J R Coll Physicians Edinb 2016; 46: 234–7
http://dx.doi.org/10.4997/JRCPE.2016.404

Efficacy of epidural blood patches for spontaneous low-pressure headaches: a case series

[1]S Ansel, [2]A Rae, [3]A Tyagi
[1]CMT1, [2]Consultant Neuroanaesthetist, [3]Consultant Neurologist, Institute of Neurological Sciences, Queen Elizabeth University Hospital, Glasgow, UK

ABSTRACT Patients with a spontaneous cerebrospinal fluid leak, normally at a spinal level, typically present with low-pressure headache. In refractory cases, an epidural blood patch may be attempted. We aimed to assess the efficacy of lumbar epidural blood patching in spontaneous, low-pressure headaches.

Methods We retrospectively analysed notes of patients who had an epidural blood patch performed for spontaneous low-pressure headaches in a single centre. Information regarding demographics, radiology and clinic follow-up was extracted from an electronic patient record system. Questionnaires regarding outcome were sent to patients a minimum of 6 months post-procedure. All patients received an epidural blood patch in the lumbar region irrespective of the site of cerebrospinal fluid leak.

Results Sixteen patients who underwent lumbar epidural blood patching were analysed (11 female; mean age 43 years). The site of cerebrospinal fluid leak was evident in only 3/16 patients. Thirteen patients attended clinic follow-up; three reported complete headache resolution, four reported improvement in intensity or frequency and six described no change. Five of eight questionnaire respondents reported reduction in pain, and in these responders, mean headache severity improved from 9/10 to 3/10. Five of eight patients returning follow-up questionnaires reported sustained improvement in headache symptoms.

Conclusion Epidural blood patch procedures can provide sustained improvement in headache symptoms in selected patients with spontaneous intracranial hypotension, but an untargeted approach has a lower success rate than reported in other case series.

***Correspondence to** S Ansel*
Queen Elizabeth University Hospital
23 Staybrae Grove
Crookston
Glasgow G53 7SU

***e-mail** sonam.ansel@doctors.org.uk*

KEYWORDS epidural blood patch, low-pressure headache, spontaneous intracranial hypotension

DECLARATION OF INTERESTS No conflict of interest declared

BACKGROUND

Intracranial hypotension often results from a cerebrospinal fluid (CSF) leak through the dura mater, most commonly at a spinal level. This produces low-pressure headaches, which are typically orthostatic in nature. In the absence of apparent provocation, such as lumbar puncture, this phenomenon is termed 'spontaneous intracranial hypotension'. It is thought that patients with connective tissue disorders are at increased risk of spontaneous intracranial hypotension due to dural weakness that can lead to a CSF leak.[1] Women aged between 40–60 years are most commonly affected and an incidence of 2–5 per 100,000 per annum has been suggested.[2]

While CSF pressure of < 60 mmH_2O and/or evidence of CSF leak on imaging form part of the diagnostic criteria for headache caused by spontaneous intracranial hypotension, in practice it is largely a clinical diagnosis.[3] Initial conservative management includes analgesia, hydration and intravenous caffeine. However, the response to these interventions is variable and often short-lived.

Autologous epidural blood patches (EBP) have emerged as the treatment of choice for those resistant to conservative management.[1] This involves an injection of ~20 ml of blood into the epidural space. The volume replacement increases CSF pressure and the blood also seals the leak.[4,5] If the site of the CSF leak is known the EBP can be targeted at the site of the leak, otherwise, a 'blind' lumbar EBP may be performed and may still be of benefit.[5] In this case series we report on the efficacy of lumbar EBP in spontaneous, low-pressure headaches.

METHODS

We retrospectively analysed clinical data from patients who had an EBP performed for a spontaneous low-pressure headache at the Institute of Neurological Sciences, Glasgow. We identified patients from theatre logbooks dated from December 2013 to October 2015. All patients had a lumbar EBP performed by a consultant neuroanaesthetist. This involved injection of 10–20ml of autologous blood into the lumbar epidural space under aseptic conditions in an operating room. All patients had their care overseen by a consultant neurologist. Diagnosis of spontaneous low CSF pressure headache was made by the neurologist using the International Classification of Headache Disorders, 3rd edition (beta version) diagnostic criteria:[3] headache developing in temporal relation to CSF pressure <60 mmH_2O or with evidence of CSF leak on imaging; not better accounted for by another headache diagnosis and not occurring within one month of dural puncture.

We used information available via electronic patient records to obtain patient demographics, radiological findings, and subjective improvement reported at clinic follow-up. Questionnaires enquiring about outcome following EBP were sent to patients, ensuring a minimum gap of six months between procedure and questionnaire completion. The questionnaires asked patients to quantify the severity of their headache before and after the procedure using a scale ranging from 0 to 10 (0 = no pain, 10 = worst pain). We sought long-term outcomes by asking patients for how long results were sustained, and included questions about patients' experience of having the procedure performed.

