

RESEARCH ARTICLE

Postdural Puncture Headache: Incidence and Risk Factors in Children Following Intrathecal Chemotherapy

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Abstract

Objective

To evaluate the incidence and risk factors of development of postdural puncture headache in children who had intrathecal chemotherapy injection.

Materials & Methods

Two-hundred eighty patients (mean age, 7.23±3.92 years) who had intrathecal chemotherapy injection were studied prospectively during 2008-2009 in the pediatric ward of Dr. Sheikh hospital in Mashhad. Patients who had lumbar puncture for their chemotherapy drug injections were assessed daily for four days to detect postdural puncture headache.

Results

There were 172 (61, 4%) male patients and the remainder were female. Postdural puncture headache was detected in 41 patients (14.6%). The body mass index did not show any significant difference between the two groups. Lumbar puncture (LP) attempts had a significant association with postdural puncture headache. The size and shape of the needle did not have a significant association with postdural puncture headache.

Conclusion

LP attempts have a significant relationship with postdural puncture headache.

Keywords: Postdural puncture headache; Children; Complication; Spinal needle

Introduction

It was thought that postdural puncture headache (PDPH) does not occur in the pediatric group because of the low CSF pressure in children and hormone changes in adolescence (1). According to the recent studies (2-5), PDPH can develop in children. It is the most common complication of lumbar puncture (LP) in children (6) with an estimated occurrence rate of 4% to 15% (3).

Apiliogulari et al. detected that PDPH is related to the size and shape of needles (6). Cutting edge needles were associated with more PDPH than pencil edge needles. But in another study there was no statistically significant difference between cutting edge and pencil point needles in causing PDPH (7).

On the other hand, it is suggested that more than one attempt for successful LP may cause a traumatized LP and therefore, clot formation of red blood cells plugs the hole in the dura and subsequent CSF leakage is obscured and as a result, less PDPH occurs (8). There have also been other studies (9, 10) reporting that multiple LP attempts lead to more PDPH.

So with regard to different study results concerning PDPH, we conducted this study to assess PDPH risk factors in our patients.

Materials & Methods

This was a prospective study performed on 280 pediatric patients in the oncology department of Dr. Sheikh hospital in Mashhad. These patients had dural puncture for their chemotherapy drug injection from 2008 to 2009.

The inclusion criteria were a history of a malignant disease with intrathecal injection of chemotherapy agents, a successful LP and lower than 15 years of age. The exclusion criteria were any contraindication of LP including any infection or wound at the site of LP, a brain mass lesion and patient refusal.

LP was done in order to inject chemotherapy drug(s) with the patient in the sitting position and the spinal needle was inserted through the lumbar disc space 3-4. The therapeutic agent(s) was injected after returning of clear CSF. Patients were assessed daily for 4-days for PDPH which was defined as a headache that appears after LP attempt(s) aggravated by the upright position and relieved in the supine position.

The study was approved by the ethics committee of Mashhad University of Medical Sciences. Written informed consent was obtained from each patient.

Data were analyzed by SPSS (ver.11.5). Tests such as Student's t test and chi square test were used to compare the data between those cases with or without headache. A p value less than 0.05 was considered significant.

Results

The mean age of the patients was 7.23 years (± 3.92). Of the 280 patients, 172 (61.4%) were male and 108 (38.6%) were female. Anthropometric characteristics of the children are shown in Table 1.

PDPH was revealed in 41 (14.6%) cases. There was no significant relationship between the needle type or LP operators and PDPH ($p=0.46$ and $p=0.83$, respectively) (Table 2).

There was no significant relationship between the two groups regarding gender ($p=0.68$) and the history of a previous LP ($p=0.49$). Needle position (superior or lateral) between the two groups did not show any

significant difference ($p=0.52$). LP attempts between the two groups is shown in Table 3.

It was revealed that 54.5% of the headaches occurred during the first 48 hours after LP.

Discussion

Based on our results, LP attempts had a significant relationship with PDPH, but the needle type and the position of the needle and the LP operator did not have any significant relationship with the PDPH complication.

In one study on 414 children aged 2-17 years, it was revealed that the needle type (27 G pencil point spinal needle versus 26G cutting point needle) had a significant relationship with PDPH, possibly due to irregular puncture made by the pencil edge needle. It may result in more local inflammatory reaction and edema for access to the arachnoid space and consequently less CSF leakage with a 27 G pencil point needle (6). This focal tissue reaction and edema may limit the CSF loss by plugging the hole.

In studies conducted by Thomas et al., Strupp et al. and Kleyweg et al. which were randomized, double-blind controlled studies, it was stated that using non-cutting edge needles lead to less headaches after LP. (11-13). It may be due to the special diamond shape of the needle that causes separation of the dural fibers without cutting them. So after ending the procedure, elastic fibers would be intact (14,15). On the other hand, the cutting edge type may be damaged by contacting the bone in comparison to the pencil point needles (16).

We used syringe needle or LP needles. LP was performed by a junior or senior resident or specialist. The size and shape of the needles and different LP operators did not show any significant difference in the occurrence of PDPH between the two groups. It may be due to the fact that the different shape and size of the needles mainly cause different dural penetrations, but a similar puncture in the fibrous arachnoid surrounding the CSF occurs, with a serious role in causing PDPH in comparison with the size of the hole in the dura alone (17).

LP attempts may cause traumatic LP leading to edema and inflammatory reaction which may plug the puncture in the dura and arachnoid; therefore, it

is associated with less PDPH (8). According to our findings, multiple punctures were associated with a significant rise in PDPH. It may be because multiple penetrations in the dura and arachnoids may be the origin of significant dural damages and as a result a larger hole is made that can result in excessive CSF leakage. Adenosine receptors may be stimulated by the decrease of CSF pressure. Headache develops due to cerebral vasodilatation and traction of the intracranial structure together with pain sensitivity. In our study, BMI did not show any significant relationship with PDPH, but in the literature it has been

stated that low BMI was associated with the rise of PDPH with an unknown cause. In conclusion, Multiple LP attempts may increase PDPH occurrence.

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Conflict of interest: There was no conflict of interest.

Table 1. Anthropometric Characteristics of Children Who Underwent LP

	Minimum	Maximum	Mean	SD
Height (cm)	61	180	125.94	30.13
Weight (kg)	8.4	68	24.68	12.20
BMI	10.25	29.56	17.25	3.64

Table 2. Comparing Needle Type and LP Operators Among Children With or Without PDPH

			Post dural puncture headache		Total
			No	Yes	
Needle type	syringe needle	Count	182	29	211
		%within	86.3%	13.7%	100.0%
		Needle Type			
	Lp needle	count	57	12	69
		%within	86.2%	17.4%	100.0%
		Needle Type			
Lp operator	Junior resident	count	72	14	86
		%within	83.7%	16.3%	100.0%
		Lp Operator			
	Senior resident	Count	152	24	176
		%within	86.4%	13.6%	100.0%
		Lp Operator			
	Specialist	count	15	3	18
		%within	83.3%	16.7%	100.0%
		Lp operator			

Table 3. LP Attempts and PDPH in the Two Groups

	Postdural Puncture Headache		P val
	No	Yes	
LP attempts once	214 (88.8%)	27 (11.2%)	0.0001
Twice or more	24 (63.2%)	14 (36.8%)	

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