearson chi-square test.

Comparison between groups of patients with high and low level of fear, high and low headache intensity before LP was done using

Table 1

Characteristics of 144 patients with or without headache after lumbar puncture.

	Headache	No headache	<i>p</i> Value
Number of patients	37 (27.6%)	97 (72.4%)	
Age (yr) (mean ± SD)	40.1 ± 16.4	46.4 ± 16.5	0.0496
Female	24 (65%)	49 (50%)	0.136*
Male	13 (35%)	48 (49%)	
BMI (mean)	26.6	26.3	NS
Fear of LP (mean*)	5.5	5.1	NS
Headache immediately before LP	14 (38%)	42 (43%)	NS
History of headache†	24 (67%)	37 (38%)	0.003
Operators experience ≤1 yr	12 (32.4%)	32 (34.4%)	NS
Operators experience >1 yr	25 (67.6%)	61 (65.6%)	NS
No stabs (mean ± SD)	1.8 ± 2.1	2.1 ± 2.17	NS
Needle size 22G	14 (38%)	31 (32%)	NS
Needle size 20G	23 (62%)	65 (68%)	NS
Opening pressure (cm H ₂ O) mean ± SD	22 ± 7.6	18.8 ± 6.8	NS
CSF content (mean ± SD)			
Cells	17.5 ± 58	24 ± 11	NS
Glucose (mg/dL)	63.3 ± 10	69.4 ± 17.7	NS
Protein (mg/dL)	38.3 ± 22.5	44.6 ± 30.5	NS

Values are in numbers (%) or mean ± SD. BMI—body mass index, CSF—cerebrospinal fluid, NS—non significant.

* Rated on a scale from 0 (no fear) to 10 (extreme fear).

** Comparing female with post LP headache with male with post LP headache.

† Headache episodes prior to acute illness that was the reason for the present admission.

χ^2 , so as comparison between percentage of post-LP headache between group with elevated and normal opening pressure. Odds ratios for post-LP headache for all baseline factors were calculated by Logistic Regression.

Factors found to be significantly different between the groups were entered into a multivariate logistic regression model, controlling for potential confounders, to identify independent associations with post-LP headache.

The statistical analysis was generated using SAS Software, Version 9.4 of the SAS System for PC, Copyright 2002–2012. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA.

3. Results

3.1. Group characteristics (Table 1)

The study sample included 144 patients, 72 men and 72 women of mean age 44.6 years (range 19–84). Thirty-seven patients (27.61%) reported post-LP headache (IHS definition). The characteristics of the patients with and without headache are shown in Table 1. The headache group was characterized by a lower mean age (40.12 ± 16.4 vs. 46.4 ± 16.5 years, (*p* < 0.05)) and a higher proportion of women (65% vs. 50%). There was no difference in BMI between the groups.

Table 2

Characteristics of patients and incidence of post-LP headache according to indication for LP.

Indication for LP (N)	Age	Sex (F)	BMI	Chronic headache (%)	Headache before LP (%)	Post-LP headache (%)
Headache (17)	38.7	11/17	24.47	64	64	11
Demyelination (20)	40.9	12/20	24.68	40	35	25
Dementia (7)	64	1/7	25.49	42	28	14
Meningitis (11)	36.04	8/11	27.41	37	90	36
Polyneuropathy (19)	57.17	5/19	26.62	21	15.7	15
Idiopathic intracranial hypertension (14)	29.5	11/14	34.58	57	50	35
Diplopia (8)	49.75	6/8	23.15	75	37.5	28
Myeloencephalitis (8)	42.13	4/8	23.94	25	37.5	12.5
Other* (29)	48.1	14/29	26.21	35	20.6	13

BMI—body mass index.

* Other—plexitis, infiltration, ataxia, positive blood VDRL test, myelopathy, motor neuron disease.

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