ABOUT JNBH

The Journal of Neuroscience and Behavioral Health (JNBH) is published monthly (one volume per year) by Academic Journals.

Journal of Neuroscience and Behavioral Health (JNBH) is an open access journal that provides rapid publication (monthly) of articles in all areas of the subject such as metagenics, evolutionary anthropology, fragile X syndrome, immunotherapy etc.

The Journal welcomes the submission of manuscripts that meet the general criteria of significance and scientific excellence. Papers will be published shortly after acceptance. All articles published in JNBH are peer-reviewed.

Submission of Manuscript

Submit manuscripts as e-mail attachment to the Editorial Office at: jnbh@academicjournals.org. A manuscript number will be mailed to the corresponding author shortly after submission.

The Journal of Medical Genetics and Genomics will only accept manuscripts submitted as e-mail attachments.

Please read the Instructions for Authors before submitting your manuscript. The manuscript files should be given the last name of the first author.
Editorial Board

Prof. Rama Devi Mittal  
Sanjay Gandhi PGI Lucknow  
India  
Prof. Kai Li  
Suzhou University, Suzhou, Jiangsu, China

Dr. Aliza Amiel  
Faculty of Life Science, Bar-Ilan University, Ramat-Gan, Israel

Dr. Olufemi Oloyede  
Department of Obstetrics and Gynaecology, Obafemi Awolowo University Teaching Hospital, Sagamu, Ogun State, Nigeria

Dr. Vishwanathan Huchagowder  
Washington University School of Medicine, USA

Dr. Abdellah S. Gounni  
Faculty of Medicine, University of Manitoba, Canada

Prof. Ruixing Yin  
Department of Cardiology, Institute of Cardiovascular Diseases, Guangxi Medical University, 22 Shuangyong Road, Nanning 530021, Guangxi, China

Dr. Guangming Han  
Georgia State University, USA

Dr. C. Emmanuel  
Global Hospitals Group, India

Dr. Alessio Squassina  
Department of Neuroscience, University of Cagliari, Italy

Dr. Jiexiong Feng  
Department of Pediatric Surgery, Tongji Hospital, Huazhong University of Science and Technology, China

Dr. Magdy Abd ElRehim Sayed Aly  
Faculty of Science, Beni Suef University, Egypt

Dr. Hamid Jafarzadeh  
Mashhad Faculty of Dentistry and Dental Research Center, Iran

Dr. Youse Rasmi  
Department of Biochemistry, Faculty of Medicine, Urmia University of Medical Sciences, Urmia, Iran

Dr Keya Chaudhuri  
Indian Institute of Chemical Biology, India

Ivan Y. Torshin  
Computational Center of The Russian Academy of Sciences, Russia

Dr. Wagdy K. B. Khalil  
National Research Centre (NRC), Egypt

Vishnu Priya  
Saveetha University, India

Dr. A. Chandrasekar  
Anthropological Survey of India, Southern Regional Bogadi 2nd stage, Mysore-570 026, India

Dr. Raghavendra Babu YP  
Kasturba Medical College, Mangalore, India

Dr. Shayesteh Jahanfar  
Royal College of Medicine, Perak; University of Kuala Lumpur, Malaysia

Prof. Wei Wang  
Capital Medical University, Beijing, China; Chinese Academy of Sciences, Beijing, China, China
Research Article

Spontaneous spinal epidural hematoma: Magnetic resonance imaging for diagnosis and patient management in two cases

Koshi Ninomiya, Koichi Iwatsuki, Akira Murasawa, Tetsu Goto, Kazutami Nakao and Toshiki Yoshimine
Spontaneous spinal epidural hematoma: Magnetic resonance imaging for diagnosis and patient management in two cases

Koshi Ninomiya¹, Koichi Iwatsuki¹, Akira Murasawa², Tetsu Goto², Kazutami Nakao² and Toshiki Yoshimine¹

¹Department of Neurosurgery, Osaka University Graduate School of Medicine, Japan.
²Department of Neurosurgery, Kawachi General Hospital, Japan.

As far as operative indications for spinal epidural hematoma are concerned, symptoms and duration from onset are thought to be quite important. However, magnetic resonance imaging (MRI) intensity of the hematoma could be a key factor in determining the need for operative intervention. Here, we discuss two cases of spinal epidural hematoma. One was the operative case of a 71-year-old man who presented with left leg paresis. On the initial spinal MRI, a low-iso T1-weighted image (WI) showed a slight high-iso T2WI heterogenous intensity and a thick epidural mass that had compressed the spinal cord dorsolaterally from the C7 to T5 levels. The mass was diagnosed as a cervicothoracic epidural hematoma in the acute phase as coagulation seemed to be starting. Five hours after presentation, his symptoms evolved into complete paraplegia; therefore, decompression laminectomy and hematoma evacuation was performed. The other case was that of a 68-year-old woman with severe neck pain. The initial MRI demonstrated a T1WI iso, T2WI high homogenous intensity epidural mass from the C2 to T4 levels. A spinal epidural hematoma in the hyperacute phase was diagnosed. Conservative treatment was recommended, and her symptoms and hematoma almost disappeared within three days. When coagulation or organization of the hematoma has not started, its absorption might be expected at an early stage. MRI appearances, including hematoma intensity, combined with simultaneous clinical information might be very important for surgical decision making and predicting prognosis in cases of spinal epidural hematomas.

