Retrieval of a Thrombus Attached to a Cournand Needle

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Abstract:
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Upon completion of a carotid angiogram, a clot of platelets, leukocytes, erythrocytes and fibrin was found attached to a No. 18 gauge Cournand needle. The chance retrieval of this thrombus establishes the occurrence of thrombus formation on angiographic needles. Such thrombi could be the source of some post-angiographic infarctions and are consistent with current concepts of clotting.

ADDITIONAL KEY WORDS
- cerebral embolus and infarction
- complication of cerebral angiogram
- thrombosis mechanisms

Introduction
The hazards of cerebral angiography have prompted numerous studies and discussions and, despite repeated efforts, the etiology of complications often remains unknown. This report documents an etiology of some of these unknown causes. It is an observation of thrombus formation on an angiogram needle during a normal arteriogram. It may be a “natural risk of angiography.”

CASE REPORT
A 39-year-old alcoholic mechanic presented with a one-month history of headache, polyphagia, polyuria, episodic visual loss, subjective dizziness and right-sided focal seizures that had progressed to a grand mal state. His general physical examination was unremarkable. Though recent memory was intact, he was mentally slowed and serial subtractions were arduous but correct. Metabolic studies, save for sedimentation rate of 39, were normal. In successive lumbar punctures there were 11 and 13 lymphocytes, while the cerebrospinal fluid was otherwise normal. The initial EEG, brain scan, pneumoencephalographic and angiographic studies were normal. Search for infection and primary tumor elsewhere and a history of recent ethanol ingestion were unrewarding. Another pneumoencephalogram and arteriogram shows a hypothalamic mass. No clinical complications occurred from these studies. The patient died eight weeks after the onset of his symptoms and autopsy was not permitted.

PROCEDURE
The angiogram was undertaken immediately after a pneumoencephalogram in which left ventricular filling was unsuccessful. No general anesthetic was used. The patient had been non per os for 15 hours. After local procaine infiltration, a 15 gauge needle was used for the skin and then No. 18 Cournand needles were easily passed into the carotid arteries. Free backflow appeared in the attached saline tubes and polaroid studies showed no sheath disruption or atherosclerosis. After single 10 cc Hypaque injections, the blunt stilette was replaced in the Cournand needle as films were developed through a seven-minute Xomat. The duration of the intravascular common carotid placement was 20 minutes. The Cournand needles were then removed. A 1 cm linear clot, with a diameter no larger than the circumference of the left Cournand needle, was attached to the blunt stilette. Afterward, there were no abnormal signs or complications.

The clot was immediately removed by the attending pathologist, D. W. B. Kingsley, and fixed. Routine stains and electronmicroscopy studies showed a bland clot with platelets, leukocytes, erythrocytes and fibrin.

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RETRIEVAL OF A THROMBUS

Discussion

Ipsilateral cerebral infarction following carotid arteriography has been the most-feared angiographic complication. In the "Report of the cooperative study of intracranial aneurysms and subarachnoid hemorrhage: cerebral angiography," the authors reported 37 autopsied cases of angiographic complications, 14 with ipsilateral cerebral infarcts. They were recent and presumably related to the study. Of the 14, emboli were discovered in three. Because emboli are known to fragment and move distally, their frequency may be higher than recognized at autopsy.

In an atheromatous carotid, embolism from the site of the percutaneous puncture is an acknowledged hazard. In this case, an intrarterial thrombus was recovered attached to an angiographic needle. Possible embolism and distal infarction from such a thrombus can be reasonably presumed.

Ordinarily, a Courmand needle would be denuded of any attached clot during withdrawal. We suspect that the initial percutaneous puncture by a larger needle may have contributed to its recovery in this instance. It is also likely that the linear configuration and small size of the clot mattered. Retrieval of a clot establishes that a thrombus can form on intravascular Courmand needles, and it can be reasonably concluded that such a thrombus may cause an embolus.

It is doubtful whether the metallic needle causes a thrombus. In earlier studies, we have retrieved a clot from the end of a nonmetallic plastic catheter placed within an artery.

Current concepts of clotting may explain this incident. It may be that having perforated a collagenous media and so rent the intima, a needle in the blood stream will provoke clotting and produce the necessary concentrations of platelets, adenosine diphosphate (ADP) and Factor XII (Hageman).

Factor XII (Hageman), a gamma globulin, is known to attach itself to foreign wettable surfaces, i.e., a Courmand needle, in the flowing blood. As it coats the needle, it acts to increase the needle adhesiveness for passing platelets. The platelets may be particularly clustered in this area by the adjacent damaged endothelium. Then the platelets stick to each other, and the needle is encapsulated, layer by layer, to form the nidus of a clot. Simultaneously, Factor XII initiates the enzymatic cycle leading to fibrin formation. A thrombus forms as the leukocytes and erythrocytes are enveloped in the fibrin. If there is a high concentration of ADP and Factor XII, platelet adhesiveness is particularly prompt. ADP is richly condensed in collagen tissue such as a vessel wall media. If the endothelium is torn to expose the media, this reservoir of ADP is immediately available to the focal nidus platelet and Factor XII. As this nidus briskly accumulates its aggregation of platelets, fibrin, erythrocytes and leukocytes, the clustered platelets and erythrocytes contribute additionally enriching ADP when ADP is already present from the collagen wall.

Thus triggered and enriched, the reaction occurs within seconds.

That clot formation can occur on an angiographic needle is shown by our case. We suspect that the presence of the needle, the adjacent disrupted endothelium and the denuded collagen constitute the constellation of circumstances which induce clotting and make for "the natural risk of angiography." In an extensive sheath disruption with its widely disrupted endothelium and denuded collagen, an increased incidence of complications can be anticipated.

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