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Article

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Spontaneous resolution of large non-traumatic bilateral acute-on-chronic subdural hematoma

D. Adam[1,2], D. Iftimie[1], Gina Burduşa[1], Cristiana Moisescu[1]

[1]Department of Neurosurgery, "Saint Pantelimon" Clinical Emergency Hospital, Bucharest, ROMANIA
[2]"Carol Davila" University of Medicine and Pharmacy, Bucharest, ROMANIA

Abstract: *Background and importance:* Chronic subdural hematomas are a frequently encountered neurosurgical pathology, especially in the elderly. They often require surgical evacuation, but recent studies have shown good results with conservative treatment in selected cases. *Clinical presentation*: We report the case of a 72-year old patient that developed large, non-traumatic, bilateral, acute-on-chronic subdural hematoma after repeated abdominal surgery for appendicular carcinoma. He presented an abdominal wound infection and good neurological status (GCS score of 14 points), factors that indicated the delay of surgical intervention. Subsequent clinical and radiological improvement forestalled the operation altogether and he presented complete spontaneous resolution of subdural hematomas at only 5 months after diagnosis. *Conclusion*: Although surgical treatment is performed in the majority of chronic subdural hematomas, in clinically and radiologically selected cases, the operation can be avoided. The hematoma can present resolution, either spontaneously or with the help of conservative treatment.

Key words: acute-on-chronic subdural hematoma, spontaneous resolution, computer tomography thickness

Clinical presentation

A 72-year-old male with a history of iterative pulmonary embolism for which anticoagulant therapy was prescribed (acenocumarol), arterial hypertension, heart failure and chronic renal disease, was operated for acute appendicitis in a county hospital. Histopathological analysis revealed an appendicular carcinoma and subsequently he was admitted to a nearby hospital where a right ileohemicolectomy with right parietal peritoneum and pelvic peritoneum resection and adhesiolysis were performed.

Over the course of hospitalization, the patient developed Clostridium difficile infection that responded positively to oral antibiotic treatment (Metronidazole and Vancomycin). On the 16th postoperative day, the patient developed impaired

general condition, absence of transit and diffuse abdominal pain. Surgeons performed an exploratory laparotomy and established the diagnosis of dynamic bowel obstruction. On the 17th postoperative day (first day after his third surgical intervention), he presented temporo-spatial disorientation, and the head CT scan revealed bilateral acute-on-chronic subdural hematoma, with a maximum thickness of 26 mm on the right and 24 mm on the left side, and diffuse cerebral edema (Figure 1).

The patient was transferred to our Neurosurgical Department and admitted in the Intensive Care Unit. At admission, he presented temporo-spatial disorientation with no other neurological deficits (GCS score = 14 points). The patient had no history of head trauma. Local examination revealed five peritoneal drainage tubes and a dehiscent, infected surgical abdominal wound. Routine blood tests at admission showed moderate anemia (Hb=8,32 g/dl), with a low hematocrit (24.82%), low platelet count (147.000/uL) and an increased INR (1,70).

Taking into consideration the abdominal wound infection, poor laboratory test results and, most importantly, the good neurological status of the patient, we decided to postpone the surgical intervention. Conservative management and close neurological monitoring were performed.

Abdominal wound cultures were positive for pluri-resistant Klebsiella and Proteus, sensitive only to Tobramycin and Colistin; urine culture was positive for Pseudomonas susceptible only to Colistin and repeated blood cultures were negative. The patient was treated with Colistin and daily dressing of the abdominal wound was performed. He later developed a large bilateral pleural effusion that was successfully managed with bilateral pleurostomy.

Contrast CT scan performed 2 weeks after admission excluded dural or calvarial metastases as a cause for subdural hematomas and showed a reduction of density, as well as size of subdural hematomas (Figure 2).

