The Moving Embolus Seen During Serial Cerebral Angiography

BY ARIE LIEBESKIND, M.D., ALI CHINICHIAN, M.D., AND MANNIE M. SCHECHTER, M.D.

Abstract: The Moving Embolus Seen During Serial Cerebral Angiography

- Movement of an occlusive process in an angiographical study is diagnostic of embolization.
  - Two cases are reported in which the demonstration of a moving embolism on serial angiography is shown.

Additional Key Words: cerebrovascular disease, cerebral circulation, emboli

Introduction

The delineation angiographically of an abrupt round edged occlusion in a vessel leading to an avascular region and of retrograde flow of contrast material in collateral vessels to the deprived area is a reliable sign of an embolic occlusion.\(^1\) Additional diagnostic criteria of cerebral embolism, such as early filling of cerebral veins, have been noted by other observers.\(^5\)\(^6\) It is felt, however, that movement or disappearance of an occlusive process on subsequent angiographical studies is a more definite sign of an embolic phenomenon. The most reliable evidence is the presence on one film of a vessel which is then found to be occluded on a second film a few minutes later.\(^7\) The purpose of this study is to present two cases where the actual movement of emboli was demonstrated angiographically. These cases actually demonstrate angiographically the movement of fresh emboli which may continually arise in the cerebral circulation and which are recognized before they have changed their position.

CASE 1

This patient was a 47-year-old white female with a 15-year history of rheumatic heart disease, mitral stenosis and mitral insufficiency and a recent history of atrial fibrillation. On the morning of the patient’s admission, aphasia and a right facial nerve paralysis developed. She was brought to the emergency room where she rapidly became comatose with decerebrate posturing. On physical examination both pupils were 3 mm in diameter and slowly reactive to light. Examination of the fundi showed no hemorrhages. She had generalized increased tone and responded to painful stimuli bilaterally, with decerebration. There was a bilateral Babinski sign. Other pertinent findings included marked cardiomegaly with mitral stenosis, mitral insufficiency murmurs and an irregular rhythm. It was felt that the sudden onset of aphasia, right facial nerve palsy and decerebration in a patient with atrial fibrillation was most likely due to emboli. However, infarction and mycotic aneurysm were also included in the differential diagnosis.

Angiography

A right common carotid angiography study showed segmental occlusion of the supraclinoid portion of the internal carotid artery. Contrast was seen in the proximal portion of the anterior cerebral artery but not in the middle cerebral branches (fig. 1A). On a film obtained three seconds later, the segmental defect in the internal carotid was still seen but, in addition, another well-defined, round-shaped defect was seen more distally (fig. 1B). This portion of the anterior cerebral artery was visualized on successive films.
MOVING EMBOLUS SEEN DURING SERIAL ANGIOGRAPHY

A. Lateral carotid angiography. An early film of the angiographical series shows contrast in the internal carotid artery extending to the level of the supraclinoid segment. At this point there is an occlusion of the vessel extending for about 1 cm. The anterior cerebral artery fills beyond this point. Note no filling of middle cerebral artery. B. Same injection and angiographical series. The film was exposed about three seconds after figure 1A. An occlusion of the anterior cerebral artery distally is now noted. C. Same angiographical series as figure 1A and figure 1B. Film exposed six seconds after 1B. Note that the segment of the anterior cerebral artery about 1 cm in length is still filled with contrast medium. D. Anterior posterior film exposed simultaneously with figure 1C.

throughout the rest of the study (figs. 1C and 1D).

CASE 2
This 69-year-old white female was admitted to the Department of Medicine because of an overdose of Doriden®. Prior to admission she was noted by her family to be depressed and withdrawn. On the day of admission she was found on the floor of her apartment unresponsive. On physical examination she had no focal signs but was semicomatose. Laboratory findings showed hypernatremia and a high serum level of Doriden for which she was treated. For a period of six days she responded well to treatment and became alert and talkative. However, on the seventh day following her admission, she was noted to behave in a bizarre fashion, becoming lethargic. Skull series, roentgenograms, lumbar puncture, and brain scan were negative. Her Doriden level was markedly elevated (2.3 mg %) and the following day she was unresponsive but reacted to noxious stimuli with only slight posturing of the right upper extremity. The right pupil was dilated and with this focal finding and an unclear history it was felt that the possibility of a subdural hematoma had to be ruled out.

Angiography
A right carotid angiography study was performed. The early arterial phase revealed an occlusion of the pericallosal artery which appeared to have a round edge at its extremity. Similar findings were noted in a branch of the middle cerebral artery (fig. 2A). There was no evidence of delay in filling of these vessels, nor abnormal changes in their caliber suggesting stenosis. In subsequent films another concave occlusion proximal but in close proximity to the first block of the pericallosal artery was noted (fig. 2B). There was early vein filling. The segment of the pericallosal artery between the two occlusions described
remained opacified throughout the study (fig. 2C). Similar changes were observed in the previously described occluded branch of the middle cerebral artery. The patient died 24 hours following the angiography study. An autopsy was not obtained.

**Discussion**

It is generally recognized that emboli are multiple, involving smaller arterial branches. However, this is not an absolute criterion as multiple branch occlusions occur in conjunction with generalized intracerebral atherosclerosis and may also be seen with arteritis of cerebral vessels. Movement or disappearance of an occlusive process is a more definitive evidence of an embolic phenomenon. Dalal et al. described nine cases with cerebral emboli which on subsequent arteriographical studies showed restoration of circulation to normal. The time interval between their repeated studies varied from 10 minutes to 21 days, and they believed that this resulted from fragmentation of the embolic plug with subsequent lysis. Similar findings were noted by other observers. Recanalization of angiographically observed arterial occlusions as a result of fibrinolytic therapy has also been reported.
MOVING EMBOLUS SEEN DURING SERIAL ANGIOGRAPHY

The demonstration of movement of an occlusive process on an angiographical study is diagnostic of embolization. If an embolus were to completely obstruct one limb of a bifurcation, contrast material could easily exit via the other channel and there might be no holdup of the contrast column. This process most likely occurred in the two cases described, in the distal segments of the vessels. The only reason for visualization of the arterial segment of the vessel throughout all phases of the study was because the emboli had migrated so close to one another that draining through side branches could not occur. Emboli may be concealed by a proximal occlusion. Ring demonstrated concealed emboli in cases with a large branch occlusion. Because of the short distance between the two emboli, what may have been a concealed embolus was now demonstrated. In both cases described, the movement of emboli within the same vessel has been demonstrated in successive films taken at time intervals of one second. The angiographical demonstration of moving emboli confirms the clinical impression that a shower of varying-sized emboli may spread and involve multiple vessels at the same time.

Summary

Two cases are reported in which the angiographical demonstration of a moving embolism was shown. This angiographical sign of movement of a filling defect is considered pathognomonic.

References

The Moving Embolus Seen During Serial Cerebral Angiography
ARIE LIEBESKIND, ALI CHINICHIAN and MANNIE M. SCHECHTER

Stroke. 1971;2:440-443
doi: 10.1161/01.STR.2.5.440

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/2/5/440

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Stroke can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Stroke is online at:
http://stroke.ahajournals.org/subscriptions/