

CHAPTER 35

THE WOMAN WITH HEADACHE FOLLOWING LUMBAR PUNCTURE

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Case History

The patient is a 43-year-old female who has suffered from migraine on an intermittent basis. Her headaches were described as being preceded about 50% of the time by scintillations in her right visual field. Twenty minutes later, this was followed by a throbbing headache which was on the right side of the head associated with nausea, occasional vomiting, light sensitivity, and sound sensitivity. These attacks would come once or twice a month and would often be associated with her menses although they did not, however, have a fixed-time relationship, sometimes coming three days before or three days afterwards. She has two children now aged 14 and 15. Note that her headaches had improved during the second and third trimester of both pregnancies only to return after she had finished breast feeding. Her menses were still regular but her mother had gone into menopause at the age of 46.

She had noted that her headaches had gotten slightly worse and were more frequent but did not think too much about it. They usually responded to oral administration of a serotonin agonist such as sumatriptan. She did not use prophylactic medication although 3 years before she had tried propranolol for about 2 months to little effect. She woke up one morning with the worst headache she had ever had. She had a slight headache on going to bed the previous night but by the time she woke at 5 in the morning, she was vomiting, could hardly see, could hardly stand, was dizzy, and unable to keep any medication down.

She did have subcutaneous sumatriptan and one injection of this seemed to help the headache slightly after about 2 hours, then it came back with more force until she could not tolerate it any more.

At this stage she was taken to Emergency where she was examined by the emergency room physician who examined her fundi and did not find any abnormality. He found her to be photophobic, coherent, able to give a good account of herself but in a lot of distress. Her neck was slightly stiff although she could touch her chin to her chest. Her reflexes were symmetrical, plantars were down-going and her blood pressure was 150/100. Because of the combination of findings and the severe nature of the headache she underwent an emergency computerized tomography scan which was negative followed by a lumbar puncture which was negative, although it ended with some difficulty in that several attempts had to be made to enter the subarachnoid space.

She was given intravenous saline for rehydration with intravenous meperidine 100 mg and dimenhydrinate 50 mg. This seemed to help the headache significantly and by the next morning she was feeling a lot better and able to be discharged. Following arrival at home, she noticed that when she stood up she would get a headache which was extremely severe, although different in nature from her previous headache. This headache would become unbearable after about half an hour of standing and could be relieved by lying down again. She called her family doctor who advised her to take a lot of fluid and to rest.

For the next week these symptoms persisted and she was forced to seek further consultation. She was advised by the neurologist who saw her and examined her that she was suffering from a lumbar puncture headache. He advised further bed rest, fluids, and caffeine in high dosage. After 2 weeks she was still having the symptoms although now the headache was more persistent and would even persist when she was lying down.

During this time she had one of her usual migraines which came and went within 8 hours. It had all the usual characteristics and was relieved by oral sumatriptan. By now she was getting extremely worried and distressed. She saw the neurologist who diagnosed a lumbar puncture headache caused by low cerebrospinal fluid (CSF) pressure. He ordered a magnetic resonance imaging (MRI) with gadolinium enhancement which was done the following day. The MRI showed normal images of the brain; however, the post-gadolinium films demonstrated intense diffuse meningeal enhancement and thickening. This finding suggested that she indeed had low CSF pressure headaches and she was referred to an anesthesiologist who performed an epidural autologous blood patch. This involved the injection of 15 mL of autologous blood into the epidural space in the vicinity of the lumbar puncture. Within 2 days her headaches had settled and she no longer had the intense constant headache which was exacerbated by postural changes. She still had the episodic migraines as before.

Questions about This Case

- What was the diagnosis of the first headache sign suffered by the patient?
- Why are these headaches sometimes related to menses?
- What are the MRI findings of a low-CSF-pressure headache?
- What is the definitive treatment for a persistent low-pressure headache?

Case Discussion

This patient exemplifies a typical scenario for a lumbar puncture headache. There was ample justification for doing a lumbar puncture and, as is sometimes the case in emergency rooms, some difficulties were encountered possibly because of the patient's state of distress. Lumbar puncture headaches are caused by low CSF pressure. The pain is associated with headache, neck ache, stiffness, shoulder pain, backache, nausea, vomiting, blurred vision, and tinnitus. Typically the headaches were worse when the patient was standing and were relieved by her lying down.

A recent review of the literature by McSwiney and Phillips quotes a frequency of lumbar puncture headaches following 36.5% of cases of lumbar puncture and states that there is a high incidence in young females with a low body mass index. According to this review, the frequency of the headache is directly related to the gauge of the needle used. The cause of the headache is thought to be due to two factors. The first is traction on

pain-sensitive structures with downward displacement of the brain and in particular traction of cranial nerves 5, 9, and 10 and the upper three cervical nerves. The second cause is thought to be due to vascular dilatation and venous engorgement. According to this review these headaches have been produced experimentally by draining about 20 mL of CSF in a standing patient.

Another frequent scenario for the induction of lumbar puncture headaches is myelography. Myelograms are usually done electively and hence there is the opportunity for minimizing the incidence of lumbar puncture headaches. A number of studies have confirmed that using small needles reduces the incidence of side effects including headache. Thus a study by Tourtellotte et al. compared the 22- versus the 26-gauge needle in volunteers. The use of the 22-gauge needle resulted in 36% of the subjects developing postural headaches compared to 12% with the 26-gauge needle. The difference was significant at $p = 0.005$.