The patient maintained a good neurological status throughout the hospitalization period (42 days), with an overall slight neurological improvement (GCS score = 15 points). He was retransferred to the Surgical Department in order to treat the ongoing postoperative abdominal wound infection, with the recommendation of monitoring the neurological status and repeat CT scan in case of deterioration. At that time, a control head CT scan revealed bilateral chronic subdural hematoma with a tendency towards resorbtion (Figure 3). After one week he was sent to a rehabilitation center.

At 5-month follow-up, the patient presented a GCS score of 15 points with no neural deficits and a new head CT scan showed the complete resolution of bilateral subdural hematoma (Figure 4).

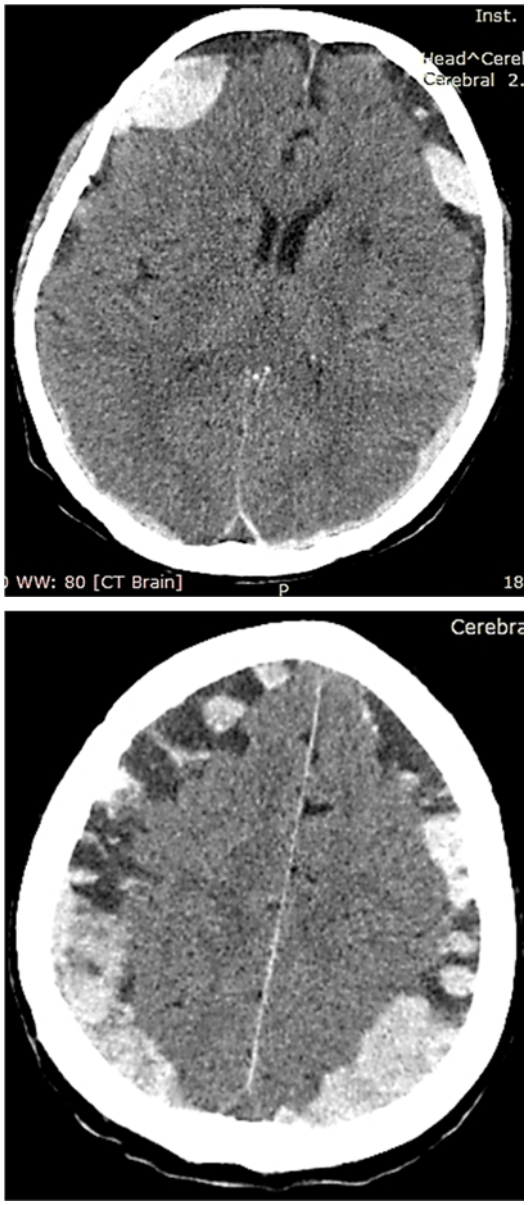


Figure 1 - CT scan performed before the transfer to our department that revealed bilateral acute-on-chronic subdural hematoma, without midline shift, with a thickness of 26 mm on the left and 24 mm on the right side

