



## Original Article

# Spontaneous chronic subdural hematoma in elderly people – Arterial hypertension and other risk factors

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## Abstract

**Background:** The risk factors implicated in the genesis of chronic subdural hematomas include old age, alcoholism, diabetes mellitus, arachnoid cysts, coagulopathy, anticoagulant (ACTh) and antiplatelet drugs. However, no study has reported an association between arterial hypertension (HTA) and chronic subdural hematomas. Therefore, the aim of this study was to investigate whether HTA is a risk factor for spontaneous chronic subdural hematomas (SCSDHs).

**Methods:** This multicenter study included patients aged over 60 years and was conducted from January 2009 to the end of 2015. One hundred and twenty-two patients with SCSDHs and 111 controls treated for other reasons with no evidence of intracranial hemorrhages on brain computed tomography were enrolled. The patients were separated into three age subgroups to provide a better insight into the role of risk factors with age.

**Results:** The average age in the SCSDH group was  $74.45 \pm 8.16$  years, compared to  $71.28 \pm 6.69$  years in the control group. The SCSDH group was significantly older than the control group ( $p = 0.0014$ ). The patients in the 60–69 years age group diagnosed with SCSDHs had significantly higher rates of HTA ( $p = 0.0519$ ), ACTh treatment ( $p = 0.0292$ ) and alcoholism ( $p = 0.0300$ ) than the control group. The patients in the 70–79 years age group diagnosed with SCSDHs had significantly higher rates of HTA ( $p = 0.0071$ ) and ACTh treatment ( $p = 0.0158$ ) than the control group. In the subgroup of patients older than 80 years, there were no statistical differences.

**Conclusion:** The incidence of HTA had borderline significance in the patients aged 60–69 years with SCSDHs and statistical significance in the patients aged 70–79 years with SCSDHs. Anticoagulant therapy was the most significant risk factor. Among the patients with SCSDHs aged 60–69 years, the percentage of heavy drinkers was significantly higher than in the control group.

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**Keywords:** Alcoholism; Blood coagulation disorders; Chronic subdural hematoma; Hypertension; Risk factors

## 1. Introduction

The risk factors commonly associated with the genesis of chronic subdural hematomas (CSDHs) include alcoholism,

diabetes mellitus (DM), old age, arachnoid cysts (ACs),<sup>1</sup> coagulopathy, anticoagulant (ACTh), and antiplatelet (APTh) therapy.<sup>2,3</sup> Compared to traumatic hematomas, spontaneous subdural hematomas are often not considered to be a distinct group of hemorrhages when clinical features, therapy, and outcomes are taken into account. The atraumatic nature of this type of bleeding means that potential patients can be identified based on their age, sex and comorbidities. In addition, spontaneous intracranial

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hypotension (induced by cerebrospinal fluid fistula, lumbar puncture, spinal anesthesia,<sup>4</sup> spinal surgery or sudden intracranial decompression) has also frequently been reported to be a cause of CSDHs.

Traumatic CSDHs are defined as bleeding in the subdural space caused by trauma to the head. Such patients present with objective findings (head skin stigmata or with minimal subdural bleeding following the traumatic event on the initial brain computed tomography (CT) scan) or positive anamnesis and/or heteroanamnesis. If neither the patients nor their relatives recall any previous trauma or accident, it should be defined as spontaneous. If the patient denies trauma to the head but members of the family confirm trauma, then it should be considered as traumatic.

No previous study has reported an association between arterial hypertension (HTA) and CSDHs. Therefore, the aim of this study was to investigate whether HTA, in addition to other factors, is a risk factor for spontaneous chronic subdural hematoma (SCSDHs). Moreover, very few studies have investigated the risk factors for atraumatic subdural bleeding. We hypothesized that SCSDHs should be classified as being truly non-traumatic, as the key determinant for the occurrence of CSDHs is sufficient subdural space, that is, cerebral atrophy, and the most common and universal cause of cerebral atrophy is aging.<sup>5</sup> As the geriatric population steadily increases worldwide and as CSDHs are typically a disease of old age, analyzing the risk factors for CSDHs is a matter of global medical interest.

