The influence of early ambulation and other factors on headache after lumbar myelography

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In order to determine the influence of early ambulation and other factors on headaches occurring after lumbar myelography we randomised 207 patients (127 men and 80 women) into two groups. Following the investigation, we allowed the 101 patients (65 men and 36 women) in group A to sit or stand freely, while we confined the 106 patients (62 men and 44 women) in group B to bed for 20 hours. The nine patients in group B who could not maintain bed rest were excluded.

There was no significant difference between the two groups as regards the prevalence of spinal headache (8.9% in group A v 14.4% in group B). Patients who reported headaches, however, were significantly more likely to be women (18.7%) than men (7.3%), be younger (mean age 45 years v 56 years), have a higher cerebrospinal pressure before removal of fluid (mean values 172 v 137 mm H2O) and a lower systolic (mean values 120 v 134 mmHg) and diastolic blood pressure.

We conclude that, although other factors may be associated with headaches, late ambulation is not effective in preventing spinal headaches after lumbar myelography.

Received 16 August 2002; Accepted 10 December 2002

Recently, it has become possible to investigate the pathophysiology of intraspinal canal disease without invasion, as a result of advances in MRI.

Myelography combined with CT, however, is an important part of the diagnostic investigation for preoperative planning because sometimes there can be a discrepancy between the pathophysiology and the MRI findings. Myelography is an invasive examination, which is accompanied by adverse effects in some patients. In particular, the most common complaint is spinal headache, which is aggravated by sitting or standing, and decreases when the patient is recumbent. Many authors have noted spinal headache after myelography. Some have stated that it is relieved by lying supine, and that it occurs after between 4.7% and 58.2% of myelographic procedures carried out under variable conditions. According to these reports, it usually begins within three days and lasts between three and five days. Young women are more likely to develop spinal headache. Smaller-gauge needles, blunt-tip needles, and parallel orientation of bevel needles are associated with lower rates of headache.

Patients with normal myelographic findings complain of headache more often than those with abnormal myelograms, including those with stenosis of the spinal canal. Some authors have reported a higher incidence of headache after lumbar myelography in ambulatory groups, while others have stated that lumbar myelography can be safely undertaken as an outpatient procedure. Although the theoretical advantage of early ambulation is obvious, offering the possibility of outpatient myelography, the question of whether early ambulation influences the occurrence of spinal headache is still a matter of debate.

Our aim was to investigate the influence of bed rest on headache after lumbar myelography. Furthermore, we present a randomised, prospective analysis of complications associated with myelography, and examine the effects of the age, gender, physique, general condition, cerebrospinal fluid pressure, and blood pressure on the frequency of headache.

Patients and Methods

We studied 207 patients (127 men and 80 women) who underwent lumbar myelography. They were randomised into two groups; those who were allowed to sit or stand
freely (group A), and those who were confined to bed for 20 hours without the head elevated (group B). Group A consisted of 101 patients (65 men and 36 women) and group B of 106 (62 men and 44 women). The two groups were separated in order to avoid patient bias because of communication between patients who followed different protocols. Nine patients (5 men and 4 women) in group B were excluded from the study because they could not maintain bed rest for 20 hours.

Myelography was usually undertaken in the afternoon. The patient had a light breakfast and no lunch. All were given premedication with intramuscular atropine sulphate (0.5 mg) and phenobarbitone (100 mg) 30 minutes before the lumbar puncture according to our policy. Lumbar puncture was performed with the patient in the left lateral decubitus position using a 21-gauge spinal needle, and with the needle bevel parallel to the dural fibres, using a midline approach. When cerebrospinal fluid flowed freely, spinal fluid pressure was measured through a connecting tube and three-way stopcock. We removed 5 ml of spinal fluid from the subarachnoid space for routine analysis and re-measured the pressure. Myelography required injection of 10 ml of iohexol (Isovist 240; Schering, Berlin, Germany) into the subarachnoid space. CT routinely followed myelography.

An observer who did not know the ambulatory status of the patients, reviewed each patient after myelography and questioned them regarding headaches. We defined a spinal headache as a positional headache, which is aggravated by sitting or standing and relieved by lying down.

The two groups of patients were compared in regard to demographic variables, including gender, age, height, weight, blood data, blood pressure, and cerebrospinal fluid pressure, using either the unpaired Student t-test or the Mann-Whitney U test. In order to monitor the metabolism, we measured haemoglobin, haematocrit, creatinine and blood urea nitrogen concentrations. All probability values were calculated within a confidence interval of 95%. Furthermore, these variables were compared between the patients who had spinal headache after myelography and those who did not. The level of significance was set at $p = 0.05$.

**Results**

There was no statistically significant difference between groups A and B as regards the prevalence of spinal headache or clinical details (Table I).