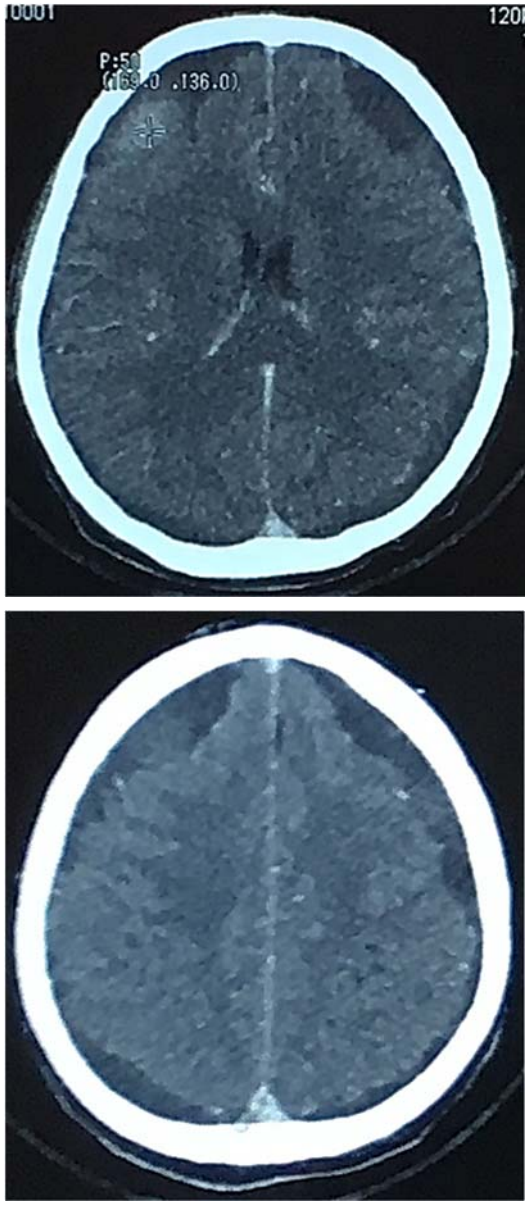
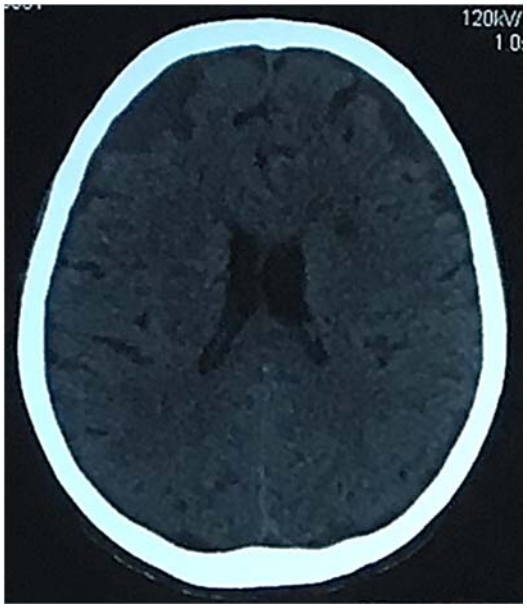


Figure 2 - Contrast CT scan, performed 2 weeks after transfer showing reduction of density and size of bilateral chronic subdural hematoma; no dural or calvarial metastases were detected



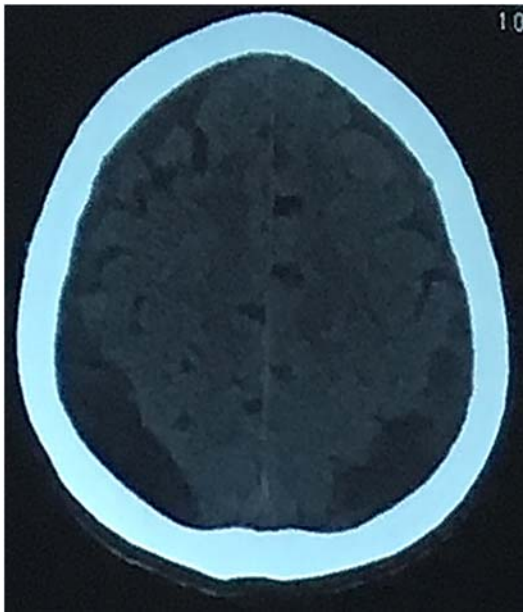


Figure 3 - Control CT scan before retransfer showing bilateral chronic subdural hematoma (homogenously hypodense) with a resolution tendency