## 2. Methods

This multicenter study was conducted at two neurosurgical centers from January 2009 to the end of 2015. One hundred and twenty-two patients older than 60 years of age who had been diagnosed with atraumatic SCSDHs were enrolled. None of the patients had any anamnesis or heteroanamnesis data of even minimal head injury in the last 3 months, nor any objective findings of skin stigmata from a recent head injury. The diagnosis of CSDH was confirmed both on preoperative brain CT and intraoperatively. These patients were classified as the SCSDH group.

The prospective control group consisted of 111 randomly selected patients older than 60 years of age who were treated at our institutions for various reasons not related to serious signs and/or symptoms of head injuries. All of these patients had some kind of positive medical history requiring brain CT and/or magnetic resonance imaging (MRI) examinations. None of initial or control (within 3 months) brain CT and/or MRI scans showed any kind of intracranial hemorrhage. Of the control group, 43 patients had a moderate head injury, 32 had some form of benign brain tumor, 14 had symptomatic headaches, 12 had cervical spine injuries, and 10 were tested for an unruptured cerebral aneurysm. While being aware that patients with head injuries have a tendency to develop CSDHs, we decided that CT and/or MRI scans were reliable enough to include the 43 patients with moderate head injuries into the control group.

The cervical spine injuries were not associated with any kind of head injury, irrespective of their mechanism of origin. The patients were separated into age groups and tested for statistical differences with regards to the following risk factors: usage of ACTh and APTh therapy, HTA, DM, alcoholism, and the presence of ACs.

Data are presented as mean  $\pm$  standard deviation, and statistical significance was defined as  $p < 0.05$  in all comparisons. Statistical significance was analyzed using the chi-square test for categorical variables and two-sample *t*-tests for continuous variables. The results are presented in tables as numeric values and percentages.

Since the recommended classification was unchanged in the 2003 and 2007 European Society of Hypertension/European Society of Cardiology guidelines, hypertension was defined as systolic blood pressure  $\geq 150$  mmHg and/or diastolic blood pressure  $\geq 90$  mmHg.<sup>6,7</sup> The patients were defined as having hypertension in this study based on cardiology examinations, previous medical records and therapy, taking into account that we were dealing with an elderly population. The patients with DM were defined according to already extensively published guidelines for the diagnosis and classification of diabetes.<sup>8,9</sup> In brief, we used the current World Health Organization diagnostic criteria for diabetes – fasting plasma glucose  $\geq 7.0$  mmol/l (126 mg/dl) or 2-h plasma glucose  $\geq 11.1$  mmol/l (200 mg/dl). Impaired glucose tolerance was not treated as frank diabetes and therefore was not taken into account.

To identify the patients with alcohol addiction, we used the Alcohol Use Disorders Identification Test (AUDIT) to identify those with hazardous and harmful patterns of alcohol consumption.<sup>10,11</sup> Alcoholism was defined on the basis of previous medical records or anamnesis and heteroanamnesis questionnaires where the patients themselves or their relatives described them as heavy drinkers consuming  $\geq 14$  drinks a week (equivalent to 210 g ethanol) for men or  $\geq 9$  for women (equivalent to 140 g ethanol).

ACTh drugs included oral anticoagulants such as warfarin, acenocoumarol or the subcutaneous application of heparin (nadroparin-calcium). Some of the patients used a new generation of oral anticoagulants including dabigatraneteksilat and rivaroxaban. The APTh drugs used by the patients in this study included aspirin and clopidogrel. The therapy for each patient was prescribed either by a cardiologist or vascular surgeon. We included only those patients who took any form of the therapy on a regular daily basis. ACs were identified on brain CT and confirmed by a radiologist.

## 3. Results

### 3.1. Age and sex

The average age in the SCSDH group was  $74.45 \pm 8.16$  years, compared to  $71.28 \pm 6.69$  years in the control group. The SCSDH group was significantly older than the control group ( $p = 0.0014$ ). There were 87 males and 35 females in

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