THE RIM SIGN OF SUBDURAL HEMATOMA

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Subdural hematomas visualized by brain scanning usually appear as crescentic areas of increased activity located paracortically or as superficial areas of diffusely increased activity. The unusual appearance of a "rim" of increased radioactivity in the brain scan of a patient with a chronic subdural hematoma has been described (*1*). We recently encountered a patient with a chronic subdural hematoma whose brain scan also demonstrated this "rim" sign.

CASE REPORT

A 60-year-old white male had noticed the onset of headaches 7 months prior to admission. He also reported a mild unsteadiness of gait for 4 months. Two weeks prior to admission the patient fell in his bathtub, striking the right side of his head. Within 24 hr of the fall, he developed a left hemiparesis, most marked in his arm. He was admitted to the hospital for evaluation.

Skull films were negative except for a 4-mm shift of the pineal to the left. An echoencephalogram confirmed the midline shift and a lumbar puncture revealed normal fluid but increased pressure. An electroencephalogram was indicative of cerebral dysfunction in the right hemisphere.

A brain scan was performed using 15 mCi of $^{99m}TcO_4^-$. Dynamic studies were done with a gamma camera equipped with a persistence oscilloscope and super 8-mm ciné film recording. Rectilinear scans were obtained 1 hr later. The dynamic study done in the anterior projection showed a "flattening" of the right cerebral convexity with relatively low activity in the peripheral portion of the right hemisphere. In addition, there was a bandlike increase in activity in the parasagittal and basal regions on the right (Fig. 1A). This was interpreted as compression of the major blood vessels of the brain and meninges by a relatively avascular mass.

Anterior and posterior rectilinear scans (Figs. 2A and B) showed a 10 × 7-cm oval rim of increased activity around a central area of decreased activity located in the superolateral portion of the right cerebral hemisphere. In the right lateral view (Fig. 2C), the lesion with its central "cold" area was demonstrated as a "rimlike" ellipsoid located in the frontoparietal region measuring 9 × 16 cm in greatest dimensions. The left lateral scan (Fig. 2D) demonstrated increased uptake over the cerebral convexity superiorly. These findings strongly suggested a subdural hematoma and a right carotid arteriogram was obtained.

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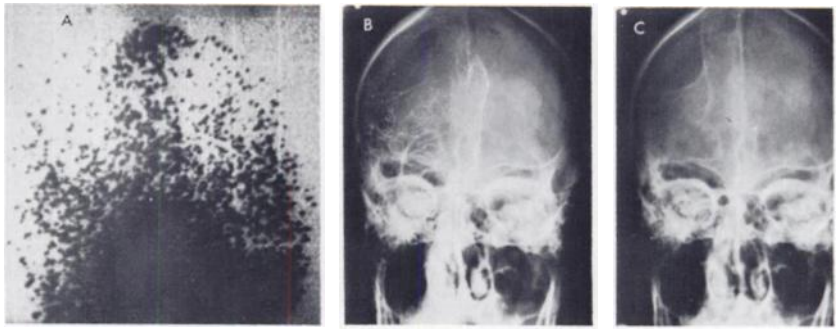

FIG. 1. Single frame from ciné film of radionuclide flow study (A) shows "flattening" of right cerebral convexity with decreased peripheral activity superolaterally on right. Findings represent vascular compression by large right subdural hematoma shown in arterial (B) and venous (C) phases of right carotid arteriogram.