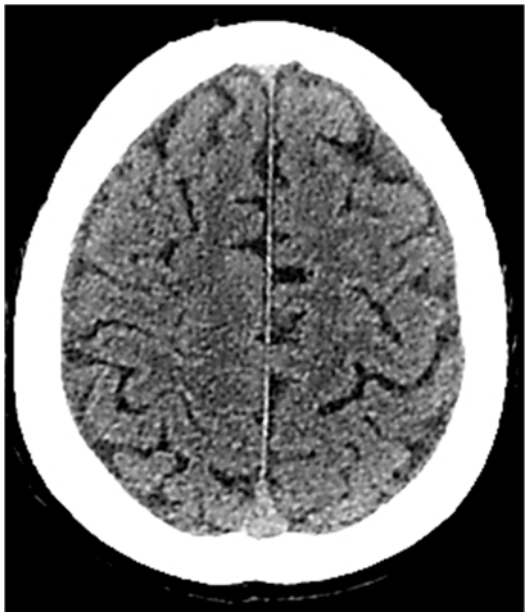


Figure 4 - CT scan performed 5 months later, showing complete resolution of subdural hematomas

Discussion

Definitions

A subdural hematoma represents an accumulation of blood between the dura mater and the arachnoid layer. The chronic subdural hematoma consists of liquefied, yellowish-brown, protein-rich, degraded blood, encapsulated in an external, fibroblastic, neomembrane and an internal one, over the arachnoid membrane.

The most frequent cause of a chronic subdural hematoma is minor traumatic brain injury in an elderly patient. A subdural hematoma is considered chronic when it is discovered at more than 3 weeks after the initial head trauma, with a hypodense aspect on computer tomographic examination. Occasionally, fresh blood can be present within a hypodense subdural hematoma, an entity that can be called acute-on-chronic.

History

Chronic subdural hematoma was initially described by Wepfer in a postmortem case, while Virchow named this entity "pachymeningitis hemorrhagica interna". (1, 2)

In 1914, Trotter (3) emphasized the traumatic origin of chronic subdural hematomas that are caused by tears of the bridging veins, mechanism demonstrated by subsequent studies. (4, 5)

Causes

The incidence of chronic subdural hematomas in senior citizens presents a high degree of variability in published studies, being approximately 8,2/100.000/year (6). For people over 70-years-old, the reported incidence is 58/100.000/year (7), while Foelholm and Waltimo estimated a rate of 1-2/100.000/year (8).

Accidental falls represent the foremost risk factor in Asghar's study (57%), followed by anticoagulation therapy and alcohol abuse6. By analyzing postmortem examinations of cancer patients, Graus estimated that subdural hematomas amount to 26% of the 7% of intracranial hemorrhages which occur in these patients (9).

The case that we report presented two associated risk factors: appendicular carcinoma and anticoagulant treatment (acenocumarol). Furthermore, his prior repeated pulmonary embolisms could have been a complication of his yet undiagnosed malignant tumor due to the associated clotting disorders that can develop because of it. At admission in our department, the patient presented an INR of 1,70. Reichman et al considered that an INR of over 1,5 is one of the indicators of coagulopathy (10).

The pathophysiology of chronic subdural hematomas has been a constant interest of research, beginning with the old osmotic gradient theory of Gardner (11). In recent decades, a new possible mechanism of hematoma expansion was proposed: the rebleeding of sinusoidal capillaries of the parietal membrane which present modified walls (12–15). This rebleeding explains the development of hyperdense areas within chronic subdural hematomas, that justify the label of acute-on-chronic that is commonly used.

Clinical features

After surgical treatment of the patient's aforementioned appendicular carcinoma, he

developed temporo-spatial disorientation as the sole neurological sign that suggested the benefit of a head CT examination.

Cognitive function impairment is common among elderly patients. Only their sudden onset or rapid neurological deterioration suggest an acute intracranial condition. Frequently, a subdural hematoma could be suggested by intracranial hypertension symptoms or focal neurological deficits that appear later in its evolution in the elderly due to their cerebral atrophy.

Markwalder et al have elaborated a clinical grading scale (Table I). (5)

Investigations

Head CT scan shows an extracerebral fluid collection, of various thickness, with a density close to that of CSF. It can also identify midline shift, if present.