RESULTS

Between December 2013 and October 2015, 16 patients had a lumbar EBP performed for spontaneous, low-pressure headaches (11 females; mean age 43 years); details are shown in Table 1. The majority of our patients had never smoked and in most cases alcohol intake was reported as trivial or moderate. Psychiatric comorbidities were most common in our cohort; in particular, depression and anxiety were present in over a third of patients. One patient had a diagnosis of Ehlers-Danlos syndrome.

Radiology findings

Fifteen patients had cranial and spinal MRI prior to their lumbar EBP. Although the site of CSF leak was identified in only three patients, 11 patients displayed other features consistent with a low-pressure state (Table 1). The three identified leaks were at the cervico-thoracic junction, C3/4 level and L5 level. The patient with Ehlers-Danlos syndrome had no identifiable CSF leak or intracranial features consistent with a low-pressure state; diagnosis in this case was based on CSF pressure of < 60mm H_2O.

TABLE 1 Patient demographics and radiological findings

Patient demographics (n=16)	**n (%)**
Male sex	5 (31%)
Age (years)	
< 24	1 (6)
25–34	4 (25)
35–44	5 (31)
45–54	3 (19)
55+	3 (19)
Smoking status	
Smoker	3 (19)
Ex-smoker	2 (13)
Never smoked	8 (50)
Missing data	3 (19)
Alcohol intake per week	
1–7 units	6 (38)
8–14 units	4 (25)
> 14 units	0 (0)
0 units	2 (13)
Missing data	4 (25)
Comorbid disease	
Depression and/or anxiety	6 (38)
Asthma	2 (13)
Ehlers-Danlos syndrome	1 (6)
Antiphospholipid syndrome/ Systemic lupus erythematosus	1 (6)
Diabetes mellitus	1 (6)
Hypothyroidism	1 (6)
Ischaemic heart disease	1 (6)
Cardiac arrhythmia	1 (6)
Osteoarthritis	1 (6)
Lumbar disc prolapse	1 (6)
No comorbid disease	4 (25)
Radiological findings (n = 15)	**n (%)**
Cerebrospinal fluid leak site identified	
Cervico-thoracic junction	1 (7)
C3/4	1 (7)
L5	1 (7)
Intracranial features of low pressure state	
Subdural hygromas	3 (20)
Slit-like ventricles	1 (7)
Cerebellar tonsillar ectopia	2 (13)
Diffusely thickened dura	4 (27)
Enhancement of the pachymeninges	2 (13)

Outcome following EBP

Clinic follow-up Thirteen patients attended clinic follow-up, 7 (54%) of whom reported some degree of relief from headaches. Three patients reported that their headache had completely disappeared while four reported headaches that were either less intense or less frequent. The patient with a CSF leak at L5 was one of the three who described complete resolution of headache. The median time to post-procedure clinic follow-up was two months.

Six patients (46%) noticed no change in their headache following EBP; one patient had a second EBP but this was also unsuccessful at relieving symptoms. The two patients with identified CSF leaks at the cervico-thoracic junction and C3/4 did not find any significant improvement in their symptoms after EBP.

Questionnaires At the time of completing the questionnaire all patients were at least six months post-procedure. Five of eight (63%) questionnaire respondents reported that their low-pressure headaches were better after EBP, with complete resolution of headache for three patients, > 60% improvement for one patient and a 30–60% improvement for the remaining patient. Mean headache severity in this group of responders improved from 9/10 to 3/10 and all five patients reported sustained improvement. All five patients said the procedure was beneficial enough to have again. Three of eight respondents reported no change in headache, but two stated that they would still accept a repeat procedure if it was offered to them.

Interestingly, two patients described improvement in other symptoms such as nausea, neck pain and tinnitus. One patient reported side effects of pain, tenderness and stiffness in the lower back after EBP, which lasted several weeks. Another patient reported mild left leg weakness after having the procedure. Five of eight respondents described the procedure as neither pleasant nor unpleasant; the remainder said it was unpleasant but acceptable.

DISCUSSION

Correct diagnosis

Clinical suspicion of headache due to spontaneous CSF leak must be high for the patient to reap any potential benefit from EBP. The differential diagnosis includes central venous sinus thrombosis, idiopathic intracranial hypertension, meningitis and subarachnoid haemorrhage.[6] Conversely, while an abrupt onset of daily persistent headache, worse on standing and relieved by lying down is commonly described, other features such as nausea, photophobia, neck pain and tinnitus may be the predominating features.