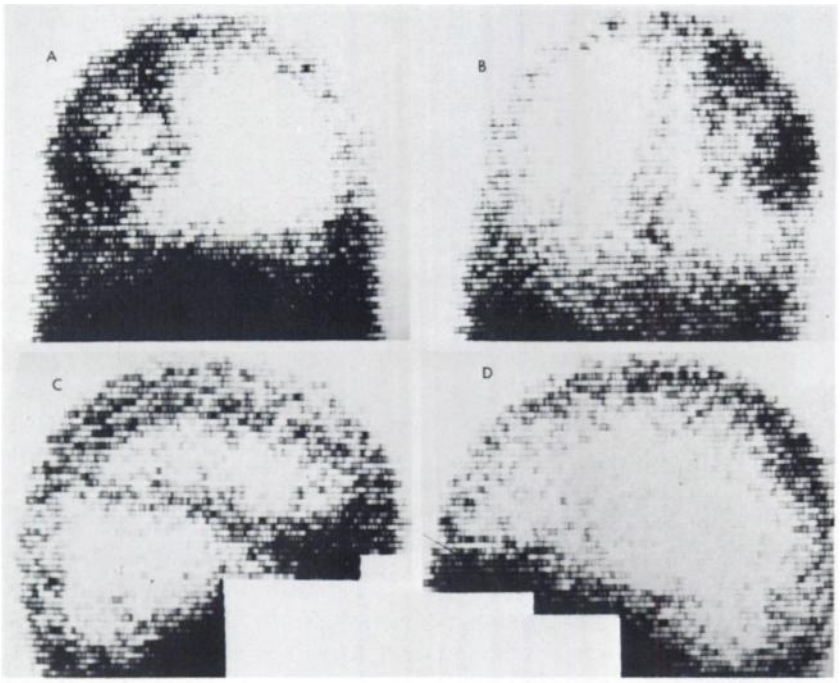

FIG. 2. Anterior (A) and posterior (B) scans of 60-year-old white male with left hemiparesis show oval "rim" of increased activity in superolateral portion of right cerebral hemisphere. Right lateral scan (C) demonstrates large ellipsoid "rim" in frontoparietal region. Left lateral scan (D) shows slight increase in activity along cerebral convexity superiorly. "Rim" conforms to size and location of thick membrane surrounding chronic subdural hematoma found at surgery.

The arteriogram confirmed the presence of a peripheral avascular mass in the right frontoparietal region displacing the cerebral vasculature downward and to the left (Figs. 1B and C). A 4-mm-thick fibrous membrane surrounding a large subdural hematoma was found at craniotomy. Evacuation of the hematoma was followed by rapid clearing of the clinical symptoms.

DISCUSSION

The appearance of a rim of increased activity around a chronic subdural hematoma has been reported by Smoak et al (*1*). Our case closely parallels their report. O'Mara has reported the "doughnut" sign (an area of abnormally increased intracerebral activity containing a central "cold" area) as an uncommon, nonspecific finding (*2*). As indicated by Smoak et al, the "doughnut" sign should not be difficult to distinguish from the "rim" sign of subdural hematoma.

The pathophysiologic mechanisms involved in the production of abnormal brain scans in subdural hematomas are not firmly established. Some investigators have found a much greater concentration of radioactivity within the subdural membrane (*3,4*) while others have reported equal or greater activity within the fluid (*5,6*). Many have observed that chronic subdural hematomas are more likely to be detected by cerebral scans than acute subdural hematomas (*3,5–8*). A close correlation between the production and thickness of a membrane surrounding a subdural hematoma and the appearance of a positive scan has been demonstrated by several investigators (*3,5,8*).

The pathophysiologic mechanisms involved in the production of the "rim" in the dynamic study apparently differ from those responsible for the production of the "rim" on the rectilinear scans. It seems reasonable that the low level of radioactivity at the periphery of the right cerebral hemisphere with a concomitant increase in parasagittal and basal activity seen in the dynamic study represents vascular compression, as previously suggested (*1*). However, the presence of an unusually thick fibrous membrane in our patient suggests that the rim visualized in the rectilinear scans represents increased activity within the fibrous membrane itself. This is substantiated by evidence of a band of increased activity in the right lateral scan completely circumscribing the area where the subdural hematoma was found surgically. If vascular compression were the only mechanism involved, an increase in the activity along the superior border of the lesion in the lateral view would not be seen.

SUMMARY

A patient with chronic subdural hematoma manifest in the dynamic study by compression of the right cerebral blood vessels and on rectilinear scans by a "rim" of increased activity surrounding the lesion is presented. The "rim" sign on the rectilinear scans seems to be due to an accumulation of the radionuclide within an unusually thick fibrous membrane surrounding the hematoma.

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