Some Angiographic Features of Brain Abscess

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The purpose of this report is to demonstrate an angiographic appearance that is highly suggestive of a brain abscess. This consists of an extremely well circumscribed shell of abnormal vascularity which, in our opinion, indicates the extent and the precise location of the abscess.

We have encountered 6 patients with brain abscesses in whom this characteristic angiographic appearance has been present. Table 1 summarizes the pertinent clinical data of these cases.

There are many clinical features common to all 6 patients. First, all patients are children with congenital heart disease. Although each has a different cardiac anomaly, all have some degree of cyanosis. Secondly, the abscesses in all the patients, with one exception (T.H.), were located in the frontoparietal area. Thirdly, all abscesses were encapsulated and large, each containing at least 100 cc. of purulent material. Finally, all patients were brought to the neurosurgeon after they were seriously ill and had profound neurological deficits. It is probable that the neurological symptoms and signs in these children had developed insidiously but were not detected because of the limitation of activity imposed by their crippling cardiac lesions.

The photographs of the roentgenograms obtained in some of the patients included in this report illustrate the abnormal vascular markings characteristic of these lesions (Figs. 1–3). We believe that the abnormal vascular marking is the result of 2 factors. First, there is crowding of the normal blood vessels as the brain surrounding the abscess be-

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Sex</th>
<th>Cardiac Lesion</th>
<th>Location of Abscess</th>
<th>Organism</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.A. 852199</td>
<td>7 yrs.</td>
<td>M</td>
<td>Absence of ventricular septum Cyanotic</td>
<td>Left frontoparietal area</td>
<td>Hemophilus influenza</td>
</tr>
<tr>
<td>G.F. 956998</td>
<td>6 yrs.</td>
<td>F</td>
<td>Tetralogy of Fallot Cyanotic</td>
<td>Left frontoparietal area</td>
<td>Microaerophilic streptococci &amp; bacteroides species</td>
</tr>
<tr>
<td>N.S. 898532</td>
<td>6 yrs.</td>
<td>F</td>
<td>Congenital heart disease, truncus arteriosus Cyanotic</td>
<td>Left parietal area</td>
<td>Microaerophilic streptococci</td>
</tr>
<tr>
<td>T.H. 862548</td>
<td>3 yrs.</td>
<td>M</td>
<td>Anomalous entry of pulmonory vein into the superior vena cava Cyanotic</td>
<td>Left temporal lobe</td>
<td>Actinobacillus</td>
</tr>
<tr>
<td>A.H. 971908</td>
<td>3½ yrs.</td>
<td>M</td>
<td>Complete transposition Interventricular septal defect Cyanotic</td>
<td>Left parietal area</td>
<td>Alpha-hemolytic streptococci</td>
</tr>
<tr>
<td>V.O. 795576</td>
<td>15 yrs.</td>
<td>M</td>
<td>Tetralogy of Fallot Cyanotic</td>
<td>Right parietal region</td>
<td>Microaerophilic Streptococci</td>
</tr>
</tbody>
</table>

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Fig. 1. Cerebral angiograms showing left frontal-parietal abscess in Patient G.F. A & B: Arterial phase, showing a faint abscess capsule in both views. C & D: Capillary phase showing increasing vascular marking in the capsule. E & F: Venous phase; the vascular marking of the abscess capsule is very clearly demonstrated. Note filling of the ophthalmic artery in B and choroid coat of the eye in B, D and faintly in F.
comes progressively compressed. Secondly, there is additional vascular proliferation in the capsule of the abscess. These 2 sets of blood vessels become superimposed in the periphery of the abscess, thus producing these striking vascular markings. Fig. 4 shows the microscopic appearance of the abscess capsule removed in Patient A.H. It demonstrates well the vascular hyperplasia.

Wickbom\(^4\) has stated that an abscess of long duration may have a capsule containing numerous small vessels. He pointed out that the angiographic pattern of such a lesion may be mistaken for a highly vascular tumor. Lecuirc and his associates\(^5\) reported on the angiographic findings of 45 brain abscesses, of which 50 per cent showed a "circular image" which was best visualized in the capillary phase and seemed to surround the capsule. These authors gave credit to Heep and Wickbom\(^1\) for having originally described this appearance. Weber\(^2\) observed a similar vascular pattern in a subdural empyema. He, too, believed the increased vascularity was in the "neomembrane" or the capsule of the empyema. In our cases this neovascularization is extremely striking. It is most evident in the late capillary and early venous phases of the angiogram. It is possible that this remarkable filling may, at least in part, result from the generalized increased vascularity due to the cardiac problems present in these patients. The demonstration of the contrast medium in the eye (Fig. 1) supports this concept. This was so unusual that it caused the radiologist to suggest the presence of a prosthesis in the orbit. In several patients there was a suggestion of multilocular cavitation. This cannot be substantiated entirely as most of these patients were treated successfully with drainage of the abscess. In only one patient was a radical removal of the abscess performed. At surgery, many small loculations within the large
capsule were encountered but the lateral angiograms suggested 2 pockets (Fig. 3).

In the majority of these patients, the lateral angiogram demonstrates the abscess capsule more clearly than the anteroposterior views. This is understandable because there is considerably less background of radiopacity in the former position. This fact suggests that a lateral stereoscopic angiogram may be extremely valuable in the localization and management of these lesions.

Summary

We have demonstrated an angiographic pattern characteristic of a brain abscess. We believe that this pattern represents opacification of capillaries in the capsule of the abscess, together with crowding of normal blood vessels compressed by the abscess.

References

1. Heep and Wickbom, I. Cited by Lecuire et al.2