Targeted vs blind EBP

MRI features suggestive of intracranial hypotension are common; however, the specific site of CSF leak is rarely identified. EBP procedures targeted at the site of a CSF leak are more successful,[7] as evidenced by the 90% success rate of lumbar EPB for postdural puncture headache.[8] All of our patients had a lumbar EBP irrespective of site of leak. It is notable that the patient with a CSF leak at L5 described complete resolution of headache following lumbar EBP, while those with identified CSF leaks in other regions gained no benefit. Wang et al. demonstrated that placement of cervical EBP in a patient with cervical CSF leak was more effective than lumbar EBP.[9]

MRI/CT myelography is thought to be superior to standard MRI scans in defining the location and extent of a CSF leak.[10] Studies reveal spontaneous CSF leaks most commonly occur at the cervico-thoracic junction or along the thoracic spine.[6] Therefore it may make sense for 'blind' EBP to be placed at the thoracic region to increase the chances of success. Another possible strategy would be to adopt the Trendelenburg position post-procedure; this may improve the chances of successful occlusion by allowing the blood to travel over many spinal segments.[11] Ferrante et al. tilted patients in a 30° Trendelenburg position for one hour before placement of lumbar EBPs, maintained the position throughout the procedure and for 16 hours following the procedure.[12] Evaluation of headache intensity by visual analogue scale found that all 28 patients achieved complete relief from orthostatic headache.[12]

Repeat EBP

Previous reports have highlighted that approximately 50% of patients require more than one EBP, and some patients may require up to 4–6 procedures.[13] A minimum of five days is advised between patches to avoid risk of rebound intracranial hypertension.[6] Only one patient in our cohort had a repeat EBP and unfortunately this was also unsuccessful. The second EBP was performed months later and it is possible that too long a gap between successive EBPs reduced the chance of success. Our results are similar to Berroir et al. who showed pain resolution in 57% of their patients with the first EBP; however, they achieved success in a further six of nine patients with a second EBP.[14] A large volume blood patch (20–100 ml) may be beneficial for those who do not respond to the initial EBP.[15]

Follow up of our patients suggested that where patients responded to EBP, improvements in symptoms were sustained. In conclusion, our case series serves as a reminder to consider the diagnosis of spontaneous intracranial hypotension as a cause of headache and adds further information about the efficacy of EBP. Identifying the source of the leak and targeting an EBP to the site of the leak is more likely to result in success, but if this cannot be done, consideration should be given to tilting the patient during and after EBP administration to maximize the spread of the blood patch.

REFERENCES

1 Mokri B. Spontaneous low pressure, low CSF volume headaches: spontaneous CSF leaks. *Headache* 2013; 53: 1034–53. http://dx.doi.org/10.1111/head.12149

2 Schievink WI. Spontaneous spinal cerebrospinal fluid leaks: a review. *Neurosurg Focus* 2000; 9: e8.

3 Headache Classification Committee of the International Headache Society. *The International Classification of Headache Disorders*. 3rd edition (beta version). Cephalalgia 2013; 33: 629–808. http://dx.doi.org/10.1177/0333102413485658

4 Scott S, Davenport R. Low pressure headaches caused by spontaneous intracranial hypotension. *BMJ* 2014; 349: g6219. http://dx.doi.org/10.1136/bmj.g6219

5 Franzini A, Messina G, Chiapparini L et al. Treatment of spontaneous intracranial hypotension: evolution of the therapeutic and diagnostic modalities. *Neurol Sci* 2013; 34: S151–5. http://dx.doi.org/10.1007/s10072-013-1364-2

6 Schievink WI. Spontaneous spinal cerebrospinal fluid leaks and intracranial hypotension. *JAMA* 2006; 295: 2286–96.

7 Cho KI, Moon HS, Jeon HJ et al. Spontaneous intracranial hypotension: efficacy of radiologic targeting vs blind blood patch. *Neurology* 2011; 29; 76: 1139–44. http://dx.doi.org/10.1212/WNL.0b013e318212ab43

8 Agarwal P, Menon S, Shah R et al. Spontaneous intracranial hypotension: Two cases including one treated with epidural blood patch. *Ann Indian Acad Neurol* 2009; 12: 179–82. http://dx.doi.org/10.4103/0972-2327.56318

9 Wang E, Wang D. Successful treatment of spontaneous low-pressure headache due to prominent cervical CSF leak with cervical epidural blood patch. *Neurology* 2014; 82: P7.178. http://www.neurology.org/content/82/10_Supplement/P7.178

10 Schievink WI, Meyer FB, Atkinson JL et al. Spontaneous spinal cerebrospinal fluid leaks and intracranial hypotension. *J Neurosurg* 1996; 84: 598–605.

11 Ferrante E, Arpino I, Citterio A et al. Epidural blood patch in Trendelenburg position pre-medicated with acetazolamide to treat spontaneous intracranial hypotension. *Eur J Neurol* 2010; 17: 715–9. http://dx.doi.org/10.1111/j.1468-1331.2009.02913.x

12 Ferrante E, Olgiati E, Sangalli V et al. Early pain relief from orthostatic headache and hearing changes in spontaneous intracranial hypotension after epidural blood patch. *Acta Neurol Belg* 2016. Epub ahead of print 23 February.

13 Mokri B. Spontaneous intracranial hypotension. *Curr Pain Headache Rep* 2001; 5: 284–91.

14 Berroir S, Loisel B, Ducros A et al. Early epidural blood patch in spontaneous intracranial hypotension. *Neurology* 2004; 63: 1950–1.

15 Mehta B, Tarshis J. Repeated large-volume epidural blood patches for the treatment of spontaneous intracranial hypotension. *Can J Anaesth* 2009; 56: 609–13. http://dx.doi.org/10.1007/s12630-009-9121-y