Key words: Spinal epidural hematoma, MRI intensity, surgical decision making.
non-progressive deficits, and can be treated conservatively. Particularly, some spinal epidural hematoma cases with rapid clinical and radiological resolution have been reported (Buyukkaya et al., 2014; Kim et al., 2005). A patient with rapid hematoma resolution and another with progressive deficits requiring surgical intervention were encountered. These two cases suggested the importance of hematoma properties and intensity on MRI in the process of surgical decision making.

CASE REPORTS

Case 1

A 71-year-old man presented with a chief complaint of paraplegia. Initially, he suffered from sudden left leg paresis and had gone to another hospital. Brain computed tomography (CT) was performed, and no abnormality was found. Right leg paresis developed about 4 h later. On admission, he showed manual muscle testing (MMT) grade 2 paresis below both iliopsoas muscles. He also had hypesthesia below his mammary region. His past medical history was significant for hypertension, atrial fibrillation and cardiogenic cerebral embolism, and he was being treated with oral aspirin and warfarin (coumadin 2 mg daily). Spinal MRI at that time demonstrated a T1WI iso-, T2WI slight high-intensity thick epidural mass mass measuring maximum 10×12 mm in the axial plane that had compressed the spinal cord dorsolaterally from the C7 to T5 levels (Figure 1). Judging from the MRI, it was thought that this represented a cervicothoracic epidural hematoma in the acute phase as coagulation was beginning. His blood pressure was 166/100 mmHg and his prothrombin time and international normalised ratio were 59.9 seconds and 2.74, respectively. The coumadin was stopped and 20 mg of menatetrenone was injected to reverse the anticoagulant effect. Because his symptoms progressed to complete paraplegia about 5 h after his arrival, hematoma removal was performed another 3 h later. Laminectomy from C7 to T4 was done, and a hard, dark hematoma was completely resected. There was no apparent vascular malformation. Although, the patient went through rehabilitation for six months, his MMT grade 2 paraplegia and bladder dysfunction remained.

Case 2

A 68-year-old woman came to our hospital with severe, sudden neck pain. She was just sitting and listening to a song without any abnormal neck movement at the time. Her blood pressure on admission was 164/75 mm Hg, and her prothrombin time and international normalised ratio were 69.7 s and 1.20, respectively. Her platlet count was normal. She had no chronic disease such as hypertension, and no medication such as anticoagulant drugs. She had no loss of sensation or other deficits on admission. Brain CT showed no intracranial hemorrhage. Spinal MRI one hour after the onset demonstrated a T1WI iso-, T2WI high-intensity homogenous intensity epidural mass measuring maximum 8×9.5 mm in the axial plane from the C2 to T4 levels compressing the spinal cord (Figure 2). A spinal epidural hematoma in the hyperacute phase was diagnosed. She was followed up without surgical intervention. Her neck pain decreased substantially the following day, and it disappeared within three days after admission. Most of the hematoma regressed on her follow-up MRI obtained almost three days after the initial MRI (Figure 3). Later, cranial and spinal angiography were performed, and no abnormal vascular malformation was detected. She was discharged at two weeks.

DISCUSSION

Spinal epidural hematomas are classified mainly into two categories—hematoma without an identified etiology, that is, “spontaneous,” or hematoma with an identified etiology, such as hemophilia, neoplasia, arteriovenous malformation, trauma, postoperative complications or anticoagulation therapy (Beatty and Winston, 1984). Many of these spontaneous epidural hematomas may result from coughing, sneezing, or straining, which may cause the transmission of increased pressure from abdominal or thoracic veins to the subdural venous plexus via valveless connecting vessels (Anderson and Donaldson, 1989). On the other hand, some authors have supposed the spinal artery is the ruptured vessel because the pressure in the venous plexus is lower than that in the epidural space, and clinically deteriorating neurological deficits occur rapidly (Beatty and Winston, 1984).