The incidence of headache was 7.3% (9/123) for men and 18.7% (14/75) for women which was statistically significant ($p = 0.0047$). The mean values of parameters including age, cerebrospinal fluid pressure before the removal of fluid and the change in pressure after the removal of fluid, and blood pressure showed statistically significant differences between patients who had and those who did not have spinal headache (Figs 1 to 4). The mean age was 45 ± 14 years for patients who suffered headaches, and 56 ± 15 years for patients who did not (Fig. 1). The mean value for cerebrospinal fluid pressure before removal of fluid was 172 ± 43 mm H2O for the headache patients, and 137 ± 41 mm H2O for the non-headache patients (Fig. 2), but the mean value for cerebrospinal fluid pressure after removal of fluid showed no statistically significant differences (Fig. 2). The mean value for systolic blood pressure was 120 ± 20 mmHg for the headache patients, and 134 ± 21 mmHg for the non-headache patients ($p = 0.0047$; Fig. 3). The mean value for diastolic pressure was 71.5 ± 12.9 mmHg for the headache patients, and 74.5 ± 11.5 mmHg for the non-headache patients ($p = 0.0047$; Fig. 3).
Following lumbar myelography, the mean value for cerebrospinal fluid (CSF) pressure showed a statistically significant difference between the patients who had headaches and those who did not, before but not after the removal of fluid. The mean value of the change in cerebrospinal fluid pressure after removal of fluid (before - after) shows a statistically significant difference between the headache and the non-headache patients.

The mean values for both systolic and diastolic blood pressure show statistically significant differences between the patients who suffered headaches and those who did not following lumbar myelography.

Graphs showing a) the relationship between cerebrospinal fluid pressure (CSFP) and age and b) between blood pressure (BP) and age (cc, correlation coefficient).
patients, and 78.4 ± 11.4 mmHg for the non-headache patients (p = 0.0075; Fig. 3).

Discussion

Whether late ambulation prevents spinal headache is still a matter of debate. Our study suggests that it does not. Hallam et al.\textsuperscript{2} also reported that there was no difference between early and late ambulatory patients as regards the incidence of headache after myelography. Sand et al.\textsuperscript{12} however, reported a high incidence of spinal headache after myelography among the early ambulatory patients. Certainly, in patients in whom headaches occur after myelography, bedrest is effective in relieving it. We believe, however, that early ambulation does not increase the risk of spinal headache.

The mechanism is incompletely understood. It has been suggested that leakage of cerebrospinal fluid causes spinal headache, which is typically associated with unmeasurable or very low cerebrospinal fluid pressures.\textsuperscript{6,8} It may be that smaller gauge needles, blunt-tip needles, and parallel orientation of a bevel needle are associated with a lower prevalence of headache, because they reduce leakage of cerebrospinal fluid. Increased cerebrospinal fluid pressure, which was identified in our study as an important factor in spinal headache, may cause leakage of cerebrospinal fluid. It is difficult to understand why age and gender are factors in spinal headache brought about by leakage of cerebrospinal fluid. To explain why age could be a factor, we related age to cerebrospinal fluid pressure before removal of fluid (Fig. 4a). There is a correlation (correlation coefficient: -0.373); younger patients have a higher cerebrospinal fluid pressure and therefore may be at a greater risk of leakage of cerebrospinal fluid because of a higher pressure. This may be a reason why age is a factor in spinal headache.

Regarding the results for the change in cerebrospinal fluid pressure before and after the removal of fluid, they seem to disagree with previously reported results which have shown that patients with normal myelographic findings complained of headache more often than those with abnormal findings.\textsuperscript{6,8} In patients with stenosis of the spinal canal the cerebrospinal fluid pressure after removal of fluid is low on the caudal side of the level of stenosis. In our study, the change in pressure before and after removal did not reflect stenosis of the spinal canal since we usually selected a puncture level above the relevant level which was determined in advance using MRI. In our patients, the change may not indicate stenosis of the spinal canal, but rather compensation for the loss of fluid.

In our study, patients with spinal headache showed significantly low values for both systolic and diastolic blood pressure. It is difficult to explain this. One hypothesis is that patients whose blood pressure is relatively low may be unable to make up for the loss of cerebrospinal fluid. On the other hand, there is a correlation between blood pressure and age in our series (correlation coefficient: 0.476, Fig. 4b). Thus increased blood pressure may be a reflection of age, rather than a direct factor in spinal headache.

We conclude that late ambulation is not effective in preventing spinal headache. Furthermore, we were able to identify factors in spinal headache, including cerebrospinal fluid pressure before the removal of fluid, the change in cerebrospinal fluid pressure after the removal of fluid, and blood pressure. There have been no previous reports which identified these factors. Our results also showed a significant prevalence of spinal headache in young and female patients, as reported in previous studies.\textsuperscript{8,13}

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References