In our reported case, the CT scan revealed bilateral chronic subdural hematoma, without midline shift. Bilateral subdural hematomas are encountered in approximately 15 to 20% of cases. (16)

Table I

Markwalder grading scale of chronic subdural hematoma

Grade	Mental status alterations	Neurological examination
0	Absent	Normal
1	Alert + headaches	Absent or mild neurological deficits
2	Drowsy or disorientated	Hemiparesis
3	Stuporous	Hemiplegia
4	Comatose	Decerebrate/decorticate posturing

Management

The gold standard of chronic subdural hematoma treatment is surgical evacuation, with the help of various techniques, such as burr hole or twist drill craniotomy, followed by drainage of the cavity. These procedures ensure a rapid brain decompression and improvement of neurological symptoms. An increasing number of neurosurgeons have noted that spontaneous resolution of chronic subdural hematomas can occur in some cases, and thus they can be managed conservatively.

Conservative management of a chronic subdural hematoma is recommended in:

- asymptomatic patients or with mild, transitory headache,
- reduced thickness with absence of mass effect and midline shift17,
- located in the frontal region, with a minimal mass effect and with the presence of a hypodense area between the hematoma and the cerebral cortex, indicating the presence of CSF (18).

Kim et al (19) monitor patients with a chronic subdural hematoma that present volume and thickness of under 43 ml and 13 mm, respectively and a midline shift of under 5 mm on the head CT scan.

Parlato et al (20) consider that in the case of patients older than 70 years, with altered mental status, brain atrophy and absence of intracranial hypertension signs and symptoms, a "wait and see" strategy should be applied.

In some patients, resolution of chronic subdural hematoma was noted under conservative treatment, with the help of corticotherapy, osmotherapy, tranexamic acid, etc. that have the effect of:

- inhibition of the inflammatory process

• inhibition of the hipofibrinolytic activity in chronic subdural hematoma

• inhibition of the angiongenic properties of the parietal neomembrane

• reduction of the osmotic pressure inside the hematoma's capsule, this effect thus stopping rebleeding (21–24)

The presented case was not treated with any of the aforementioned drugs, and thus their mechanism of action and efficiency will not be thoroughly presented.

We emphasize that some chronic subdural hematomas can present resolution over time, in 4 to 15 months after trauma, either spontaneous, or with the help of conservative treatment.

Recent studies have proposed a grading system based on radiological criteria, that can predict the prognosis of a conservative treatment strategy of chronic subdural hematoma (Tabel II) (25, 26).

Tabel II

Radiological grading system of chronic subdural hematoma for evaluating the potential for success of conservative treatment

Size based on midline shift	
Small (no midline shift)	**0**
Medium (< 5mm)	**1**
Large (5-10 mm)	**2**
Massive (>10 mm)	**3**
Density based on Hounsfiel units on CT scan	
< 30	**0**
31 – 40	**1**
>40	**2**
***Bilateral chronic SDH**	**1 extra point to be added**

For patients with a lower score (0-2), conservative treatment has a better chance of success, compared to patients with a higher score.

By correlating this radiological grading system with the clinical grading scale described by Markwalder, we can state that for patients with chronic subdural hematoma that have a low score (0-2) in both grading systems, the ones that refuse the surgical intervention or are inoperable, conservative treatment can be a potentially successful alternative to the surgical treatment.

The patient we reported presented confusion with no focal neurological deficits and his head CT showed a bilateral hematoma with mixed hypo-hyperdensity and no midline shift. According to the Markwalder grading system, he had a two point score and as for the radiological grading system, a score of three.

The operation could not be performed due to the local infection of the postoperative abdominal wound. In addition, his good neurological status allowed postponing the neurosurgical intervention. Repeated head CT scans showed the reduction of density of the acute-on-chronic hematoma and subsequently, its disappearance at 5 months after diagnosis.

Conclusion

Although surgical treatment is performed in the majority of chronic subdural hematomas, in clinically and radiologically selected cases, the operation can be avoided. The hematoma can present resolution, either spontaneously or with the help of conservative treatment.

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