Another study by McConaha, Bastiani, and Kaye compared the use of a 22-gauge needle with that of a 29-gauge needle. In this case the 29-gauge needle was inserted down the lumen of the 22-gauge needle once the ligament had been penetrated by the former. Results showed convincingly that the use of a 29-gauge needle dramatically reduced the incidence of lumbar puncture headache. The authors discuss the use of the introducer in order to reduce the problem of needle flex which can occur using the 29-gauge needle.

A study by Lenaerts et al. showed that there was no difference in the incidence of lumbar puncture headache in patients who were punctured using a circular atraumatic needle (Sprottes) or relatively with the frequency of traumatic taps. The atraumatic needle is widely used by anesthesiologists for spinal and epidural anesthesia but is not routinely used by neurologists for diagnostic lumbar punctures. One reason for this is that the Sprottes needle is much more expensive than a standard needle. In this study, therefore, no advantage was found in using the atraumatic needle in lumbar puncture but this is not to say that the atraumatic is not more useful in epidural anesthesia.

Traditionally, patients who have had a lumbar puncture have been asked to keep still and recumbent for at least 4 hours following the lumbar puncture although this period varies. Early recommendations were for bed rest for 24 hours. Carbaat and Van Crevel compared the effect of keeping 50 patients recumbent and the other 50 patients ambulant. The two groups were comparable in age, sex, and neurotic traits. There was no difference in the incidence of lumbar puncture headaches between the two groups suggesting that at least 24 hours of recumbency offers no advantage.

A study by Smith, Perkin, and Clifford Rose assessing 50 patients suggested that there was a significant advantage in keeping the patient for 30 minutes at a 30° head-down tilt followed by 3¾ hours of supine bed rest compared to a then standard 4 hours' supine bed rest.

Spinal anesthesia is another situation where lumbar puncture or postural puncture headache occurs. Lybecker et al. found that postural puncture headache occurred within 2 days in 96% of the 75 cases noted in the large study that they performed. A quarter of those with postural pressure headaches were classified as severe. Transient headaches were common following dural puncture. The incidence of postural puncture headaches was 7.35% of the overall sample of spinal anesthetics performed. This is clearly a small percentage but becomes relevant when seen in the context of patients with a previous history of headaches, including those with migraine.

There are no studies of the effect of prior migraine on the onset of lumbar puncture headaches. Low CSF pressure headaches can also appear spontaneously presumingly as a result of minor trauma or straining. Such headaches are recognized by the postural nature of the headaches and by the relatively sudden onset of headache. In some cases the patients have felt a sharp pain between the shoulders and this is followed by the headache which may come on suddenly or within several days. If the headache becomes chronic the postural nature may become less clear and a more diffuse chronic headache may occur.

Investigations

There have been various attempts made at investigating the presence of dural leak. Probably the most promising approach is the use of MRI with gadolinium enhancement. This technique shows significant dural enhancement following the injection of gadolinium. Other methods of investigation include myelography which demonstrates a rapid clearance of the contrast medium but this is probably not so useful. Frequently investigations are unnecessary or difficult to obtain and in this case the history should point to the diagnosis. There have been a number of treatment modalities tried including the use of bed rest, high intake of fluid, caffeine in high doses, desmopressin acetate, steroids, and epidural autologous blood patches.

The epidural autologous blood patch should be considered if there has been no resolution of symptoms within 2 weeks following the lumbar puncture. Blood patching has been done for over 30 years; it has been shown to be effective. The first report by Gormely showed that by using 2 to 3 mL of autologous blood, a 100% cure was obtained in a series of 8 subjects, one of

whom was himself. Currently an average of 15 to 20 mL of blood is being used. What happens to the blood has been a matter of some speculation although a recent study by Beards et al. carried out MR imaging in five patients at intervals of 30 minutes, 3, 7, 9, and 18 hours after blood patching. At 30 minutes and at 3 hours the clot was shown to have a mass effect compressing the dural sac and displacing the conus medullaris and cauda equina. There was also compression or displacement of nerve roots nearby. The main bulk of the clot occupied four or five vertebral levels with thinner spread cephalad and caudad several vertebrae further.

By 3 hours, the blood had concentrated into a focal clot within the dural sac adherent to the dura, and from 7 hours onward, the mass effect had disappeared with a thinning layer of blood adherent to the dural sac but extending much further cephalad than caudad. It was assumed by the authors in the editorial of that same journal that this was probably a generalizable phenomenon as it occurred in all five patients.

A recent paper by Carp et al. reviews the effects of the serotonin receptor agonist sumatriptan on post-dural-puncture headache in six patients. All of the six subjects had lasting relief after a single injection of subcutaneous sumatriptan 6 mg. One case required a second injection after 21 hours and one case received transient relief and requested an epidural blood patch for recurrent headaches after 24 hours. Further studies confirming these findings in a double-blind manner are not available but they certainly offer a scope for further investigation and may be considered prior to using an epidural blood patch.

Currently epidural blood patching is the treatment of choice in lumbar puncture and post-myelography headaches.

Selected Readings

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Editorial Comments

When standing tends to worsen a headache and produce nausea, and lying down helps, suspect a low-CSF-pressure syndrome, such as a lumbar puncture headache. It is of some interest that low-pressure, lumbar puncture headaches occur as frequently as they do, given the significant number of patients who undergo this procedure. Obviously most resolve without intervention but for those occasions when this does not occur, Dr. Gawel and Ms. Magissano have provided a detailed overview of the diagnosis, pathogenetic considerations, and treatment of this particular headache. A definitive diagnosis and favorable outcome can be expected and, as well, a smaller lumbar puncture needle may prove preventive.