Embolism during Cerebral Angiography

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Received September 1, 1971

Summary. During angiographic investigations fibrin clots can form in the puncturing needle or in the catheter. Occasionally these pass into the brain arteries during contrast medium injection. The angiographic characteristics of these embolisms, which happened in 7 out of 1000 cerebral angiographies, are demonstrated. In our own 4 cases with control angiogram it is shown that these emboli dissolve in a short time, without any therapeutic measures. Fortunately, neurological complications due to these emboli seem to be rare.

Key words: Angiography — Cerebrovascular Disease — Embolism — Fibrinolysis.

As a part of angiographic studies of cerebrovascular disease one has learned to examine smaller branches of the brain arteries and to search for occlusions or stenoses in these peripheral regions [4, 13]. The following criteria, alone or in combination, suggest an occlusion of a small vessel:

1. The absence of a small arterial branch supplying a certain area. Since these small branches are variable, the absence of a side-branch of the third or fourth order cannot always be diagnosed with certainty.

2. The sharp interruption of the continuity of a vessel or an abrupt decrease in diameter, found in several films of a series. In the latter case it is supposed that one side-branch is occluded just at the bifurcation of this vessel.

3. A delayed contrast filling and clearance of a vessel.

4. A retrograde contrast filling of peripheral branches through leptomeningeal anastomoses.

5. An early filling vein as in the luxury perfusion syndrome.
Often these circulatory disorders in smaller vessels can be proven only by serial angiography with high exposure-frequency (2 or more exposures/sec). Occasionally, uncertain findings can be clarified by the use of functional tests such as hyperventilation or pharmacological increase of blood pressure during the angiography [7].

To prove such circulatory disturbances, one often needs additional injections of contrast medium. This prolongs the whole procedure and so gives an increased risk of complications. The most common and severe complications of cerebral angiography are of technical origin, caused by injury to the vessel during the puncture or during the injection of contrast medium (i.e. puncture of an atheromatose plaque, intramural injection of contrast medium, formation of a dissecting aneurysm [1]). On the other hand, the risks caused by presently available contrast media is, in the usual dosages (6 ml/injection), of minor importance.

Only in recent years the possibility of another complication, cerebral embolism during contrast medium or saline injection, has been recognised. This is not caused directly by the puncturing or the contrast medium. It is found both during the direct puncture of the vessel and during the use of the various catheter methods [2, 3]. These embolisms seem to occur more frequently whilst using puncture needles which have an open hub [2] and are closed by a blunt stilet between series. Fibrin aggregates frequently form between the head of the stilet and the needle hub. These are loosened by the forced injection of contrast medium and are then carried into the arteries. In spite of various procedures such as the washing of the hub with saline before attaching the syringe and aspiration of blood before the contrast medium injection, we have seen several embolisms of fibrin clots of this type. In the assessment of the films, the question arises whether an arterial occlusion corresponds to a pre-existing lesion or is iatrogenic due to the angiography.

The clinical consequences of these fibrin emboli and their further development are of special interest and will be considered in terms of our own experience. During our last 1000 cerebral angiographies, by direct puncture of the artery, with the needle closed by a blunt stilet between series, we have encountered 7 artificial embolisms. In every case the embolism only occurred in the course of extended angiographic procedures and not at the beginning of the examination. The correct location of the needle in the artery was verified in each case from the X-ray pictures. In 4 patients we were able to follow up the further development of the embolus by a control angiogram.

None of the 7 patients, in whom angiography under local anaesthesia was complicated by a fresh fibrin embolus, had subjective or objective neurological symptoms, nor a worsening of the pre-existing symptoms. This fact seems to be of great importance. This favourable outcome in our