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Case study

Predictive (subtle or overlooked) initial head CT findings in patients who develop delayed chronic subdural hematoma

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ABSTRACT

With the aging population, the incidence of chronic subdural hematoma (CSDH) is expected to rise. Once symptomatic the morbidity from CSDH is not insignificant. We studied patients who had a minor head injury and CT brain scan prior to developing CSDH to determine if there were any predictors on these scans for subsequent development of a CSDH. A retrospective review was performed on all patients operated for CSDH over a 3-year period and a review performed on those who had imaging studies at the time of a preceding minor head injury. Seven of 37 patients had CT scans prior to developing CSDH. All had evidence of small increases in CSF intensity on the side or sides of the subsequent CSDH. In conclusion, in those patients with a history of minor head injury prior to developing a CSDH, CT brain demonstrated small increases in cerebral spinal fluid (CSF) intensity on the side or sides of the subsequent CSDH. Recognizing this finding may be helpful in monitoring these patients or initiating medical therapy.

1. Introduction

The etiology of chronic subdural hematoma (CSDH) remains uncertain [1–6]. The usual explanation for the initiating event has been the tearing of a bridging vein usually caused by a prior minor trauma. Other authors, especially Asian [1,6–10], have described traumatic subdural hygromas as a predisposing cause. Risks factors are felt to include brain atrophy and coagulopathy. Many patients who present with a CSDH relate a minor head injury in the recent past. Not infrequently these patients have had a head CT at the time if they presented to the emergency department. With the increasing age of the population, the expected rising incidence of CSDH makes earlier diagnosis, which may respond better to medical management, even more important. We performed a retrospective review of patients who had burr hole drainage of their CSDH to determine how many had head CT at the time of the initial minor head injury and reviewed those results to determine if there were any predictors of subsequent development of the CSDH.

2. Materials and methods

2.1. Case series

From 2011 to 2014 we performed a retrospective review of the medical record of all patients who underwent surgery for a CSDH at Carle Foundation Hospital, a level 1 trauma center. After reviewing the hospital record we obtained all previous CT or MRI brain on these patients. Both the neurosurgeons and the neuroradiologist have reviewed the initial head CTs performed at the time of the minor head injury that predated the surgery for the CSDH. The neuroradiologist was blinded to the results. The approval of the study and the requirement of patient consents were both exempt by the local Institutional Review Board.

3. Results

There were 37 patients who underwent surgery for CSDH during this time period. Average age was 65 (range 24–96). Seven of the 37 had initial head CT at the time of the minor head injury preceding the development of a CSDH. All seven had Glasgow coma scores (GSC) of 15. All were discharged to home from the emergency department. All of the head CTs were interpreted as normal or demonstrating cerebral atrophy. One patient also had an MRI

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brain at that time because of complaints of dizziness. The time delay between the initial scan and the development of CSDH was 21–40 days (with the average of 32 days). Even in retrospect none of the head CT or MRIs demonstrated any sign of acute hemorrhage; however, they all demonstrated increased cerebral spinal fluid (CSF) intensity extra-axial collection on the side or sides of the subsequent development of the CSDH (Fig. 1A and B). This increase in the CSF intensity extra-axial collection was relatively subtle, especially on initial head CTs, and was not described as a subdural hygroma by the radiologist. When MRI was performed the subdural CSF intensity fluid was more obvious (Fig. 2A and B). One patient had a head CT 1 month prior to her minor head trauma for unrelated complaints; this head CT did not demonstrate an asymmetrically enlarged CSF intensity extra-axial collection anterior to frontal lobes at the time (Fig. 3A–C). A group of 20 patients who had CT brain for other reasons were reviewed and none demonstrated increased CSF intensity collection.

4. Discussion

CSDH is a common neurosurgical disease with the incidence of approximately 7.4 per 100,000 [11] in the general population but increases with age. With the aging of the population, the number of patients with CSDH coming to treatment is expected to increase [12]. Although CSDH is frequently considered a benign disease, long term follow-up studies demonstrate significant morbidity and mortality. Miranda et al. [11] reported on the short and long term follow-up in 209 patients with CSDH. The mean age was 80 years old; 137 underwent surgery and 72 were treated conservatively. 16.7% died in the hospital and the 6-month and 1-year mortality rates were 26.3% and 32% respectively. Comparison of actual vs. predicted median survival between CSDH patients who were discharged from the hospital vs. control population was 4.4 years vs. 6 years. Dumont et al. [13] retrospectively reviewed 301 consecutive patients over the age of 55 with the primary diagnosis of CSDH. For all patients, the median survival was approximately 4 years after the initial diagnosis. However, the median survival decreased with older age patients, decreasing to 1.5 years in patients over 85 years old. Compared with standardized mortality ratios, patients with CSDH had increased ratios in all age groups. Therefore, earlier diagnosis and treatment have the potential to positively influence these outcomes.

