

Short report

Failure of postural manoeuvres to prevent lumbar puncture headache

D HILTON-JONES, RA HARRAD, MW GILL, CP WARLOW

From the Department of Neurology, Radcliffe Infirmary, Oxford, UK

SUMMARY Diagnostic lumbar puncture was performed on 76 neurological inpatients. They were randomly allocated to one of four bed rest positions for four hours following the procedure (supine and horizontal, prone and horizontal, supine with head-down tilt and prone with head-down tilt) after which they were allowed to get up. There was no substantial or significant difference in the incidence of headache between the four groups. Expectation of headache did not appear to be an important factor in its development.

It is widely believed that headache after lumbar puncture is related to cerebrospinal fluid (CSF) hypotension attributable to continued leakage of CSF through the dural hole made at lumbar puncture.¹⁻³ If this postulate is correct the development of post-lumbar puncture headache may possibly be prevented by techniques that counteract CSF hypotension. Many such techniques have been reported,⁴⁻⁶ but most trials suffer from poor design particularly with respect to randomisation. However, the importance of needle size seems to be beyond doubt.^{7,8} Although epidural blood patching may be a useful method in the treatment of intractable post-lumbar puncture headache, it is not without complications^{9,10} and cannot be recommended for routine use for the prevention of headache, particularly in inexperienced hands. The role of posture in preventing post-lumbar puncture headache dates to Sicard in 1902 who recommended 24 hours bed rest after puncture.¹¹ This procedure is still widely practised although Carbaat and Van Crevel's¹² recent study shows that it simply delays the onset of headache and does not prevent its development. Two other recent studies^{13,14} have suggested that the incidence of headache may be reduced by tilting the patient head down after lumbar puncture, thereby reducing the CSF hydrostatic pressure in the lumbar subarachnoid space and thus decreasing the amount

of CSF leakage. Brocker¹⁵ suggested that the adoption of the prone position after lumbar puncture dramatically decreased the incidence of headache by the proposed mechanism of decreased CSF leakage with the dural hole uppermost. We decided to study this further by looking both at the effect of the supine and prone positions, and at head-down bed tilting in a randomised clinical trial. The results of the studies mentioned above suggest that headache after lumbar puncture should be least frequent in patients adopting the prone and tilted position, and most frequent in those adopting the supine and horizontal position. We also looked at the effect of anticipation of headache on its subsequent development, a subject about which there has been recent controversy.¹⁶

Patients and methods

Patients admitted to the Neurological Wards at the Radcliffe Infirmary, Oxford, and (for part of the trial) some patients admitted to the National Hospital for Nervous Diseases, Queen Square, London requiring diagnostic lumbar puncture, were included in the trial with the following exceptions: (1) patients taking regular analgesics for intercurrent disease, (2) patients who could not be mobilised at four hours, and (3) patients who had headache as a major feature of their illness or who had a headache at the time of lumbar puncture. Immediately prior to lumbar puncture, the patients were randomly allocated to one of four groups by drawing a card from a series of sealed envelopes; stratification by the three operators (DH-J, MG, RH) was performed prior to randomisation. The groups represented the four possible combinations of posture from the two variables under consideration being tilted

Address for reprint requests: Dr D Hilton-Jones, Department of Neurology, Radcliffe Infirmary, Oxford OX2 6HE, UK.

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and supine, tilted and prone, horizontal and supine or horizontal and prone. In the bed tilted group the foot of the bed was elevated 30 cms above the ground. In all cases the patients had only one pillow. Before the lumbar puncture was performed, the operator asked the patient if he or she expected to develop any problems as a result of the test, headache not being mentioned by the medical or nursing staff. Lumbar puncture was performed in the left lateral position using a 20 SWG needle and gaining access via the L3/4 interspace where possible. The opening pressure was measured and then 10 ml of CSF removed. The closing pressure was recorded and in those patients allocated to the two bed tilted groups, the new closing pressure was noted after the foot of the bed had been elevated. After removal of the needle, the patients assumed their allocated posture for four hours after which time they were mobilised unless they complained of headache in which case they were allowed to stay in bed in the supine and horizontal position until they could get up without a serious headache. At four, 24 and 72 hours after lumbar puncture the patients were asked whether, "they had developed any pain, discomfort or other problems since lumbar puncture" and headache was not specifically mentioned by the questioner. All symptoms volunteered by the patient were recorded and if headache was mentioned a record was made of its time of onset, duration, whether it had caused the patient to lie down and whether analgesics had been requested. In an attempt to exclude bias by the person who had performed the lumbar puncture, all questioning of the patients was performed by the senior nurse on the ward. No recommendation as to fluid intake was made to the patients, but intake in the 24 hours following lumbar puncture was recorded. The fact that the study was taking place on several wards meant that patients rarely had the opportunity of discussing their experiences with other patients in the trial.

Results

Seventy-six patients were admitted to the trial; the randomisation procedure resulting in slightly unequal numbers of patients and each sex in the four groups (table 1). Severity of headache was difficult to assess and we included in the analysis all patients who developed headache within 72 hours of the

lumbar puncture. Headache occurred in 29 (38%) patients, the subdivision into the four groups being shown in table 1. There was no significant difference in the incidence of headache between the four groups, nor between all the prone versus all the supine patients (44% versus 32%) nor between all the horizontal and all the tilted patients (31% versus 47%), and nor was there any significant interaction (either synergism or antagonism) between the two treatment variables. The group which in theory should have fared best (prone patients tilted head-down) in fact fared worst with an incidence of headache of 47%, and those who in theory should have fared worst (supine horizontal patients) actually fared best with an incidence of headache of 23%. None of these differences was significant, perhaps as a result of small numbers and a type II error. Of the 29 patients with headache, 26 lay down at some stage because of the headache. Two of the remaining three patients requested analgesics, but the third patient who only experienced pain on sudden head movement, remained fully mobile and did not request analgesics. The discharge from hospital of only one patient (in the tilted and supine group) was delayed because of persistent severe headache.

