THE QUESTION IS WHETHER HEMIPARESIS IS MORE COMMON IN UNILATERAL THAN BILATERAL CHRONIC SUBDURAL HEMATOMA

PITANJE JE DA LI JE HEMIPAREZA ČEŠĆA KOD UNILATERALNOG NEGO BILATERALNOG HRONIČNOG SUBDURALNOG HEMATOMA

Mirela JUKOVIĆ, Kosta PETROVIĆ and Viktor TILL

Summary

Introduction. Chronic subdural hematoma is an intracranial hemorrhagic lesion that illustrates various expressions in clinical and radiological practice. The aim of this study was to emphasize the correlation between the brain site of chronic subdural hematoma and clinical symptoms/signs of disease. Furthermore, the study denotes the significance of hemiparesis occurrence in the patients with unilateral chronic subdural hematomas more than in those with bilateral ones, associated with time required to diagnose hematoma. Material and Methods: A three-year study included 72 patients with chronic subdural hematoma. According to their clinical and neurological symptoms on hospital admission, all patients underwent non-contrast brain computed tomography scan, which confirmed the diagnosis. The radiological parameters, including the site of chronic subdural hematoma, a hematoma width and midline shift were recorded to give precise data about the correlation with neurological symptoms. A special focus was put on the lag time between the onset of symptoms and signs to diagnosis of chronic subdural hematoma. Results. The study proved that the patients with unilateral chronic subdural hematoma had more frequent occurrence of hemiparesis than the patients with bilateral chronic subdural hematoma. It took the left-sided chronic subdural hematomas less time (about 200 hours earlier) than the right-sided ones to present its symptoms although the average hematoma diameter value was almost the same. Conclusion. The site and the form of intracranial lesion-chronic subdural hematoma could have a great influence on neurological and functional condition in a patient. Although the length of time required for making diagnosis as well as clinical symptoms greatly differ and the latter are not always so clear, physicians should maintain a high level of suspicion for this disease and thus contribute to prompt diagnosis and better clinical outcome of patients.

Key words: Paresis; Hematoma, Subdural, Chronic; Tomography X-Ray, Computed; Diagnosis; Signs and Symptoms

Sažetak

Introduction

Chronic subdural hematoma (CSDH) is a common intracranial hemorrhagic lesion which could be presented on a brain computed tomography (CT) scan as unilateral (Figure 1) or bilateral form (Figure 2). Patients with these extra axial crescent fluid collections show a spectrum of symptoms/signs in the clinical presentation of this disease. Although it is a relatively common disease in elderly, the prompt diagnosis is not usually so clear. In literature, the unilateral chronic subdural hematoma is more frequent than the bilateral one [1, 2]. The incidence of a bilateral CSDH is about 16-20% in population [3]. However, why some patients have unilateral and other bilateral hematoma or what determines the site of CSDH is not still quite clear. Lee at al. showed the influence of the cranial morphology on the formation of either unilateral or bilateral CSDH. Unilateral hematomas are more frequent in asymmetric cranium, but bilateral CSDHs are more common in the symmetric cranium [4]. According to Kim et al. asymmetric cranium is defined when the angles for both sides have difference bigger than 2 degrees [5].

Material and Methods

A prospective three-year study involved 72 patients with uni- or bilateral CSDH who had been diagnosed by CT scan at the Clinical Centre of Vojvodina, Centre for Radiology, and hospitalized and treated at the Department of Neurosurgery. All patients underwent clinical and neurological examination, which was followed by initial non-contrast brain CT scan. The CT brain protocol included axial slices parallel to the infraorbitomeatal line, from the foramen magnum to the apex of skull using Somatom Emotion 16 and Cardiac Sensation 64 CT scan, Siemens, Germany. Technical parameters for routine brain CT scan are: 120 kV, 400 mAs, detector collimation 0.75 mm, slice thickness 5 mm, with Kernel H31ms (www.ctisus.com). The brain CT findings included the side and the diameter of hematoma, as well as the midline shift and the angle of the cranium for both sides. The angle was measured by Picture Archiving Communication System (PACS) system using two lines: one passing through the median plane as the connection with the crista galli and occipital protuberance, and the other one touching the cranium tangentially at the point of its maximal convexity. The diameter of the bilateral hematoma was measured as the sum of both sides. The diameter of the midline displacement was measured as the perpendicular distance from the septum pellucidum to the line drawn from the crista galli to the occipital protuberance. The neurological symptoms on hospital admission varied from mild headache, nausea, vomiting, hemiparesis, psychoorganic syndrome, facial nerve paresis and impaired consciousness. A descriptive statistical (arithmetic mean, minimum and maximum values) and Fisher’s exact test (nonparametric test) were used as statistical analysis for this study. The p value (p<0.05) was considered significant. Statistical software (Statistica 10.0) was used to evaluate these study data.