CSDH was first described by J.J. Wepfer in 1656 and then by Rudolf Virchow in 1856. Virchow named this condition pachymeningitis haemorrhagica interna because he recognized that there was an inflammatory component involved. Over the years, a variety of pathophysiologic mechanisms have been proposed to be important in the formation of CSDH [1–6]. Many authors hypothesize the tearing of a bridging vein in patients with atrophy

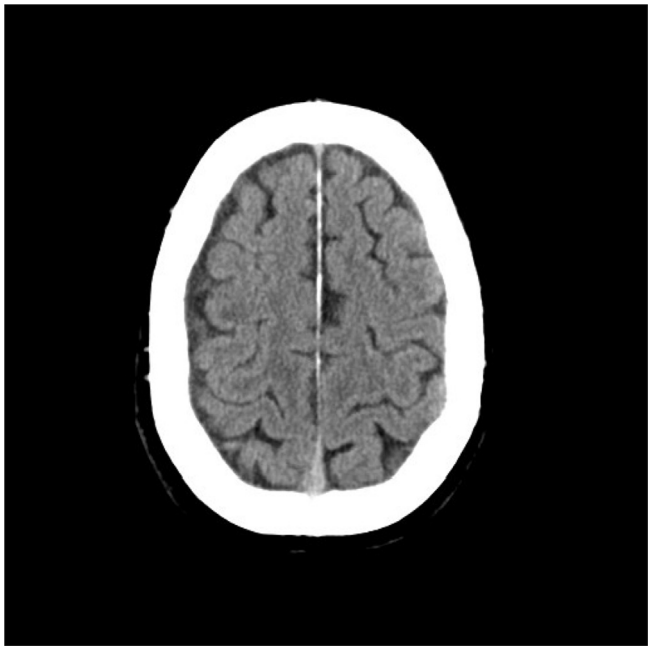

Fig. 1A. Axial CT image demonstrating a small asymmetric CSF intensity extra-axial collection over right frontal-parietal lobe convexity at the time of a minor head injury in a 70-year-old male.

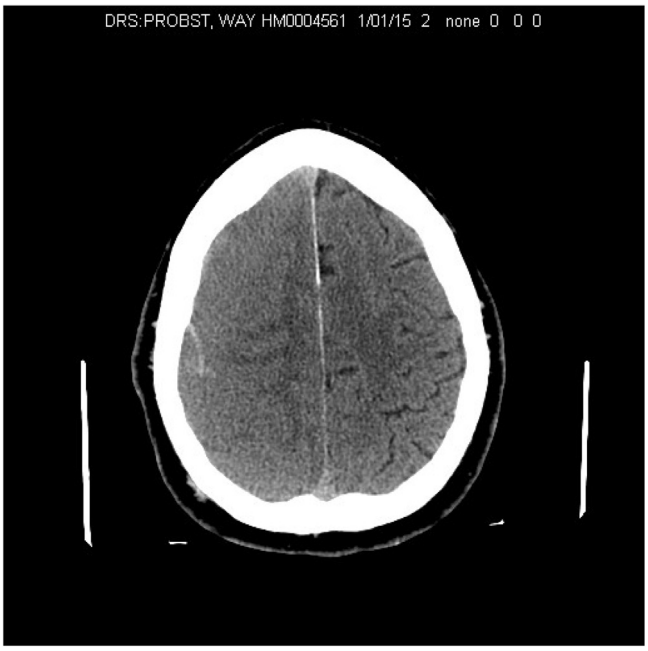

Fig. 1B. Axial CT image approximately 1 month later demonstrating an isodense subacute to early chronic SDH over the same region.

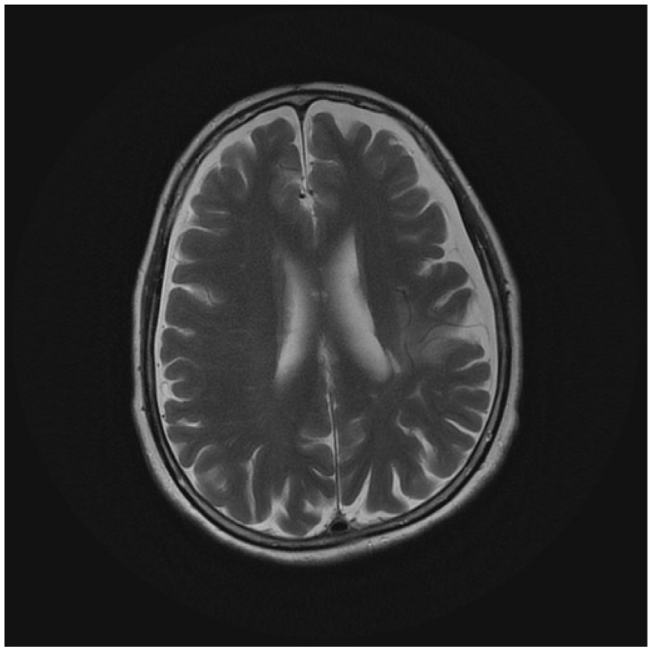

Fig. 2A. Axial T2 MRI demonstrating small bilateral subdural hygromas.