The time of onset and duration of headache is shown in table 2. Headache developing before mobilisation was more common in the horizontal and prone group, but the figures were too small to achieve significance. Although headache may develop after three days, it is unlikely that we missed a significant number of cases; in a recent study¹² only three of 41 patients developed a headache more than three days after mobilisation. The mean CSF opening pressure (in mms of water) was 138 (standard deviation (SD) = 44) in the patients who did not develop headache and 139 (SD = 48) in those who did and the mean change in pressure for each group after removal of 10 ml of CSF was 39 (SD = 25) and 43 (SD = 22) respectively. Of 19 patients whose CSF pressure fell by 60 mms of water or

Table 1 Age, sex and headache in 76 patients

Group	No	Sex		Age (yr)		Headache		
		M	F	Mean	Range	No	M	F
All patients	76	37 (49%)	39	42	18-73	29 (38%)	11	18
Tilted and supine	15	9 (60%)	6	39	18-65	7 (47%)	3	4
Tilted and prone	19	6 (32%)	13	44	20-64	9 (47%)	2	7
Horizontal and supine	22	9 (41%)	13	42	24-73	5 (23%)	1	4
Horizontal and prone	20	13 (65%)	7	43	22-61	8 (40%)	5	3
All tilted	34	15 (44%)	19	42	18-65	16 (47%)	5	11
All horizontal	42	22 (52%)	20	42	22-73	13 (31%)	6	7
All prone	39	19 (49%)	20	43	20-64	17 (44%)	7	10
All supine	37	18 (49%)	19	41	18-73	12 (32%)	4	8

Table 2 Time of onset and duration of headache

Group	Onset (hours)			Duration (days)		
	<4	4-24	25-72	<1	1-3	>3
Tilted and supine	0	5	1	0	3	3
Tilted and prone	2	5	1	3	2	3
Horizontal and supine	2	4	0	0	1	5
Horizontal and prone	4	3	2	1	4	4

more, 27% developed headache. After bed tilting the mean CSF pressure fell by 26 (SD = 25) in the group of patients who developed headache and by 18 (SD = 16) in the group who did not. None of these differences was substantial or significant (*t* test, Wilcoxon rank test).

Other symptoms complained of after lumbar puncture included back ache, neck pain and nausea. Back ache was more common in patients who did not develop headache (29%) compared with those who did (21%). Neck pain occurred in five out of 29 (17%) patients with headache and not at all in patients without headache. Nausea occurred in five out of 29 (17%) patients with headache and in one out of 47 (2%) patients without. When asked before lumbar puncture about possible side effects of the procedure, 11 patients thought that they might get a headache. Only four (36%) did, which was not much different from the overall incidence of headache. Of the 29 patients who developed headache, 18 (62%) were female and 11 (38%) male ($\chi^2 = 2.55$, NS). The mean age of patients who developed headache was the same as the patients who did not develop headache, being 42 years. There was no significant difference in the fluid intake in the 24 hours following lumbar puncture between the patients who developed headache and those who did not. There was no significant difference in the incidence of headache or other side effects between the three different operators.

Discussion

The overall incidence of headache in our series is similar to that reported by others.^{7,12} We have been unable to show any significant benefit of bed tilting or the prone posture after lumbar puncture in decreasing the incidence of headache and have thus been unable to confirm the work of previous authors.¹³⁻¹⁵ Indeed the incidence of headache was lowest, though not statistically significantly, in those patients who adopted the horizontal and supine position and was highest in those patients who had adopted the bed tilted and either prone or supine position. Even if the study had been extended to a very much larger number of patients, the chance of the tilted and prone group ever significantly better-

ing the horizontal and supine group as far as the development of headache is concerned, is statistically so slight that we do not think that further study along these lines is justified. This result is probably not surprising any more than the result of the recent study that showed no beneficial effect of 24 hours bed rest after lumbar puncture.¹² If postural manipulations immediately after lumbar puncture are to prevent the development of headache, it must be assumed that either they decrease the size, or increase the speed of repair of the dural hole prior to mobilisation. If this is not the case then headache is bound to occur upon mobilisation (at least if it is within 24 hours or so) at much the same frequency as it would occur if the patient had been mobilised immediately after lumbar puncture. The only effect of postural manipulation would be to delay the onset of symptoms. When comparing 24 hours bed rest with immediate mobilisation, this effect is clearly seen.¹² A marked fall in CSF pressure after removal of fluid has been associated with an increased incidence of headache,¹⁷ but our results do not confirm this.

Anticipation of headache did not appear to be a significant factor in its development, but this should not necessarily be used to support the view that patients should be forewarned of its possible occurrence.¹⁶

The present evidence, therefore, indicates that no special postural manoeuvring need be performed after lumbar puncture and that patients should be allowed to mobilise of their own will. If physicians insist on bed rest after lumbar puncture, despite evidence that this is unnecessary,¹² our results suggest that the horizontal and supine position is as good as any, but that the patient's preference should not be ignored. If headache develops and is troublesome, the patient should be instructed to lie down until the headache goes. If measurement of CSF pressure is not considered essential, the use of a small gauge needle would be associated with a low incidence of headache.

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