The commonly recommended treatment for spinal epidural hematoma is surgical decompression. In the case of a patient with neurologically progressive deficits, immediate decompression is thought to be very important. However, several authors have reported cases of spontaneous recovery, including both spontaneous and traumatic spinal epidural hematomas (Aoki et al., 2012; Buyukkaya et al., 2014; Kim et al., 2005; Hentschel et al., 2001). In particular, there are some cases of rapid hematoma resolution. Buyukkaya et al. (2014), reported a 46-year-old patient with a C5-T1 nontraumatic epidural hematoma with spontaneous resolution within 48 h, both clinically and radiologically. Kim et al. (2005), also presented a case of a patient with traumatic cervical epidural hematoma with early neurological improvement on the first day and resolution of the dorsal epidural hematoma within three days. With regard to the mechanism of spontaneous resolution, Ninomiya et al.
Figure 1. The T1- (A, C) and T2- (B, D) weighted images of the initial spinal MRI show a thick epidural hematoma compressing the spinal cord dorsolaterally. C and D are axial images of the T1 level. There are septa in the hematoma (arrows) and hematoma showed mixed intensities both in T1 and T2 images.

(2000), suggested that leakage of the liquid hematoma through the intervertebral foramen leads to spontaneous decompression of the spinal neural structures. Other study (Hentschel et al., 2001) think that spread of the hematoma along the spinal epidural space, is a plausible explanation for spontaneous recovery.

This “spreading theory” was supported by a study performed by Groen (2004) who reported that the mean length of the hematoma was significantly higher in nonoperative cases compared to operative cases of spontaneous spinal epidural hematoma (5.4 versus 4.2 vertebral segments). Based on this study, it is believe that MRI appearances and intensity of the hematoma are very important in predicting “spreading” and “resolution”. Table 1 shows the progression of MRI intensity of a hematoma over time. In the first 24 h after the onset of symptoms, spontaneous spinal epidural hematoma is usually isointense on T1-weighted images and hyperintense on T2-weighted images, compared to the spinal cord (Lovblad et al., 1997). Soon after, the hematoma gives slightly decreased signal intensity on T1-weighted images and is hypointense on T2-weighted images, reflecting the presence of deoxyhemoglobin, which represents the beginning of coagulation.

The mixed-intensity and multilocular hematoma seen on the MRI in Case 1 suggested that coagulation was progressing, and we could not expect more hematoma “spreading” or early “resolution.” Symptoms of the patient at that time were also progressing, so immediate decompression was needed. Consequently, surgical decompression should have been performed earlier than we did in this case. On the other hand, Case 2 showed a “spreading” homogenous hematoma in the hyperacute phase, which indicated that early “resolution” could still be expected. If any new neurological deficits had arisen, immediate follow-up MRI would have been necessary to confirm the intensity of the hematoma. Except for MRI, myelography and CT can be used to diagnose spinal epidural hematomas. Myelography shows a narrowing of the contrast dye, and CT shows an epidural bleed as a hyperdense mass. However, both of them are limited utility in terms of differential diagnosis, and cannot be used to determine when bleeding commenced compared to MRI (Buyukkaya et al., 2014; Boye and Schumacher,
Figure 2. The T1- (A, C) and T2- (B, D) weighted images of the initial spinal MRI show a thick homogenous epidural hematoma compressing the spinal cord dorsally. C and D are axial images of the T1 level.

Figure 3. The T1- (A) and T2- (B,C) weighted images of the spinal MRI 67 h from the onset, demonstrate nearly complete resolution of the hematoma.
Table 1. Progression of MRI Intensity of hematomas over time and relationship between hemoglobin.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Hyperacute</th>
<th>Acute</th>
<th>Subacute</th>
<th>Chronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb: oxy</td>
<td>↓</td>
<td>↓</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>Hb: deoxy</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>T1</td>
<td>↑</td>
<td>↓</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>T2</td>
<td>↑</td>
<td>↓</td>
<td>↓</td>
<td>↑</td>
</tr>
</tbody>
</table>

Hb: hemoglobin.

2009). Therefore, it is believed that MR imaging can provide useful information about the age and appearances of epidural spinal hematomas.

Conclusion

Comparison of these two cases suggests that MRI appearances and intensity of a hematoma could be an important factor in surgical decision making for the treatment of spinal epidural hematomas. MRI reveals the position, size, and location of the lesion, and provides information about the degree of spinal cord compression. Combined with simultaneous clinical information, it is believed this will help neurosurgeons make appropriate surgical decisions.

Conflict of interests

The authors have not declared any conflict of interests.

REFERENCES


Journal of Neuroscience and Behavioral Health

Related Journals Published by Academic Journals

- Journal of Diabetes and Endocrinology
- Journal of Medical Genetics and Genomics
- Journal of Public Health and Epidemiology
- Medical Case Studies
- Medical Practice and Reviews
- Journal of Infectious Diseases and Immunity