Intracerebral biopsy hemorrhage: monitoring and intervention guided by intraoperative sonography.

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Failure to demonstrate the sinus thrombosis by angiography probably was due to the time lag between the first CT scan and angiography, although the delay was only a few hours. Even when careful observation, thin slices, and a wide window setting were used, the CT scan taken on the next day also failed to demonstrate the empty delta sign. Thus, we think that the thrombus in the superior sagittal sinus may have disappeared between the time of the first CT scan and the angiography. The IV hydration therapy, which resulted in rapid clinical improvement, may have contributed to the disappearance of the thrombus. A benign clinical course in cases of cerebral venous thrombosis such as our case has been described by Kusunoki et al. [9]. In such cases, the presence of abundant venous collaterals is thought to be one contributory factor [10]. In our case, we suspect that the thrombus may have been either dissolved or carried away in the very early stage as an abortive form, thus resulting in complete recovery. An empty delta sign on CT scan is pathognomonic for cerebral venous sinus thrombosis. However, disappearance of the sign may occur early, as seen in our case, and should be recognized as a possibility when cerebral venous thrombosis is suspected.

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Intracerebral Biopsy Hemorrhage: Monitoring and Intervention Guided by Intraoperative Sonography

Blind surgical procedures on intracranial masses have long been a problem for neurosurgeons. In recent years, CT guidance has increasingly been used to guide neurosurgical procedures. With the development of CT stereotaxis, biopsies and aspirations of intracranial material can be carried out through a burr hole with minimal invasiveness.

Paralleling the rise in the use of CT stereotaxis has been the use of intraoperative brain sonography to guide cerebral procedures. Intraoperative sonography provides a real-time view of the brain that can be used to monitor procedures. Attachment of a biopsy guide to the sonographic transducer allows accurate biopsies and aspirations of cysts, although at this time a craniotomy usually is needed.

Sonography requires a greater exposure but allows continuous monitoring for complications, such as postbiopsy hemorrhage. In this report of a case of postbiopsy intracerebral bleeding, we describe how monitoring via intraoperative sonography allowed us to take immediate measures to prevent further hemorrhage and confirm stabilization of a hematoma.

Case Report

The patient was a 59-year-old man who had a history of right hemiparesis. A CT scan showed a cystic lesion approximately 2–2.5 cm in diameter just lateral to the internal capsule in the left cerebral hemisphere. A left craniotomy was performed, and an intraoperative sonographic probe with a 5-MHz transducer connected to an OR 330 Technicare machine was used to identify the lesion and select a route for the biopsy. A cystic lesion approximately 2 cm in diameter was identified just lateral to the internal capsule (Fig. 1A). The lesion was entered, and cystic fluid was evacuated. The lesion was then biopsied twice. After the second biopsy, active bleeding was noted in real time within the cystic cavity. The bleeding was hypoechoic at first; however, in a matter of minutes, it became hyperechoic, and the diameter of the previous lesion increased (Fig. 1B). At this point, to prevent further hemorrhage, we lowered the patient's blood pressure and maintained it at a systolic pressure of 70–80 mm Hg. The size of the lesion stopped growing, and the blood pressure was maintained at 70–80 mm Hg for approximately 45 min. During that time the lesion was monitored continuously. When the lesion had been stable for approximately 45 min, the blood pressure was slowly raised. Once the lesion was stable, the craniotomy was closed and the patient was sent to the recovery room. A postoperative CT scan confirmed the hemorrhage (Figs. 1C and 1D). The patient recovered uneventfully.

Discussion

Lillehei et al. [1] have documented the sonographic appearance of acute cerebral hematomas. The hematomas are hypoechoic at first and then become hyperechoic after 22 sec because of red-cell aggregation. If a complication such as a hemorrhage is detected, preventive action could theoretically be taken while the patient is still in the operating room rather than in the recovery room or CT scanner. Knake et al. [2, 3] documented two cases in which postbiopsy hemorrhage did occur and in which they were able to monitor the hemorrhage by sonography. They determined that the hemorrhagic lesion had stopped growing even though they had taken no interventional measures.

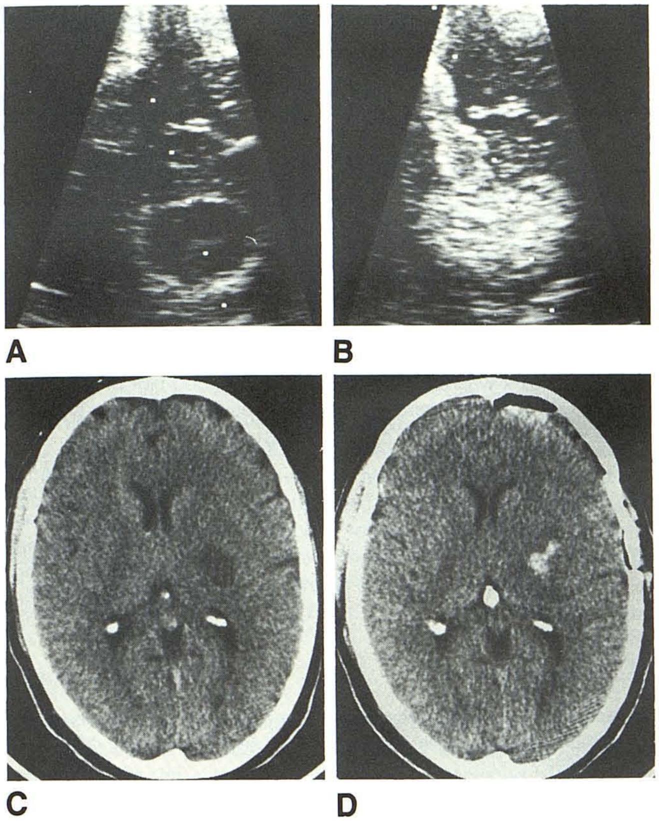

Fig. 1.—Intracerebral biopsy hemorrhage.

A, Intraoperative sonogram shows a cystic lesion deep within left cerebral hemisphere that a later pathologic examination showed was a cystic glioma.

B, Sonogram of same lesion after biopsy shows tract to lesion is now hypoechoic, indicating some hemorrhage. Cystic lesion itself now appears larger by approximately 0.5 cm and has a hyperechoic center, indicating some expansion by hematoma.

C, CT scan before surgery shows a cystic lesion deep within left hemisphere adjacent to posterior limb of internal capsule.

D, CT scan after biopsy shows hemorrhage within lesion.

Our case shows the potential benefit of real-time sonographic monitoring. It allowed us to take immediate intervention (i.e., lowering blood pressure) to prevent further bleeding and enlargement of the hematoma. In addition, we were able to continuously monitor the state of the hematoma to confirm its stabilization. The sonographic appearance of this hematoma confirmed the findings obtained in the animal model: hypoechoic bleeding quickly became hyperechoic.

If CT stereotaxis had been used for this biopsy, by the time the hemorrhage was confirmed by the postbiopsy CT, it might have been too late for any effective interventional measures. If the new small transducers that allow monitoring through a burr hole are used, perhaps a reasonable approach would be to combine CT stereotaxis with intraoperative sonographic monitoring. The biopsy would be performed via CT stereotaxis through one burr hole, and then the procedure would be monitored via intraoperative sonography through a second burr hole.

In conclusion, this case illustrates the potential of using continuous monitoring via intraoperative sonography to prevent what could have been a catastrophic complication. The monitoring allowed us to provide immediate therapeutic intervention and thus limit the extent of intracerebral hemorrhaging.

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