Results

The average age of the patients was 68.8, ranging from 39 to 90 years. Twenty five (35%) patients were women and 47 (65%) were men, the F:M ratio being 1:1.9. There were 29 patients younger than 65 years of age and 43 patients older than 65 years of age. The number of patients with unilateral CSDH was 44 (61%). There was an equal number (22 patients) with the left-sided and the right-sided CSDH. Twenty-eight (39%) patients had bilateral CSDH. Eighteen patients younger than 65 and 26 patients older than 65 had unilateral CSDH. Eleven patients younger than 65 and 17 patients older than 65 suffered from bilateral CSDHs. A trauma, which had preceded the hemorrhage, was known in about 66.6% of patients;
however, the traumatic event was not reported in 33.4% of patients. The traumatic event was known in 30 patients older than 65 and in 18 patients younger than 65. There were no data about a trauma in 13 patients older than 65 and in 11 patients under the age of 65. In the group of patients with unilateral CSDHs, a trauma was present in 72%, while in the group of bilateral CSDHs, a trauma was present in 61%. The patients with unilateral CSDH had more frequent hemiparesis in comparison to the patients with bilateral CSDH. Thirty-five patients with unilateral presentation of CSDH had hemiparesis on hospital admission, but nine patients were without it. In the group of patients with bilateral CSDHs, 13 patients had hemiparesis, but 15 patients were without it. There were statistically significant differences between hemiparesis occurrence in these two hematoma types (p < 0.05) (Graph 1). Twenty-nine patients older than 65 had hemiparesis, whereas in the group of patients under the age of 65, hemiparesis was observed in 19 patients. Other symptoms and signs in the patients with unilateral and bilateral CSDH included headache, vertigo, the facial nerve paresis, a speech disturbance and a psychoorganic syndrome (Table 1). Some of the patients had two or more symptoms, but without significant differences in leading symptoms or signs between the group of patients under and above the age of 65. Many of these patients (58.8%) had arterial hypertension, four patients had anticoagulant therapy, five patients suffered from chronic obstructive pulmonary disease, one patient had thrombocytopenia and seizures were diagnosed in two patients. The majority of CSDHs were diagnosed in spring and summer months. The time interval from the onset of the first symptoms in the patients with CSDH to hospital admission and diagnosis was different between the left and the right-sided unilateral CSDH. On average, it took about 212 hours (about 9 days) and 433 hours (about 18 days) from the onset of the symptoms to hospital admission.

### Table 1. Type of symptoms and signs in patients with chronic subdural hematoma (patient had more than one symptom and sign)

<table>
<thead>
<tr>
<th>Symptoms and signs</th>
<th>Number of patients Ages under 65</th>
<th>Number of patients Ages above 65</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Starost ispod 65 godina</td>
<td>Starost iznad 65 godina</td>
</tr>
<tr>
<td>Hemiparesis/Hemipareza</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td>Headache/Glavobolje</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>Speech disturbance/Poremećaj u govoru</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>Psychoorganic syndrome/Psihoorganski sindrom</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Vertigo/Vrtoglavica</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Facial nerve paresis/Pareze facijalnog nerva</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

Figure 2. Bilateral chronic subdural hematoma
Slika 2. Bilateralni hronični subduralni hematom

Graph 1. Presence/absence of hemiparesis in patients with uni- and bilateral CSDH
Grafikon 1. Prisustvo/odsustvo hemipareze kod pacijenata sa unilateralnim i bilateralnim hroničnim subduralnim hematomom
days) the symptoms to develop in the patients with the left-sided CSDH and the right-sided CSDH, respectively; however, this difference is of no statistical significance (p>0.05). The average diameter of the left and right-sided CSDH was 23.5 mm and 21.3 mm, respectively. Regarding the presentation of the unilateral and bilateral CSDH, the mean time interval from the onset of symptoms to hospital admission was 310 hours and 293 hours, respectively, the average diameter of the unilateral and bilateral CSDH being 22 mm and 31.6 mm, respectively. In the group of 28 patients with bilateral hematoma, 13 patients with hemiparesis had wider diameter of the hematoma on the left side than on the right side. The average diameter of the midline shift was 11 mm and 6 mm in the patients having the unilateral hematoma and in those having the bilateral one, respectively. The cranial morphology of patients with CSDH is given in Table 2. Although the asymmetry of the cranium was higher in the group of patients with the unilateral CSDH, there was no statistically significant difference (p>0.05) between the two groups.

