SWIRL SIGN IN INTRACEREBRAL HEMORRHAGE

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Key-word: Brain, hemorrhage

Background: An 80-year-old male (patient A) felt at home and consequently was admitted to the emergency unit. Following the head trauma, he was bleeding on the right frontoparietal area. The patient was found unconscious and the Glasgow Coma Scale was 9/15. An unenhanced CT scan of the brain was performed.

A second patient, an 86-year-old male (patient B) was admitted to the intensive care unit with a degrading Glasgow Coma scale from 14/15 to 8/15. A subdural hematoma was diagnosed on a first CT scan. An unenhanced CT scan of the brain was performed to control the hematoma.

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blood between the dura mater and the bone. Usu-
or extradural hematoma is the accumulation of
axial epidural hemorrhage. The epidural hematoma
'Swirl sign' is most frequently reported in extra-
dense clotted blood is observed.
Unenhanced CT scan of the brain in patient A
(Fig. 1, A: axial section, B: reformatted image in the
coronal plane) discloses on both images a left sub-
dural hematoma associated with epidural hematoma
limited by the left fronto-parietal suture. There is
no significant mass effect. An area isodense with
the brain parenchyma (36HU) surrounded by hyper-
dense clotted blood is observed.
Unenhanced CT scan of the brain in patient B
(Fig. 2) On first CT scan (A), a left hemispheric sub-
dural hematoma is shown. At the time there was
neither engagement nor significant mass effect. In
comparison to the first CT scan, on control CT scan
(B) the left hemispheric subdural hematoma was
increased. Furthermore, the control CT scan also
revealed an area isodense with brain parenchyma,
and surrounded by hyperdense area of clotted
blood, as well as a significant mass effect and be-
inning subfactual engagement.

Radiological diagnosis
In both patients the foci isodense with the brain
parenchyma foci were supposed to be non-clotted
blood within intracranial hemorrhage, known as
'Swirl Sign'.
The patient A was not operated on due to general
and functional status. The patient was suffering
from advanced Alzheimer disease. Palliative care
was established with family agreement. After an
initial episode of declining neurological status, a
progressive neurological amelioration was ob-
served.
In patient B non-clotted blood was confirmed
at surgery. Consecutively to the subdural hematoma,
the patient developed a large ischemic fronto-
occipital lesion. Unfortunately, the patient deceased
7 days after the operation.

Discussion
The ‘Swirl sign’ is sometimes observed in intra-
cranial hemorrhage. Intracranial hematomas are
divided in intra-axial and extra-axial hemorrhage. Intra-axial hemorrhage corresponds to an intra-
cerebral hemorrhage. Extra-axial hemorrhage is a
bleeding inside the skull but outside the brain
parenchyma. Depending on the authors, intraven-
tricular hemorrhage is categorized either intra-axial
or extra-axial hemorrhage.
There are three subtypes of extra-axial hemor-
phage: epidural hematoma, subdural hematoma
and subarachnoid hemorrhage. In the literature the
'Swirl sign' is most frequently reported in extra-
axial epidural hemorrhage. The epidural hematoma
or extradural hematoma is the accumulation of
blood between the dura mater and the bone.Usu-
ally it appears convex in shape. Its extension is
stopped at the skull sutures. Rapidly, the collection
may cause pressure on the brain, leading to an aug-
mentation of the intracranial pressure and to per-
manent brain damage and death if it is untreated. In
subdural hematoma the blood collects between the
dura mater and the arachnoid. Small subdural
hematomas may not be serious, and the blood can
be absorbed over the weeks. Large hematoma can
progressively enlarge over the weeks, possibly
leading to death when not drained. Epidural hem-
orrhage is more frequently caused by an arterial le-
sion, while subdural hematoma more commonly
results from a venous lesion.
The ‘Swirl sign’ may be observed on non-
enhanced CT scan of the brain. CT findings consist
of foci of isodensity within areas of hyperdensity
relative to brain parenchyma, corresponding to
clotted hematoma. The foci of isodensity should be
fresh, unclotted blood. According to New and
Aronow the predominant attenuation is produced
by the protein fraction of the hemoglobin. The iron
content contributes only for 7 up to 8% of the
density and protoporphyrin contributes negligibly
to the degree of attenuation. Their results indicate
that the attenuation rises in a very short period,
consistent with formation of clotted blood.
Greenberg and all report a series of thirteen patients
with acute subdural and epidural hematomas with
unclotted blood at the time of surgical decompres-
sion. A recent study showed that swirl sign in intra
subdural hematoma is an independent predictor of
death and an unfavorable functional outcome.
In conclusion, the ‘Swirl sign’ may be seen in
patient with intra-axial or extra-axial intracranial
hemorrhage: intracerebral hemorrhage, subdural
and epidural hematomas. In extra-axial hemato-
mas, these isoattenuating lesions are termed hy-
peracute extra-axial hematomas. When it is present
the ‘Swirl sign’ is an ominous sign associate to a
poor outcome.

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