**Discussion**

The clinical presentation of CSDH gives a wide spectrum of variety. It can be presented in the form of a mild headache with nausea and vomiting or with hemiparesis and psychoorganic syndrome that are more common in the elderly. All above mentioned neurological symptoms and signs could be interpreted as a stroke or functional decline during the physiological process of aging and would be, thus, misdiagnosed. Before the era of CT scans, a lot of CSDHs were diagnosed post-mortem [6], but in daily routine CT imaging has become a more accessible method for the diagnosis of intra cranial traumatic lesions. Moreover, specific clinical criteria in patients with minor head injuries were developed to identify indications for CT scan [7]. McFarlane et al. showed that CSDHs are more often in male than female patients [8]. According to them, the left-sided CSDHs were more common than the right-sided ones, with the possibility that the right-sided CSDHs were substantially more silent in the clinical presentation than the left-sided hematoma, or it could be that the right-sided CSDHs were diagnosed far more after the left-sided [5, 8]. Our study showed that CSDHs were more common in males and that the presence of the unilateral CSDH hematoma was more common than the bilateral one. There were a unique number of the left and right-sided unilateral CSDHs. Although the average diameter of the left-sided and the right-sided unilateral CSDH in our study was almost equal (being 23.5 mm and 21.3 mm, respectively), the time interval from the development of symptoms to the proper diagnosis was twice longer in the right-sided CSDH than in the left-sided hematoma (about 200 hours longer), but with no statistical significance (p>0.05). The hemiparesis was present in 18 patients with the left-sided CSDH and in 17 patients with the right-sided, but their clinical and neurological presentations were sooner discovered in the patients with the left-sided hematoma than in those with the right-sided one. One of the theories which can explain these phenomena is the functional asymmetry of the brain hemispheres. Ninety five percent of people have the left hemispheric dominance that is responsible for reading, speech, logic, noticing details. The left hemisphere controls the right hand movements and this could be the reason for rapid detection of neurological symptoms and signs in the patients with the left-sided form of CSDH [8, 9]. This study has also suggested that the development of hemiparesis is a significant sign of the unilateral CSDH presentation, more than in the bilateral CSDHs. The theory which could explain why patients with the unilateral CSDH have hemiparesis more often than those with the bilateral ones is a wider diameter of midline displacement and, consequently, the cortico-pinal tract compression, with the disturbance in the cerebral blood flow on the side of hematoma [10]. Moreover, Yokoyama et al. showed that the fractional anisotropy (FA) value in the pyramidal tract, measured by diffusion-tensor-imaging (DTI) on magnetic resonance was decreased on the side of the chronic subdural hematoma which could be responsible for the development of motor weakness in the patients. A reduction of FA value in the pyramidal tract was caused by the compressive effect of CSDH and vasogenic edema [11]. The average diameter of midline shift in the bilateral CSDH was smaller than in the unilateral one, but hemiparesis was manifested at lower values of midline shifts in the bilateral CSDH as compared to the unilateral CSDH. A possible explanation for this is probably the more substantial compression of pyramidal tracts and serious metabolic changes in specific regions of the brain parenchyma which are affected by the compressive effect of CSDH. In

### Table 2. Cranial morphology of patients with CSDHs

<table>
<thead>
<tr>
<th>Cranial morphology</th>
<th>Unilateral CSDH</th>
<th>Bilateral CSDH</th>
</tr>
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<tbody>
<tr>
<td>Symmetrical/Simetrična</td>
<td>18 (25%)</td>
<td>14 (19.4%)</td>
</tr>
<tr>
<td>Asymmetrical/Asimetrična</td>
<td>26 (36%)</td>
<td>14 (19.4%)</td>
</tr>
</tbody>
</table>

*HSDH - hronični subdualni hematom*
addition, our study showed that previous trauma was a very important factor for the CSHD development, especially in the group of patients older than 65. In literature, the etiology of subdural hematoma is usually connected with the previous traumatic event [12, 13]. It may be interesting to state that CSHDs were diagnosed more frequently during spring and summer months. A possible mechanism which could explain the more frequent occurrence of CSHD in patients during these months is the greater mobility and higher temperature, which could be factors that may have affected a higher risk of injury. The comorbidity such as chronic obstructive pulmonary disease, seizures and coagulopathy are potential risk factors for intracranial hemorrhage event. In their study, Tsai et al. emphasized that bilateral hematoma was more common in patients with anticoagulant or antiplatelet therapy [1], but in our study only three patients with the bilateral CSHD and seven patients with the unilateral CSHD had coagulation disorders. The asymmetry of the cranium had a slightly higher frequency in our patients with the unilateral CSHD than in those with the bilateral hematoma, but with no statistical significance. One of the reasons for this fact might be the small sample size and future investigation could confirm or deny the hypothesis previously set by Lee et al. about the relationship between asymmetry of the skull and localization of CSHDs [4].

**Conclusion**

The site and the form of chronic subdural hematoma could have a great influence on neurological and functional condition in a patient. Although the length of time required for making diagnosis as well as clinical symptoms greatly differ and the latter are not always so clear, physicians should maintain a high level of suspicion for this disease and thus contribute to prompt diagnosis and better clinical outcome of patients.

**References**